SUSTAINABILITY PRACTICES AND FINANCIAL PERFORMANCE IN A HIGH-IMPACT INDUSTRY: EVIDENCE FROM INDONESIAN CHEMICAL FIRMS

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ABSTRACT

Firms in Indonesia's chemical sub-sector face growing expectations to strengthen sustainability initiatives without undermining financial performance. Nevertheless, prior studies report inconsistent results on whether Environmental, Social, and Governance (ESG) disclosure, green accounting adoption, and intellectual capital contribute to improved financial outcomes, particularly in emerging markets. This study examines the influence of ESG disclosure, green accounting practices, and intellectual capital on the financial performance of chemical sub-sector companies listed on the Indonesia Stock Exchange (IDX). Using a quantitative approach, the study analyzes panel data covering the 2020–2023 period. A purposive sampling method yielded 18 firms that met the research criteria. Multiple linear regression was employed to test the proposed relationships, with STATA used for data processing and estimation. The results indicate that ESG disclosure, green accounting implementation, and intellectual capital do not significantly affect firms' financial performance during the study period. These findings provide sector-specific evidence from Indonesia's chemical industry and enrich the limited literature on the ESG–financial performance relationship in capital-intensive sectors within emerging-market

Keywords: ESG disclosure; green accounting; intellectual capital; financial performance.

ABSTRAK

Perusahaan pada subsektor kimia di Indonesia menghadapi tuntutan yang semakin besar untuk memperkuat inisiatif keberlanjutan tanpa mengorbankan kinerja keuangan. Namun, temuan penelitian sebelumnya masih menunjukkan hasil yang tidak konsisten mengenai apakah pengungkapan *Environmental, Social, and Governance* (ESG), penerapan *green accounting*, *dan intellectual capital* mampu meningkatkan kinerja keuangan, khususnya di negara berkembang. Penelitian ini menganalisis pengaruh pengungkapan ESG, praktik green accounting, dan intellectual capital terhadap kinerja keuangan perusahaan subsektor kimia yang terdaftar di Bursa Efek Indonesia (BEI). Dengan pendekatan kuantitatif, penelitian ini menggunakan data panel periode 2020–2023. Sampel ditentukan melalui metode purposive sampling dan diperoleh 18 perusahaan yang memenuhi kriteria penelitian. Pengujian hubungan antarvariabel dilakukan menggunakan regresi linear berganda dengan bantuan perangkat lunak STATA untuk pengolahan dan estimasi data. Hasil penelitian menunjukkan bahwa pengungkapan ESG,

penerapan *green accounting*, dan *intellectual capital* tidak berpengaruh signifikan terhadap kinerja keuangan perusahaan selama periode pengamatan. Temuan ini memberikan bukti empiris yang spesifik pada industri kimia di Indonesia serta memperkaya literatur yang masih terbatas mengenai hubungan ESG dan kinerja keuangan pada sektor padat modal di konteks negara berkembang.

Kata Kunci: *ESG disclosure*; *green accounting*; *intellectual capital*; *financial performance.*

A. INTRODUCTION

In the era of globalization, corporate performance is no longer evaluated solely through profitability and growth indicators. Stakeholders increasingly expect firms to demonstrate responsible conduct across economic, social, and environmental domains, consistent with the *triple bottom line* framework—profit, people, and planet (Angelina & Nursasi, 2021). For industries with high environmental exposure, this expectation is not merely normative but can translate into operational constraints, compliance costs, and market responses that ultimately affect financial outcomes.

The 2020–2023 period constituted a pivotal phase for Indonesia's chemical manufacturing sub-sector. The COVID-19 pandemic disrupted production and demand, and the Ministry of Industry reported a decline in capacity utilization of up to 30% in the second quarter of 2020, creating immediate pressure on financial performance. At the same time, the pandemic accelerated stakeholder demands for sustainability-oriented governance and reporting. Consequently, the chemical sub-sector provides a particularly relevant setting to examine whether sustainability-related corporate practices are associated with financial performance under adverse conditions.

