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The Effect of Green Accounting, Digital Financial Literacy, and Carbon Emission Disclosure on Sustainable Financial Performance

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ABSTRACT

This study examines the effect of green accounting (GA), digital financial literacy (DFL), and carbon emission disclosure (CED) on sustainable financial performance (SFP) in ISSI-listed companies adopting ESG practices (2019–2023). Using a quantitative approach, panel data from annual reports, sustainability reports, and ESG databases were analyzed via EViews 12, employing moderated regression analysis (MRA) to test interactions. Findings reveal that GA and DFL significantly enhance SFP ($\beta = +$, $p < 0.05$), with CED and firm size acting as positive moderators. The study highlights DFL as a novel driver of SFP in emerging markets, while emphasizing the regulatory role of CED in Indonesia. Limitations include a focus on Sharia-compliant firms, suggesting future research should expand to non-Sharia companies and longitudinal post-2023 data. Practical implications urge policymakers to mandate CED and firms to invest in DFL training. The research contributes originality by integrating GA, DFL, and CED previously unexplored in combination within an ESG framework, offering empirical insights for sustainable finance strategies.

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INTRODUCTION

The global business landscape has witnessed a paradigm shift toward sustainable development, compelling corporations to integrate Environmental, Social, and Governance (ESG) principles into their operational and financial strategies (Eccles & Serafeim, 2013). This transition is particularly critical in emerging markets like Indonesia, where the Financial Services Authority (OJK) has mandated sustainable finance through Regulation No. 51/2017, emphasizing the adoption of green accounting practices, transparency in carbon emissions, and digital financial literacy to achieve long-term financial resilience (OJK, 2017). However, despite these regulatory efforts, empirical studies examining the interplay between green accounting (GA), digital financial literacy (DFL), and carbon emission disclosure (CED) on sustainable financial performance (SFP) remain scarce, especially within the context of Sharia-compliant firms listed on the Indonesian Sharia Stock Index (ISSI) (Savitri & Suhari, 2023). Green accounting, defined as the systematic inclusion of environmental costs into financial reporting, has been recognized as a pivotal tool for enhancing corporate accountability and stakeholder trust (Burritt & Schaltegger, 2001). Recent studies highlight its positive correlation with SFP, particularly when coupled with robust ESG frameworks (Alshehhi et al., 2018). For

instance, firms that internalize environmental costs through GA mechanisms demonstrate improved return on equity (ROE) and higher ESG scores, as they align operational efficiencies with sustainability goals (Quintana-García et al., 2022). Concurrently, the rise of digital financial literacy a competency in leveraging digital tools for sustainable financial decision-making has emerged as a critical enabler of SFP, particularly in post-pandemic economies where digital transformation accelerates ESG integration (OECD, 2020). Research by (Martiny et al., 2024) underscores that executives with advanced DFL skills are more adept at navigating ESG-related risks and opportunities, thereby enhancing firm value.

Despite these advancements, the role of carbon emission disclosure (CED) as a moderating variable in the GA-SFP relationship remains underexplored. While prior literature confirms that CED enhances investor confidence and reduces capital costs (Plumlee et al., 2015), its interaction with GA and DFL in shaping SFP is yet to be empirically validated, especially in Islamic finance contexts where ethical investments prioritize environmental stewardship (Furqani & Haneef, 2015). This study addresses these gaps by investigating how GA, DFL, and CED collectively influence SFP in ISSI-listed companies from 2019 to 2023, a period marked by Indonesia's intensified ESG regulatory reforms (Mohammad & Wasiuzzaman, 2021). The research is grounded in stakeholder theory (Carnahan et al., 2010), which posits that firms addressing multidimensional stakeholder demands through GA (environmental accountability), DFL (digital competence), and CED (transparency) achieve superior financial performance. Additionally, the triple bottom line framework (Calza et al., 2023) justifies the inclusion of these variables, as they collectively balance profit, people, and planetary objectives.

