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# SUSTAINABILITY AS A VALUE CREATION MECHANISM: A CONCEPTUAL FRAMEWORK OF ESG, PROFITABILITY, AND MARKET VALUATION

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**Abstract**

This study investigates how sustainability practices are capitalized into firm value by modeling profitability as a key transmission mechanism. Using a balanced panel of 51 non-financial firms listed on the Indonesia Stock Exchange over 2017–2023 (357 firm-year observations), we estimate a Random Effects model via EGLS, selected through Chow, Hausman, and Lagrange Multiplier tests. The results show that ESG performance, carbon disclosure, and green innovation positively and significantly enhance return on assets (ROA). Further analysis indicates that ESG performance, carbon disclosure, green innovation, and ROA exert positive and significant effects on firm value (Tobin's Q), whereas firm size and leverage have negative effects. Mediation tests (Sobel, Aroian, and Goodman) confirm that ROA significantly mediates the relationship between sustainability dimensions and firm value. The models explain 48% of the variation in ROA and 54% in firm value. Conceptually, the findings support a unified value-creation framework integrating the Triple Bottom Line and Doughnut Economics, highlighting internal profitability as the mechanism linking sustainability to market valuation.

**Keywords:** Sustainability; ESG Performance; Green Innovation; Carbon Disclosure; Profitability; Firm Value; Tobin's Q; Doughnut Economics; Triple Bottom Line; Modern Capitalism.

## INTRODUCTION

Since the Brundtland Report (1987), sustainability thinking has evolved from a normative, intergenerational concept into an increasingly operational and strategic framework for firms (de Oliveira et al., 2023; Gallardo-Vázquez, 2025; Yip et al., 2023. A major milestone was Elkington's Triple Bottom Line, which translated sustainability into firm-level objectives by integrating economic, social, and environmental dimensions (Alhaddi, 2015; Kusmendar et al., 2025). As firms are now evaluated on their ability to operate within planetary boundaries while maintaining socio-economic resilience, sustainability has shifted from a CSR-oriented norm toward a core mechanism of value creation (Fanning & Raworth, 2025; Kate Raworth, 2017). This transformation is informed by critical scholarship

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highlighting capitalism's failure to internalize social and environmental externalities, resulting in systemic market failures. In response, Doughnut Economics reframes sustainable growth as value creation bounded by social foundations and ecological limits, aligning sustainability-oriented behavior with welfare economics and market failure theory as an efficiency-enhancing response rather than a cost-imposing trade-off (Elkington, 2018; Gucciardi & Luzzati, 2024; Nieuwland, 2023; Sridhar & Jones, 2013; Thompson et al., 2024; Turner & Wills, 2022; Van Der Enden, 2022).

Despite its prominence, Elkington's Triple Bottom Line (TBL) has largely remained symbolic in practice, favoring transparency and reporting over transformative business logic, reinforcing sustainability disclosure and economic performance decoupling's perennity (Afeltra et al., 2023; Alowais, 2024; Boje, 2016; Rambaud & Richard, 2015; Sridhar & Jones, 2013). As a result, methodological frameworks have failed to combine the Stiglitz institutional critique of growth centricity in economics measurement with Raworth's planetary boundary (Gucciardi & Luzzati, 2024; Ilyas & Osiyevskyy, 2022; Schlesier et al., 2024; Stiglitz, 2020), hence mixed and inconclusive empirical findings of ESG-performance, carbon disclosures, and green innovation on firm value due to disclosure bias, a one-dimensional construct of ESG, and overlooking internal value-creation mechanisms (Ali et al., 2022; Postiglione et al., 2024; Rina et al., 2022; Siddique et al., 2021; Soewarno et al., 2019).

To overcome these conceptual and empirical shortcomings, this study makes a case for a new triangular conceptual framework that coherently amalgamates Raworth's boundary-based paradigm, Stiglitz's alternative metrics discourse, and Elkington's corporate sustainability logic into an epistemologically integrated model (Ferretto et al., 2022; Loviscek, 2021; Schlesier et al., 2024; Sen & Foster, 1997; Shao, 2025). The study conceptually and empirically repositions sustainability beyond procedural disclosure to a systemically grounded value-creation mechanism through internal efficiency and external legitimacy conduits (Bautista-Puig et al., 2021; Recordon et al., 2025; Wirjawan, 2024), while empirically studying ESG performance, carbon disclosure, and green innovation impact on firm value (Tobin's Q) through mediating profitability (ROA) using panel data analysis (Ahmad et al., 2024; Aydoğmuş et al., 2022; Demirel & Kesidou, 2019; Liu, 2023; Yadiati et al., 2024).