Financial performance remains central to firm value creation and investment decisions. It signals how efficiently firms deploy resources to generate returns and meet stakeholder expectations (Hasan et al., 2024). Investors continue to rely on financial performance as a key consideration in equity investment, as it reflects future profitability potential and corporate stability (Injayanti et al., 2023). Yet, recent business phenomena suggest that inadequate environmental management and weak handling of non-financial risks can directly damage both operational

outcomes and market valuation. For example, PT Barito Pacific Tbk (BRPT) reportedly experienced operational disruption in 2022 following the revocation of forest area connection permits by the Ministry of Environment and Forestry (KLHK). Market.bisnis.com (2022) reported declines in production and revenue, increased legal and environmental penalty burdens, a negative market reaction reflected in a drop in stock price, and a subsequent decline in ROA. A similar pattern was reported for PT Unggul Indah Cahaya Tbk (UNIC), which incurred environmental remediation costs and faced deteriorating margins and higher insurance premiums. These cases indicate that environmental non-compliance and weak non-financial risk management may reduce firm value through both cost channels and credibility channels.

The urgency of sustainability in the chemical sub-sector is also reinforced by its environmental footprint. Indonesia's chemical industry is among the major contributors to hazardous and toxic waste (B3), and KLHK data position it as the third-largest producer after oil and gas and mining. The sector generates various hazardous outputs—such as organic solvents, heavy metals, catalyst residues, wastewater-treatment sludge, and toxic chemical by-products—that require strict management due to flammable, corrosive, reactive, and toxic properties. This context strengthens the relevance of evaluating sustainability disclosure and environmental accounting practices in relation to financial performance.

Within this setting, three mechanisms are frequently proposed as determinants of financial performance: ESG disclosure, green accounting, and intellectual capital. ESG disclosure serves as a transparency mechanism that communicates environmental, social, and governance performance, and may function as a signal that reduces information asymmetry and risk perceptions. Investors increasingly incorporate ESG considerations in decision-making (Kim & Li, 2021), consistent with global responsible investment initiatives (Pandey, 2022) and broader stakeholder expectations for *triple bottom line* alignment (Junius et al., 2020). ESG adoption may also enhance corporate reputation and

stakeholder trust (Wahyudi & Anggraini, 2022), and reputational benefits are often linked to improved financial outcomes (Buallay et al., 2020). However, empirical results remain mixed. While Triyani et al. (2020) and Giannopoulos et al. (2022) document positive associations between ESG disclosure and financial performance, Pandey (2022) reports that ESG practices do not consistently translate into financial gains. These inconsistencies suggest that the ESG–performance relationship may vary by context, sector characteristics, measurement choices, and time horizon.

Green accounting represents a second pathway, intended to identify and internalize environmental costs that are typically underrepresented in conventional accounting systems. By measuring and recording environmental impacts and related expenditures, green accounting can support more sustainable operational decisions and compliance (Maama & Appiah, 2019). Tifany et al. (2020) argue that investors and financial institutions increasingly consider environmental factors; thus, firms adopting green accounting may be perceived as lower risk and more responsible, potentially improving capital access. Nonetheless, green accounting may impose substantial initial costs and therefore depress short-term profitability, even if long-term benefits—cost efficiency, reputational gains, and risk mitigation—are expected (Maama & Appiah, 2019). Descriptive observations reported by Kontan.co.id, drawn from annual financial reports, suggest that chemical firms with higher ESG scores show lower leverage and that firms with stronger green accounting practices display better liquidity. Yet, these patterns do not establish causality because firm size and governance characteristics may co-move with both sustainability practices and financial performance.