This study contributes to the literature in three key ways. First, it pioneers the integration of DFL into the GA-SFP nexus, offering empirical evidence on how digital competencies amplify sustainability outcomes (Barber, 2023). Second, it examines CED as a novel moderator, addressing calls for research on disclosure mechanisms in emerging markets (Dempsey & Sheng, 2023). Third, it focuses on ISSI-listed firms, which operate under Sharia principles that inherently emphasize ethical and sustainable practices, yet are underrepresented in ESG research (Handayani et al., 2022). By employing panel data analysis via EViews 12 and moderated regression techniques, this study provides actionable insights for policymakers seeking to refine Indonesia's sustainable finance roadmap, as well as for corporate managers aiming to optimize ESG strategies. The findings are expected to demonstrate that GA and DFL significantly drive SFP, with CED and firm size acting as positive moderators a revelation that could redefine prioritizations in ESG investment and training programs (Adeneye et al., 2023). Ultimately, this research underscores the urgency of adopting integrated sustainability metrics in financial reporting, while advocating for policy interventions to standardize DFL education and CED mandates across ASEAN markets (Dung et al., 2024).

The urgency of this research stems from the growing global emphasis on integrating environmental, social, and governance (ESG) principles into corporate strategies to address climate change, resource scarcity, and stakeholder demands for ethical business practices. As Indonesia's ISSI-listed companies increasingly adopt ESG frameworks, understanding the interplay between green accounting, digital financial literacy, and carbon emission disclosure in driving sustainable financial performance becomes critical. Green accounting is pivotal for quantifying environmental costs and resource efficiency, enabling firms to align profitability with ecological stewardship. However, its effectiveness hinges on organizations' ability to leverage digital financial literacy a competency often underdeveloped in emerging markets to interpret complex ESG data and make informed, sustainable investment decisions.

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Simultaneously, carbon emission disclosure has gained prominence as investors and regulators demand transparency in climate-related risks, yet its direct impact on financial outcomes remains underexplored in Southeast Asian contexts. This study addresses a significant gap in literature by examining how these three variables collectively influence sustainable financial performance, offering insights into whether ESG adoption translates to tangible economic benefits amid Indonesia's evolving regulatory landscape and market dynamics. The 2019–2023 timeframe captures post-pandemic recovery efforts, heightened ESG reporting mandates, and the rise of green financing instruments, making findings timely for policymakers refining sustainability regulations, corporate leaders optimizing ESG strategies, and investors prioritizing ethical portfolios. By bridging theoretical gaps and providing empirical evidence from an emerging economy, this research contributes to global discourse on balancing profitability with planetary boundaries, while equipping stakeholders with actionable frameworks to navigate the transition toward a low-carbon, digitally driven economy.

LITERATURE REVIEW

2.1 Green Accounting

Green accounting has emerged as a transformative approach to corporate financial reporting, integrating environmental costs and sustainability metrics into traditional accounting frameworks to provide a more comprehensive assessment of organizational performance (Grimaldi et al., 2020). This paradigm shift responds to mounting stakeholder demands for transparency in environmental stewardship, particularly as climate change and resource scarcity redefine business risks (Eccles & Serafeim, 2013). At its core, green accounting quantifies the financial implications of environmental activities, such as carbon emissions, waste management, and energy consumption, enabling firms to align their operations with the triple bottom line (TBL) of profit, people, and planet (Calza et al., 2023). Recent studies underscore its pivotal role in enhancing sustainable financial performance (SFP), as firms adopting green accounting practices demonstrate improved resource efficiency, regulatory compliance, and investor confidence (Alshehhi et al., 2018). For instance, (Sehgal et al., 2022) found that companies internalizing environmental costs through green accounting mechanisms reported a 12–15% increase in return on equity (ROE), attributed to reduced regulatory penalties and optimized operational expenditures. The theoretical foundation of green accounting is rooted in stakeholder theory (Mahrani & Soewarno, 2018), which posits that firms must address the environmental concerns of diverse stakeholders ranging from investors to communities to achieve long-term viability. Empirical evidence from emerging markets, such as Indonesia, highlights the growing adoption of green accounting in response to regulatory pressures like OJK Regulation No. 51/2017, which mandates sustainability disclosures for listed firms (Talawa & Badwan, 2024). However, challenges persist in standardizing measurement methodologies, particularly in quantifying intangible environmental benefits (e.g., biodiversity conservation) and reconciling them with financial metrics (Dempsey & Sheng, 2023).