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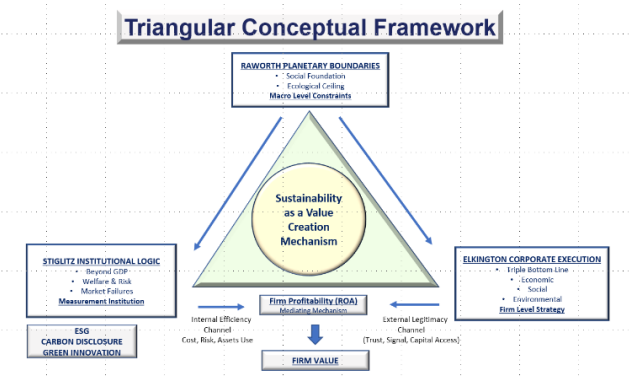


Figure 1. Source: Author, (Elkington, 1997; Elkington, 2018; Fanning & Raworth, 2025; Kate Raworth, 2017; Stiglitz, 2019; Stiglitz, 2020)

## LITERATURE REVIEW

### Environmental Social Government

Environmental, Social, and Governance (ESG) performance is beginning to become a more integrated strategic function that goes beyond simply performing the minimum possible, instead informing the operational and financial performance of a firm (Shan et al., 2024; Zheng et al., 2025) Stakeholder theory posits that strong ESG initiatives foster trust and strong relational ties with key constituents like customers, employees, policymakers, and investors. This diminishes transaction costs and bolsters the firm's access to and legitimacy of critical resources (Cardillo & Basso, 2025). Similarly, a positive ESG rating reflects managerial competence and long-term orientation, which diminishes information asymmetry, thereby lowering the cost of capital and the risk/return trade-off of the firm (Kordsachia et al., 2021; Landi & Sciarelli, 2019).

### Carbon Disclosure

Firms that make carbon disclosure a regular practice are likely to improve their Return on Assets (ROA) via two key factors: mitigating both the degree of information asymmetry/judgment risk and signaling managerial discretion of regarding the firm's climate risk governance. Increased carbon transparency diminishes firm-specific idiosyncratic risk and financing uncertainty, thus strengthening operational stability and improving the efficiency of asset utilization (Brogi & Lagasio, 2018; Bui et al., 2020). The value of carbon transparency also comes from providing credible signals to stakeholders of management's long-term commitment to firm strategies and the capability of managing environmental risk, which can lead to better operational performance (Siddique et al., 2021).

### Green Innovation

Green innovation includes technologies for pollution prevention and developing products for eco-efficient processes. Investments in green innovation

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enhance Return on Assets (ROA) by decreasing operational costs and promoting resource-efficient processing while providing a competitive edge for above-market sales (Borsatto & Amui, 2019; Rina et al., 2022). Also, oriented prevention and superior green innovations of a highly qualitative nature, enhance sales and reduce costs. They turn environmental expenditures into formidable profitability, improving the environmental profitability of assets over a certain period (Dangelico, 2016). However, the return on investments earned through green innovation becomes a function of the dimension of the innovation, the level of the firm, and the time period predicted. It is only in large-sized firms with strong Absorptive Capacity where the return of the effort becomes clear; high implementation costs in the short run will lead to poor performance in the accounting records, and in the medium to longer run, the positive effects will show through improved productivity (Aguilera-Caracuel & Ortiz-de-Mandojana, 2013; Duque-Grisales et al., 2020).

**Return On Assets**

Return on assets (ROA) reflects management's ability to convert assets into profits and directly influences firm value, as persistent profitability increases expectations of future cash flows and lowers perceived downside risk, thereby enhancing market capitalization (Butt et al., 2023; Sudiyatno et al., 2020). In sustainability-oriented capital markets, however, the capitalization of ROA into firm value is shaped by environmental, social, and governance (ESG) performance, green innovation, and carbon disclosure (Cort & Esty, 2020; Lau, 2023; Li et al., 2024). Firms with superior ESG performance and substantive green innovation exhibit stronger ROA persistence and growth potential through improved operational efficiency and access to green market opportunities, reinforcing the profitability–valuation linkage (Al-Mari & Mardini, 2024; Naeem et al., 2021). Moreover, high-quality carbon disclosure enhances the credibility of ROA by reducing information asymmetry and climate-related risk, allowing investors to translate profitability improvements into market value more accurately (D'Orazio & Dirks, 2022; Dharma et al., 2024; Kabir et al., 2021).