The third mechanism is intellectual capital (IC), which reflects a strategic shift toward knowledge-based value creation. Intellectual capital emphasizes investments in employee capabilities, organizational systems, technology, and stakeholder relationships (Avilya & Ghozali, 2022), and is commonly conceptualized as human, structural, and relational capital (Khan et al., 2021; Shah et al., 2021; Wang & Juo, 2021). In

Indonesia, PSAK 19 recognizes intangible assets such as technology, systems, rights, licenses, market knowledge, and intellectual capital. However, firms are not required to formally measure and disclose intellectual capital, which may constrain systematic IC governance. Empirical findings also remain inconsistent: Hadli et al. (2023) and Gani (2022) find positive effects of intellectual capital on financial performance, whereas Usman & Mustafa (2022) and Stevani & Antoni (2022) report no significant association. These mixed results motivate additional evidence, particularly within capital-intensive and environmentally sensitive sectors.

Despite the growing emphasis on sustainability and knowledge-based assets, the combined influence of ESG disclosure, green accounting, and intellectual capital on financial performance remains insufficiently resolved in Indonesia's chemical sub-sector. Prior studies provide divergent results and often focus on broader samples or different industries, while sector-specific environmental risk exposure may shape the nature and timing of financial impacts. Accordingly, this study examines the effects of ESG disclosure, green accounting implementation, and intellectual capital on the financial performance of chemical manufacturing firms listed on the Indonesia Stock Exchange.

This study extends Viona et al. (2024) by (1) incorporating intellectual capital as an additional explanatory factor, (2) updating the observation period to 2020–2023 to capture pandemic and recovery dynamics, (3) operationalizing green accounting using a dummy approach, and (4) focusing specifically on the IDX-listed chemical sub-sector. By doing so, this research contributes sector-specific empirical evidence to the sustainability–performance debate in emerging markets and provides insights relevant for managers, investors, and regulators seeking to evaluate whether sustainability disclosure, environmental accounting practices, and intellectual resource management are associated with financial outcomes in a high-impact industry.

B. METHODS

This study examines manufacturing firms in the chemical industry sub-sector listed on the Indonesia Stock Exchange (IDX) over

the 2020–2023 period. The chemical sub-sector was selected due to its considerable environmental footprint and relatively technology-intensive operations, making it a suitable context for investigating the linkage between sustainability-related practices and financial performance. The population consists of all IDX-listed companies within this sub-sector. The sample was determined using purposive sampling based on the following criteria: (1) firms with audited financial statements consistently available throughout the observation period, and (2) firms that published complete annual reports and sustainability reports for 2020–2023.

The study relies on secondary data sourced from audited financial statements, annual reports, and sustainability reports obtained from the official IDX website (www.idx.co.id). Data collection was conducted by identifying eligible firms using their ticker codes and compiling the required disclosures and financial indicators for each firm-year observation that met the sampling criteria.

A quantitative approach was applied using panel data regression. The analysis proceeded in several stages. First, descriptive statistics were used to summarize the dataset using minimum, maximum, mean, and standard deviation values. Second, the appropriate panel estimation model was determined through the Chow test, the Lagrange Multiplier (LM) test, and the Hausman test. Third, classical assumption diagnostics were conducted, including a normality assessment based on skewness and kurtosis, a multicollinearity check using tolerance values (> 0.10) and Variance Inflation Factors (VIF < 10), a heteroscedasticity test using the Breusch–Pagan procedure, and an autocorrelation test. Hypotheses were evaluated using the coefficient of determination (R^2), t-tests for partial significance of each explanatory variable, and an F-test for joint significance. All estimations and statistical procedures were performed using STATA.

Financial performance serves as the dependent variable and is proxied by Return on Capital Employed (ROCE). ROCE was selected because it captures the efficiency with which firms utilize invested capital to generate returns, which is particularly

relevant for capital-intensive industries such as chemicals.