The integration of green accounting with Environmental, Social, and Governance (ESG) frameworks has further amplified its relevance, as investors increasingly prioritize ESG-aligned investments (Adeneye et al., 2023). For example, a 2022 study by Disli et al. revealed that firms with robust green accounting systems achieved higher ESG scores, attracting 20–30% more sustainable investment inflows compared to peers lacking such disclosures. This correlation is particularly pronounced in Sharia-compliant firms, where ethical financial

practices inherently emphasize environmental responsibility (Handayani et al., 2022). Despite these advancements, critical gaps remain in understanding how green accounting interacts with digital financial literacy (DFL) and carbon emission disclosure (CED) to drive SFP, especially in Islamic finance contexts. Recent research by (Kraus et al., 2022) suggests that digital tools can enhance the accuracy and accessibility of green accounting data, yet empirical validation in Indonesia's ISSI-listed companies is lacking. Furthermore, while carbon disclosure projects (CDP) have promoted transparency, their synergy with green accounting practices remains underexplored (Arnold et al., 2012). This study addresses these gaps by examining green accounting as a linchpin of SFP within Indonesia's unique regulatory and cultural landscape, offering novel insights into its interplay with DFL and CED. By leveraging panel data from ISSI firms (2019–2023), the research aims to validate green accounting's role as a catalyst for sustainable finance, while advocating for standardized global reporting frameworks to bridge existing methodological disparities (Dung et al., 2024).

2.2 Digital Financial Literacy

Digital Financial Literacy (DFL) has emerged as a critical competency in the era of sustainable finance, particularly as organizations navigate the complexities of ESG integration and digital transformation (Mwenda et al., 2023). Defined as the ability to effectively utilize digital tools for financial decision-making with sustainability considerations, DFL bridges the gap between traditional financial literacy and the demands of modern, technology-driven sustainable finance (Andaris & Dasman, 2024). Recent studies demonstrate that executives with advanced DFL skills are 27% more likely to make ESG-aligned investment decisions, as they can better analyze sustainability metrics through digital platforms (Havidz et al., 2024). The COVID-19 pandemic accelerated this trend, with 68% of financial institutions in Southeast Asia reporting increased reliance on digital tools for ESG assessment (Malahayati et al., 2021). In Indonesia's Islamic finance sector, DFL takes on added significance due to the unique requirements of Sharia-compliant ESG investing, where digital platforms must accommodate both financial and ethical screening processes (Muslim et al., 2020).

Theoretical frameworks position DFL within the broader concept of financial capability, extending it to include sustainability-conscious digital navigation skills (Novandalina et al., 2022). Empirical evidence from ISSI-listed companies reveals that firms investing in DFL training programs show 15% higher ESG disclosure quality, as digitally literate managers better understand reporting technologies and stakeholder communication channels (Baber, 2023). However, significant challenges persist in standardizing DFL measurement, particularly in distinguishing between basic digital finance skills and advanced sustainability-focused financial technology competencies (Kasozi & Makina, 2021). The integration of DFL with green accounting practices presents particularly promising opportunities, as digitally literate financial teams can more accurately track and report environmental costs using specialized software (Sehgal et al., 2022). Recent regulatory developments in Indonesia, including OJK's digital finance roadmap, have begun addressing these gaps by mandating DFL components in professional certification programs. Looking ahead, research suggests that DFL will become increasingly vital for sustainable financial performance as blockchain and AI technologies transform ESG reporting and verification processes (Dung et al., 2024). This study contributes to the literature by examining DFL's role in enhancing the relationship between green accounting practices and sustainable financial outcomes within Indonesia's unique Islamic finance context, while proposing a framework for DFL assessment specific to ESG-driven organizations.

2.3 Carbon Emission Disclosure

Carbon Emission Disclosure (CED) has become a cornerstone of corporate sustainability reporting, reflecting growing stakeholder demands for transparency in climate-related financial risks (Rizki et al., 2023). Recent studies demonstrate that comprehensive CED can reduce a firm's cost of capital by 1.5-2.1% while improving access to green financing (Jung et al., 2023). In Indonesia, where ISSI-listed companies face mounting pressure from OJK's Sustainable Finance Roadmap, the quality of CED varies significantly, with only 38% of firms meeting international reporting standards. The theoretical foundation of CED draws from legitimacy theory, which posits that organizations disclose emissions data to maintain social contracts and stakeholder trust (Sehgal et al., 2022). Empirical evidence from ASEAN markets reveals that firms with robust CED mechanisms experience 23% higher ESG ratings and demonstrate greater resilience during climate-related market shocks.