**Firm Value**

There is increasing empirical evidence that intrinsic channels (operational efficiency, green innovation) and extrinsic channels (market valuation, lower financing costs) jointly lead to positive firm value when firms undertake ESG, green innovation, and green investment (Khan & Vismara, 2025; Sellitto et al., 2020). Positive ESG value and profitability links characterize large-sample studies (Aydoğmuş et al., 2022). Market reactions to credible green financing (e.g., green bonds) and stronger ESG ratings also signal real valuation effects and not symbolic disclosure (Flammer, 2023) . Firm-level analyses confirm that substantive green

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innovation and robust ESG disclosure enhance Tobin's by improving internal performance (Zhang et al., 2019; Zhang et al., 2022).

**Hypothesis Development**

Environmental initiatives and the associated governance enhancements are positively correlated with productivity and, more importantly, with the accounting performance measure, Return on Assets (ROA) (Nirino et al., 2021), ESG also has a positive impact on increasing ROA (Dalal & Thaker, 2019; Fatemi et al., 2018) . However, empirical evidence also documents contexts in which ESG investment lowers short-term accounting profitability (due to upfront costs, trade-offs, or sectoral/regulatory constraints), so the net effect can be neutral, negative, or conditional on firm and market characteristics (Garcia & Orsato, 2020; Landi & Sciarelli, 2019). As a result, we expect that firms that invest in their ESG performance will be more profitable than their non-ESG investing counterparts. **H1**: ESG has a positive effect on ROA.

The degree of financial performance improvement also depends on the industry in which the firm operates and on other firms in the industry. It has also been observed that non-carbon-intensive firms improve their return on assets (ROA) in much less time than carbon-intensive firms (Ibishova et al., 2024; Trinks et al., 2020). Some studies have shown that Carbon disclosure has a positive impact on ROA (Luo & Tang, 2022; Shen et al., 2021). An empirical study has found a negative correlation between carbon disclosure and ROA (Liu et al., 2023; Luo, 2019). It should be noted that, in the short run, accounting performance is negatively impacted by compliance and transition costs. However, it is widely accepted that once a firm transitions to a low-carbon outcome in its operations, the firm's financial performance will improve (Liu et al., 2023; Wang et al., 2025; Xu et al., 2025). **H2:** Carbon Disclosure has a positive effect on ROA.

Green innovations influence Return on Investments (ROA) through two major mechanisms. The first is improved cost-efficiency because of a decrease in the cost of inputs and the cost of complying with pollution laws. The second is better strategic positioning, because improved cost-efficiency allows the firm to achieve better environmental compliance, afforded by the attainment of green market sales (Fernando & Wah, 2017; Hizarci-Payne et al., 2021; Meng et al., 2014). Consequently, firms that can integrate effective green innovations with their company strategy are more likely to experience a meaningful and continuous level of profitability in their assets. However, a growing strand of empirical literature documents that green innovation exerts a negative short-term effect on return on assets (ROA). Typically, this adverse relationship is attributed to the upfront investment costs, payback period, and organizational adjustment costs that come with adopting green technologies. ROA is a measure of accounting-based profitability, which green

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innovation disrupts temporarily through operational inefficiency (Khan et al., 2022; Z. Xie et al., 2022). **H3:** Green Innovation has a positive effect on ROA.

ESG performance reflects a firm's commitment to environmental, social, and governance improvements and serves as a positive signal of managerial quality, effective risk management, and long-term orientation (Cardillo & Basso, 2025; Yadav et al., 2016). From a stakeholder theory perspective, firms addressing stakeholder concerns are more likely to gain legitimacy and investor trust (Zheng et al., 2025). In Indonesia, ESG integration into investment decisions is increasing amid supportive yet voluntary regulation, resulting in heterogeneous disclosure quality. While strong ESG performance signals lower non-financial risk and long-term value, capital market valuation responses remain inconsistent (Fatemi et al., 2018; Gunawan et al., 2025; Nareswari et al., 2023) **H4:** ESG has a positive effect on Firm Value.

Carbon emissions and climate-risk reporting reflect corporate accountability and transparency by aligning disclosed climate data with actual operations (Alsaifi et al., 2020). In emerging markets such as Indonesia, where carbon disclosure remains largely voluntary and influenced by regulatory and sustainability indexing frameworks, detailed reporting enhances capital market access by reducing information asymmetry and agency problems (Arian & Naeem, 2025; Boulton, 2024; Öcal & Kamil, 2021). Evidence from emerging Asian economies shows that voluntary carbon disclosure lowers the cost of capital and improves firm performance, particularly when supported by substantive environmental initiatives (Bui et al., 2020). These benefits are strongest in weak enforcement settings, positioning carbon transparency as a value-enhancing mechanism rather than symbolic compliance (Cahyono et al., 2022; Farabi et al., 2025; Sætra, 2023). **H5:** Carbon Disclosure has a positive effect on Firm Value.