The independent variables include ESG disclosure, green accounting, and intellectual capital. ESG disclosure was measured using an ESG disclosure index based on the GRI 2021 framework, computed as the proportion of disclosed items relative to the total items expected to be reported. Green accounting was operationalized as a dummy variable, coded 1 if a firm explicitly reported environmental-related costs (e.g., operational environmental expenditures, recycling costs, or environmental research costs) and 0 otherwise. Intellectual capital was measured using the Value Added Intellectual Coefficient (VAIC) method proposed by Pulic (1998), which captures the efficiency of value creation through human capital (VAHU), structural capital (STVA), and capital employed (VACA).

To reduce omitted-variable bias, the model includes firm size and profitability as control variables. Firm size is measured as the natural logarithm of total assets, while profitability is proxied by Return on Assets (ROA). The empirical specification is expressed as follows:

$$KKit=\alpha+\beta1PESGit+\beta2GAit+\beta3GICit+\beta4SIZEit+\mu i+\varepsilon itKKit=\alpha+\beta1PESGit+\beta2GAit+\beta3GICit+\beta4SIZEit+\mu i+\varepsilon it$$

Through this design, the study aims to provide empirical evidence on the association between ESG disclosure, green accounting practices, and intellectual capital and firms' financial performance, while accounting for differences in firm size and profitability.

C. RESULT AND DISCUSSION

Table X reports the descriptive statistics for all variables. Financial performance (KKP) has an average value of 0.0304 with a standard deviation of 0.1174. The observed values range from −0.4822 to 0.3321, indicating substantial dispersion in performance across firms, with some observations reflecting negative returns while others display relatively strong outcomes.

For the explanatory variables, ESG disclosure (PESG) records a mean of 0.3499 and a standard deviation of 0.1737, with values spanning from 0.1282 to 0.9231. This spread suggests meaningful differences in the extent of sustainability disclosure across the sampled firms. Green accounting

(GA), measured as a dummy variable, has a mean of 0.5472 and a standard deviation of 0.5025, with minimum and maximum values of 0 and 1, respectively. The mean implies that slightly more than half of the firm-year observations report the implementation of green accounting practices.

Intellectual capital (IC) exhibits very high variability, with a mean of 185.12 and a standard deviation of 2604.21. The range extends from −10965.4 to 15143.01, indicating pronounced heterogeneity and the presence of extreme values in intellectual capital efficiency across firms. Firm size (lnFS) shows an average of 27.72 with a standard deviation of 2.98, ranging from 15.90 to 32.68, reflecting considerable differences in firm scale within the chemical sub-sector sample. Profitability (ROA) also displays substantial dispersion, with a mean of 220.19 and a standard deviation of 1574.56, and values ranging from 0.0303 to 11466.07, suggesting that profitability differs markedly across observations and may be influenced by outliers or scaling effects.

Overall, the descriptive statistics indicate substantial cross-sectional variation in both the dependent and independent variables, with particularly high dispersion observed for intellectual capital and profitability measures. This variability provides sufficient variation for subsequent panel regression analysis, while also underscoring the importance of appropriate diagnostics and robust inference when estimating the model.

Panel Data Regression Results

Variabel	Regression Model Model: Random Effect			
	Coefficient	z	P>|z| (One-tailed)	Conclusion
PESG	-.0557151	-1.39	0.0785	H_1 : Rejected
GA	.0086955	0.75	0.2065	H_2 : Rejected
IC	.0000225	0.07	0.4655	H_3 : Rejected
lnFS	.0016197	0.45	0.3125	
ROA	.0124261	0.11	0.4545	
_cons	.0143853	0.15	0.442	

Source: signifikan 10%
Authors' Processed Data, STATA v.12 (2025)