Green innovation is defined as the creation and use of environmentally conscious products, processes, or technologies to enhance efficiency while reducing harm to the environment (Ahmed et al., 2023b; Hao et al., 2022; X. Xie et al., 2022). In terms of the resource-based perspective, green innovation represents a strategic capability that facilitates all three forms of innovation: cost savings, increased productivity, and differentiation; therefore, green innovation will provide firms with softer advantages (Khanra et al., 2021; Yuliandhari et al., 2023). In addition to providing operational advantages, organisations pursuing green innovation will improve their corporate reputations while aligning with sustainability-oriented investment preferences (Ogiemwonyi et al., 2023; Zhu & Liu, 2025). Thus, firms that are pursuing green innovation should achieve a higher value in terms of firm value because of both increased operational efficiencies and improved perceptions within the marketplace (Karimi

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Takalo et al., 2021; Wang et al., 2021).**H6:** Green Innovation has a Positive Impact on Firm Value.

Prior studies document largely a positive relationship between profitability, as measured by return on assets (ROA), and firm value proxied by Tobin's Q (Velte, 2017; Yu & Xiao, 2022) . However, the evidence on this relationship is not definitive. Evidence from R&D intensive firms and emerging markets points to ROA having a weak, negative, or even nonlinear association with Tobin's Q, with current profitability signaling a lack of growth or opportunities being affected by high levels of investment significance (Garcia & Orsato, 2020; Saygili et al., 2022). These mixed findings present a gap in knowledge on the conditional and context-specific mechanisms of capitalizing profits into firms' value in emerging markets under different disclosure regimes and institutional contexts (Zhu & Liu, 2025).**H7:**ROA has a positive effect on Firm Value.

Return on assets (ROA) acts as the core transmission channel through which sustainability-related strategies are transformed into firm value, where superior ESG performance's impact is reflected in operational efficiency, risk management, and capital access, translating into high and stable profitability, which is later assimilated into market valuation (Agustia et al., 2019; Naeem et al., 2021). Also, high-quality carbon disclosure limits information asymmetry and environmental risk, enhances operational efficiency, and corroborates the credibility of profitability signals, hence the market can reflect more on improvements in ROA on Tobin's Q (Chen & Ma, 2021; Remo-Diez et al., 2023; Xu et al., 2025). Green innovation further strengthens this channel by reducing input and compliance costs while providing growth opportunities, hence enhancing ROA and long-term firm value (Steindl et al., 2024; X. Xie et al., 2022). Together, these findings embrace a mediation umbrella where the value effects of ESG, carbon disclosure, and green innovation are relayed via ROA, while the profitability–valuation linkage is enhanced via transparent disclosure and the combined effect of sustainability practices. **H8a, H8b, H8c:** ROA has an improved mediating effect of ESG, Carbon Disclosure, and Green Innovation on Firm Value.

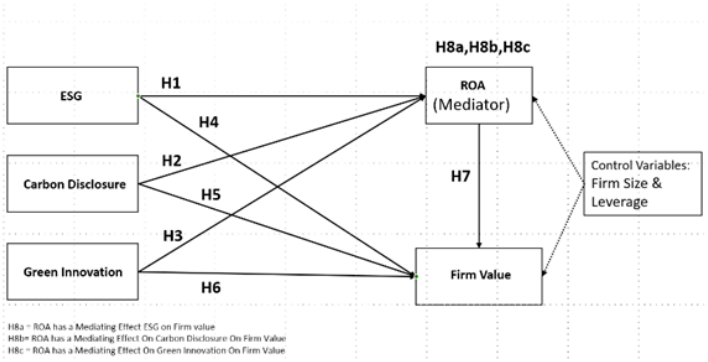


Figure 2 Research Framework Model. Sources: author, (Do & Kim, 2020; Monasterolo & de Angelis, 2020; Tolliver et al., 2019; Xie et al., 2016)

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## RESEARCH METHOD

The goal of this research investigation is to assess the influence of ESG (environmental, social, governance) performance, carbon disclosure, and green innovations on firm value (using Tobin's Q as a measure of performance) while simultaneously assessing both internal and external factors that govern this relationship within an Indonesian contextual framework. This research employs a quantitative method and uses a panel data analysis to evaluate the transmission mechanisms between sustainability dimensions and firm value. The research design emphasizes the mediating influence of operational profitability as well as the moderating influences of capital structure and organization size in the Indonesian capital market. To find the best panel data regression model, a three-step diagnosis was done using a Chow test to decide between a pooled model and fixed effects, a Hausman test to decide between fixed and random effects, and a Lagrange Multiplier test to decide between pooled and random effects. The model the diagnosis showed was the best, and results were considered statistically important if p was less than 0.05.

### Sample Data and Sources

This study investigates non-financial firms listed on the Indonesia Stock Exchange (IDX), excluding financial institutions due to their distinct regulatory environments and financial structures. Using a multi-year panel to capture variations in sustainability practices and financial performance, the sample is selected through purposive sampling. ESG performance data are sourced from the Environmental Social Governance Intelligence (ESGI) database at Airlangga University, carbon disclosure data from corporate sustainability reports, and financial variables from audited annual reports and established databases. From 906 listed firms in 2023, 51 companies comprising 357 firm-year observations satisfy all selection criteria and form the final sample.

## RESULTS AND DISCUSSION

**Table 1. Panel Estimation**

| Variable | Coefficient | | |
|---|---|---|---|
| | CEM | FEM | REM |
| Constant | 2.240134 | 1.32959 | 1.155776 |
| ESG | -0.545667 | -0.238342 | 0.101567 |
| CarbonDisc | -0.27329 | -0.050703 | -0.115362 |
| GreenInnovation | -0.197533 | 0.230114 | 0.172851 |
| ROA | 0.180824 | -0.022137 | -0.007524 |
| Firmsize | 3.83E-17 | -2.1E-17 | -3.78E-19 |
| Leverage | 2.32E-16 | -1.72E-16 | 6.73E-17 |

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Table 1 reports the results of the panel model selection tests. The Chow test rejects the pooled specification (Prob. = 0.0000), while the Hausman test favors the random effects model over fixed effects (Prob. = 0.9222), a conclusion further supported by the Breusch–Pagan Lagrange Multiplier test indicating the presence of random effects (Prob. = 0.0000). Given the large panel sample, the Central Limit Theorem (Gujarati & Porter, 2008; Mitic & Bloxham, 2018) ensures asymptotic normality of the estimators, and additional diagnostic tests for multicollinearity, heteroskedasticity, and autocorrelation were performed with robust standard errors applied where necessary.

**Table 2. Multicollinearity Model 1**

| | ROA | ESG | CarbonDisc | GreenInv |
|---|---|---|---|---|
| ROA | 1.000000 | -0.064846 | -0.033665 | 0.056092 |
| ESG | -0.064846 | 1.000000 | 0.419646 | 0.363186 |
| CarbonDisc | -0.033665 | 0.419646 | 1.000000 | 0.626215 |
| GreenInnov | 0.056092 | 0.363186 | 0.626215 | 1.000000 |

Table 2 shows that pairwise correlations among the explanatory variables remain moderate, with the highest correlation observed between carbon disclosure and green investment (r = 0.626), while ESG is moderately correlated with both variables. Importantly. The associations with ROA are relatively weak, and none of the correlation coefficients approach commonly accepted multicollinearity cut-off values, indicating that multicollinearity is unlikely to present a substantive issue in the subsequent multivariate regression analysis.

**Table 3. Heteroskedasticity**

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.034150 | 0.008026 | 4.255033 | 0.0000 |
| ESG | 4.05E-07 | 1.04E-06 | 0.388269 | 0.6981 |
| CarbonDics | 0.001964 | 0.011876 | 0.165416 | 0.8687 |
| GreenInnov | 0.001233 | 0.012921 | 0.095386 | 0.9241 |

The heteroskedasticity test indicates no evidence of heteroskedasticity, as all probability values exceed the 5% significance level.

**Table 4. Hypothesis Testing**

| Variable | Coefficient | Prob. | Conclusion |
|---|---|---|---|
| C | -0.400476 | 0.0000 | β Significant |
| ESG | 7.59E-06 | 0.0028 | β Significant |
| CarbonDics | 0.459666 | 0.0000 | β Significant |
| GreenInnov | 0.63684 | 0.0000 | β Significant |

The regression model can be expressed as follows:

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ROA = −0.400476 + 0.00000759 ESG + 0.459666 Carbon Disclosure + 0.636840 Green Innovation + ε.