The partial (t-test) regression results indicate that ESG disclosure is associated with a significant negative effect on financial performance. Accordingly, H1 is not supported, as the hypothesis predicted a positive relationship. The negative coefficient may reflect the short-term cost burden of ESG adoption and reporting—such as upfront investments in environmentally friendly infrastructure and social initiatives—which can compress profitability in the near term (Taliento et al., 2019). This pattern is consistent with a trade-off perspective,

whereby higher ESG standards may raise operating and compliance costs and, in turn, reduce short-run profitability (Yuen et al., 2022; Dakhli, 2022). Similar evidence has been reported in developing-country settings, where ESG effects are often negative or statistically insignificant (Albitar et al., 2020; Kalia & Aggarwal, 2023). Illustratively, PT Madusari Murni Indah (MOLI) recorded relatively high ESG scores in 2021–2022 but exhibited negative ROCE, suggesting that ESG disclosure not aligned with short-term operational priorities may coincide with weaker contemporaneous financial performance. Nevertheless, from a signaling-theory perspective, ESG engagement may still convey favorable long-run signals to stakeholders even if short-run accounting returns are pressured (Ghozali, 2020; Putri & Puspawati, 2023).

In contrast, green accounting does not show a statistically significant relationship with financial performance, implying that H2 is not supported. This result is also reflected in heterogeneous firm patterns within the sample: PT Surya Esa Perkasa (ESSA) in 2022 did not explicitly report green accounting yet achieved strong performance, whereas PT Surya Biru Murni Acetylene (SBMA) reported green accounting but recorded low ROCE. These observations support the argument that green accounting is often implemented primarily as a mechanism for stakeholder communication and compliance rather than as an immediate driver of profitability, with potential benefits materializing over a longer horizon (Sapulette et al., 2021; Ekawati, 2023; Sugiyarti et al., 2023). The findings further suggest that environmental cost disclosures have not been sufficiently priced or prioritized by investors in short-term performance assessments, which contrasts with the expected positive signaling role of sustainability information (Angelina & Nursasi, 2021a).

Likewise, intellectual capital is not statistically significant in explaining financial performance, therefore H3 is not supported**.** This outcome indicates that the potential value of intellectual resources may not yet be translated into improved short-run capital efficiency. For instance, PT Lotte Chemical Titan (FPNI) reports a very high VAIC while maintaining relatively low ROCE, implying that intellectual-

capital efficiency does not necessarily coincide with contemporaneous financial returns. This result aligns with prior studies emphasizing that intellectual capital is more likely to shape market valuation, reputation, and long-term competitive positioning than short-term accounting profitability (Halim et al., 2020; Usman et al., 2020; Lami & Antoni, 2024). As an intangible resource, intellectual capital may influence financial outcomes indirectly and require time and complementary capabilities to generate measurable effects.

Overall, the evidence suggests that ESG disclosure, green accounting, and intellectual capital do not provide immediate positive contributions to firms' financial performance over the observation period. This implies that sustainability initiatives and intangible-resource management may require appropriate strategic alignment and a longer time horizon to translate into superior financial outcomes, particularly in capital-intensive industries.

D. Conclusion

This study aimed to assess whether ESG disclosure, green accounting, and intellectual capital influence firms' financial performance. The analysis covered 53 firm-year observations drawn from 18 IDX-listed manufacturing firms in the chemical sub-sector over the 2020–2023 period, with the sample selected using purposive sampling. Based on the empirical results reported in Chapter Four, ESG disclosure is found to have a significant negative association with financial performance, indicating a short-term trade-off between ESG-related investments and profitability. Substantial expenditures on environmentally friendly initiatives and social programs may increase costs in the near term, thereby weakening returns.

In contrast, green accounting does not exhibit a statistically significant effect on financial performance. This finding may reflect differences in implementation across firms and the fact that green accounting often functions primarily as a stakeholder communication and compliance mechanism rather than an immediate profitability driver, with potential benefits more likely to emerge over a longer horizon. Finally, intellectual capital shows a negative but statistically

insignificant relationship with financial performance, suggesting that intellectual resources may not yet be managed and deployed effectively enough to generate measurable short-term financial gains.

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