Based on the results reported in Table 4, several conclusions can be drawn. First, ESG performance exerts a positive and statistically significant effect on ROA, as indicated by a coefficient of 7.59E-06 and a probability value of 0.0028 < 0.05, thereby supporting **H1**. Second, carbon disclosure shows a strong positive influence on ROA, with a coefficient of 0.459666 and a probability value of 0.0000 < 0.05, leading to the acceptance of **H2**. Third, green innovation also demonstrates a positive and significant impact on ROA, evidenced by a coefficient of 0.636840 and a probability value of 0.0000 < 0.05, thus validating **H3**. Overall, the results confirm that sustainability-related practices significantly enhance firms' accounting profitability

**Table 5. Multicollinearity Model 2**

| Variable | ESG | Carbondisc | Greeninnov | ROA | FirmSize | Leverage |
|---|---|---|---|---|---|---|
| ESG | 1.000000 | 0.419646 | 0.363186 | -0.064846 | -0.003675 | 0.039511 |
| CarbonDisc | 0.419646 | 1.000000 | 0.626215 | -0.033665 | -0.034714 | 0.068112 |
| GreenInnov | 0.363186 | 0.626215 | 1.000000 | 0.056092 | -0.033739 | -0.094054 |
| ROA | -0.064846 | -0.033665 | 0.056092 | 1.000000 | 0.007896 | -0.034609 |
| FirmSz | -0.003675 | -0.034714 | -0.033739 | 0.007896 | 1.000000 | 0.081371 |
| Leverage | 0.039511 | 0.068112 | -0.094054 | -0.034609 | 0.081371 | 1.000000 |

The correlation matrix indicates that the pairwise correlations among the independent variables are generally moderate and remain below commonly accepted threshold levels. The highest correlation is observed between CarbonDisc and GreenInnovation (r = 0.626), which is below the critical value of 0.80, suggesting no serious multicollinearity concerns. Overall, the results confirm that multicollinearity is not present in Model 2, and the estimated coefficients can be interpreted reliably without distortion arising from strong linear relationships among the explanatory variables.

**Table 6 Heteroskedasticity Model 2**

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.010287 | 0.006499 | 1.582716 | 0.1144 |
| ESG | 0.005204 | 0.007835 | 0.664222 | 0.5070 |
| CarbonDisc | 0.002251 | 0.005991 | 0.375688 | 0.7074 |
| GreenInnovation | 0.000684 | 0.007957 | 0.085909 | 0.9316 |
| ROA | 0.000237 | 0.000958 | 0.246979 | 0.8051 |
| FirmSize | 7.09E-20 | 5.51E-19 | 0.128700 | 0.8977 |
| Leverage | -7.62E-18 | 1.29E-17 | -0.592675 | 0.5538 |

The results of the heteroskedasticity test show that the probability values for all explanatory variables exceed the 5% significance threshold, ranging between from 0.114 to 0.932. Accordingly, the null hypothesis of homoskedasticity is not

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rejected, indicating that the error variance remains constant across observations. This finding confirms that the regression model is free from heteroskedasticity, thereby ensuring the statistical reliability of both the estimated coefficients and their corresponding standard errors.

**Table 7. Hypothesis Testing Model 2**

| Variable | Coefficient | Prob. | Conclusion |
|---|---|---|---|
| C | 1.225821 | 0.0000 | β Significant |
| ESG | 2.33E-06 | 0.0475 | β Significant |
| CarbonDisc | 0.018821 | 0.0405 | β Significant |
| GreenInnov | 0.127003 | 0.0000 | β Significant |
| ROA | 0.098008 | 0.0004 | β Significant |
| FirmSize | -1.94E-17 | 0.0000 | β Significant Negative |
| Leverage | -1.60E-16 | 0.0000 | β Significant Negative |

Y = 1,225821 + 2,33E-06 ESG + 0,018821 CarbonDisc + 0,127003 GreenInnovation + 0,098008 ROA− 1,94E-17 FirmSize− 1,60E-16 Leverage+ e

The estimated panel regression model indicates that firm value is positively and significantly influenced by ESG performance, carbon disclosure, green innovation, and profitability (ROA), while firm size and leverage exert negative effects. The positive coefficients on ESG, carbon disclosure, and green innovation suggest that sustainability-related activities enhance market valuation, with green innovation exhibiting the strongest economic impact, underscoring the role of substantive operational transformation rather than symbolic disclosure. ROA also displays a sizable positive effect, confirming that improvements in profitability are capitalized into firm value. In contrast, the negative effects of firm size and leverage imply potential diseconomies of scale, organizational rigidity, and reduced financial flexibility that weaken value creation. The Panel EGLS estimation with random effects confirms that all core explanatory variables are statistically significant at the 5% level, while the model demonstrates strong explanatory power (Adjusted $R^2 \approx 0.54$) and no serious autocorrelation issues, supporting the robustness and reliability of the results

**Table 8. ROA Mediates Firm Value and ESG**

| Input: | | | Test statistic: | Std. Error: | *p*-value: |
|---|---|---|---|---|---|
| *a* | 7.59E-06 | Sobel test: | 2.30849164 | 3.2e-7 | 0.02097181 |
| *b* | 0.098008 | Aroian test: | 2.25772538 | 3.3e-7 | 0.02396279 |
| $s_a$ | 2.52E-06 | Goodman test: | 2.36284402 | 3.1e-7 | 0.0181353 |
| $s_b$ | 0.027269 | Reset all | Calculate | | |

Sources: Sobel Test Calculator

The mediation analysis confirms that return on assets (ROA) significantly mediates the relationship between ESG performance and firm value. The Sobel test indicates a significant indirect effect (z = 2.308; p = 0.021), which is consistently supported by

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the Aroian (z = 2.258; p = 0.024) and Goodman (z = 2.363; p = 0.018) tests. These results demonstrate that ESG performance enhances firm value not only directly but also indirectly through improved profitability, thereby validating the mediating role of ROA in the ESG–firm value relationship.

**Table 9. ROA Mediates Firm Value and Carbon Disclosure**

| | Input: | | Test statistic: | Std. Error: | *p*-value: |
|---|---|---|---|---|---|
| *a* | 0.459666 | Sobel test: | 3.48889844 | 0.01291266 | 0.00048502 |
| *b* | 0.098008 | Aroian test: | 3.48113326 | 0.01294146 | 0.0004993 |
| $s_a$ | 0.031646 | Goodman test: | 3.49671581 | 0.01288379 | 0.00047102 |
| $s_b$ | 0.027269 | Reset all | Calculate | | |

The mediation analysis in Table 9. confirms that return on assets (ROA) significantly mediates the relationship between carbon disclosure and firm value. The Sobel test indicates a strong indirect effect (z = 3.489; p < 0.001), corroborated by the Aroian and Goodman tests. These results demonstrate that carbon disclosure enhances firm value both directly and indirectly by improving profitability, thereby validating the mediating role of ROA in this relationship.

**Table 10. ROA Mediates Firm Value and Green Innovation.**

| | Input: | | Test statistic: | Std. Error: | *p*-value: |
|---|---|---|---|---|---|
| *a* | 0.636840 | Sobel test: | 3.51344573 | 0.01776473 | 0.00044233 |
| *b* | 0.098008 | Aroian test: | 3.50742484 | 0.01779523 | 0.00045247 |
| $s_a$ | 0.038188 | Goodman test: | 3.51949774 | 0.01773418 | 0.00043236 |
| $s_b$ | 0.027269 | Reset all | Calculate | | |

The mediation results indicate that ROA significantly mediates the relationship between green innovation and firm value. The Sobel test reports a test statistic of 3.513 with a p-value below 0.001, confirming a statistically significant indirect effect. This finding is further corroborated by the Aroian and Goodman tests, which also yield highly significant results ($p < 0.001$). Collectively, these results provide strong empirical evidence that green innovation enhances firm value not only through a direct pathway but also indirectly by improving firm profitability, as reflected in ROA, thereby validating the mediating role of ROA in the green innovation-firm value nexus.

**Discussion**

This study provides strong empirical evidence that sustainability operates as a value creation mechanism, rather than a symbolic or disclosure-oriented practice, within the Indonesian capital market. By employing a Random Effects Model estimated using EGLS and explicitly incorporating Return on Assets (ROA) as a mediating variable, the findings clarify how ESG performance, carbon disclosure, and green innovation are translated into firm value. Importantly, the results demonstrate that sustainability initiatives are capitalized by the market only when they generate measurable improvements in operational profitability.

The results of Model 1 show that ESG performance, carbon disclosure, and green innovation have positive and statistically significant effects on ROA, thereby

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supporting Hypotheses H1–H3. ESG performance exhibits a positive coefficient ($\beta = 7.59 \times 10^{-6}$; $p < 0.01$), indicating improved asset efficiency among sustainability-oriented firms. Carbon disclosure shows a strong positive impact on profitability ($\beta = 0.4597$; $p < 0.001$), reflecting the role of transparency in reducing information asymmetry and enhancing risk governance. Green innovation displays the largest effect on ROA ($\beta = 0.6368$; $p < 0.001$), underscoring its importance as the primary operational driver of profitability. The model explains 48% of the variation in ROA (adjusted $R^2 = 0.476$) and is statistically robust ($F = 108.36$; $p < 0.001$). These findings align with stakeholder and signaling theories, while the dominance of green innovation supports the resource-based view, highlighting substantive operational transformation over symbolic sustainability practices(Ahmed et al., 2023a; Awan et al., 2021; Li et al., 2023; Rehman et al., 2021; Zhang & Zhu, 2019).

Model 2 examines firm value and shows that ESG performance, carbon disclosure, green innovation, and ROA all exert positive and statistically significant effects on Tobin's Q, thereby supporting Hypotheses H4–H7. ESG performance remains significant ($\beta = 2.33 \times 10^{-6}$; $p < 0.05$), while carbon disclosure ($\beta = 0.0188$; $p < 0.05$) and green innovation ($\beta = 0.1270$; $p < 0.001$) continue to display strong valuation effects. ROA also positively affects firm value ($\beta = 0.0980$; $p < 0.001$), confirming that profitability is capitalized into market valuation. The model explains 54% of the variation in firm value (adjusted $R^2 = 0.537$) and exhibits strong overall fit ($p < 0.001$) with no evidence of serious autocorrelation. Mediation analysis using Sobel, Aroian, and Goodman tests further confirms that ROA significantly mediates the effects of ESG, carbon disclosure, and green innovation on firm value, thereby supporting Hypotheses H8–H10, with particularly strong indirect effects for carbon disclosure and green innovation ($p < 0.001$) (Zhou et al., 2022).

## CONCLUSION

This finding addresses perhaps the most important contradiction in the literature on corporate social responsibility (CSR) and environmental and social governance (ESG) in emerging markets. The literature has noted mixed or insignificant links between the value of firms and their ESG disclosures and practices, but in the case of Indonesia, with its voluntary ESG disclosure regime and a market with significant skepticism about the truth of a firm's ESG claims, ESG disclosures seem to provide positive value to a firm, but only when the ESG actions generate positive financial returns (Cardillo & Basso, 2025; Gartia et al., 2024; Rohendi et al., 2024). Thus, Return on Assets (ROA) acts as a filter of credibility, enabling investors to identify real ESG actions that go beyond the legal obligations imposed on a firm that is, the firm's 'symbolic compliance' with ESG obligations (Taddeo et al.). The control variables also provide interesting contributions. Particularly, the negative and very significant impact of firm size on firm value

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suggests that large sizes of firms simultaneously in the same market may create diseconomies of scale, organizational (or bureaucratic) inertia, and/or a lack of market demand for large incumbents (Natsir, 2019; Singh & Khatua, 2025; Wijaya et al., 2024). In the same way, the negative impact of firm leverage suggests that large financial leverage (debt) constrains the ESG value of an organization. The combination of these factors illustrates the organizational and financial structure as important factors in explaining the positive value of the ESG and sustainability practice (Fuente et al., 2022; Hausdorf & Timm, 2023). As (Elkington, 2018) critiqued the Triple Bottom Line, the finding empirically proves that sustainability only generates positive value to an organization when it is fully incorporated into the organization's key operational practices. With the addition of profitability as a mechanism, the study integrates the most relevant macro-level sustainability frameworks (Doughnut Economics and welfare economics) with corporate finance at the micro level (Ferretto et al., 2022; Gucciardi & Luzzati, 2024; Wahlund & Hansen, 2022).

The study examines how sustainability is relatively unique compared to other multinational companies (MNCs) within the scope of the Indonesian capital market, with particular focus on how sustainability is not a symbolic practice or driven merely by disclosures (Gabrielli et al., 2026; Suhartini et al., 2024). From the perspective of disaggregated sustainability, we focus on the ESG score, carbon disclosures, and green innovation metrics while determining return on assets (ROA) as a mediating variable. Sustainability and its goals are responsive to the market value of a firm. Of the empirically validated dimensions of sustainability, green innovation is also the most substantial ROA contributor, but the other three dimensions of sustainability also enhanced the profitability of the firm and contributed positively to the Rogers firm value metrics (market to book value of assets), sustainability value, and firm market value (Yang et al., 2024). Contrary to other studies, we found that ROA, among other variables, is the most dominant variable to explain how the market is responsive to the sustainability initiatives of a firm. Sustainability initiatives are not rewarded by the market or investors without demonstrable sustainability initiatives or without demonstrable profitability. This also shows that sustainability value without sound operational and financial performance is not a practice, but is simply the byproduct of good capitalism (Zhang & Zhou, 2023).

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