Particularly in Islamic finance, CED aligns with Sharia principles of environmental stewardship (khalifa), creating unique disclosure expectations that blend religious ethics with global reporting frameworks. The CDP (formerly Carbon Disclosure Project) has emerged as the gold standard for CED, with adopters showing 17% better performance in sustainability indices compared to non-disclosers (CDP, 2023). However, significant challenges persist in measurement methodologies, particularly in Scope 3 emissions accounting and the verification of carbon offset claims. Recent regulatory developments, including Indonesia's carbon tax policy, have intensified the financial materiality of CED, with non-compliant firms facing potential valuation discounts of up to 15%. Innovative research by (Pyeon et al., 2023) demonstrates that CED quality mediates the relationship between green accounting practices and sustainable financial performance, particularly when combined with digital reporting platforms. This study addresses critical gaps by examining CED's moderating role in Indonesia's Islamic capital markets, while proposing a framework for integrating Sharia-compliant ESG metrics with global carbon reporting standards. The findings will contribute to ongoing debates about the financial materiality of climate disclosures in emerging markets, where regulatory environments and reporting capabilities differ significantly from developed economies (Hariram et al., 2023).

2.4 Sustainable Financial Performance

Sustainable Financial Performance (SFP) represents a paradigm shift in corporate success metrics, integrating traditional financial indicators with environmental and social impact measures. Recent empirical studies demonstrate that companies with robust ESG integration achieve 14-25% higher risk-adjusted returns compared to industry peers (Ongkodjojo & Juniarti, 2023). In Indonesia's Islamic capital markets, SFP takes on unique dimensions as Sharia principles inherently align with sustainability goals, creating a "double filter" of financial and ethical performance . The theoretical foundation of SFP combines stakeholder theory with resource-based view, suggesting that ESG-compliant firms develop intangible assets that generate long-term competitive advantages . Measurement of SFP has evolved beyond conventional ROE/ROA metrics to include ESG score integration, with leading frameworks like SASB and GRI providing industry-specific key performance indicators (Khan et al., 2023). Particularly compelling is evidence from ISSI-listed companies showing that firms scoring in the top ESG quartile maintain 18% higher valuation multiples during market downturns. The mediating role of digital transformation in SFP has gained prominence, with

digitally mature ESG adopters demonstrating 22% faster adaptation to sustainability regulations.

However, critical challenges persist in standardizing SFP measurement across emerging markets, where local reporting frameworks often conflict with global standards. Recent regulatory changes in Indonesia, including OJK's Enhanced Sustainability Reporting Guidelines (2023), have accelerated SFP transparency, with early adopters seeing 15% reduction in capital costs. Cutting-edge research reveals that the interaction between green accounting rigor and carbon disclosure quality explains 38% of SFP variance in ASEAN financial sectors. This study addresses crucial gaps by examining how the triad of green accounting, digital financial literacy, and carbon disclosure collectively drive SFP in Indonesia's unique Islamic finance ecosystem, while proposing a contextualized SFP measurement framework that bridges global standards with local Sharia-compliance requirements (Suripto, 2021), (Gunarto et al., 2020), (Supriyanto et al., 2023). The findings will contribute to ongoing academic debates about the financial materiality of ESG integration in emerging Islamic markets, while providing practical insights for regulators and Sharia-compliant investors.

2.5 ESG Adoption

ESG adoption has emerged as a transformative paradigm in global corporate governance, with particular significance in Islamic capital markets where Sharia principles naturally intersect with sustainability objectives (Mohd Thas Thaker et al., 2022). The concept of ESG adoption extends beyond mere compliance to encompass strategic integration of environmental, social, and governance factors into core business operations and financial decision-making. In Indonesia's Islamic financial sector, ESG adoption has gained momentum following OJK's Sustainable Finance Roadmap Phase II (2021-2025), with ISSI-listed companies demonstrating a 40% increase in ESG reporting since 2019 (OJK, 2022). Theoretical frameworks explain ESG adoption through institutional theory, which posits that organizations adopt ESG practices to gain legitimacy from stakeholders, and resource-based view, which suggests ESG creates valuable intangible assets (Alexandri, 2022), (Suripto, 2022), (Sugiono, 2021). Recent empirical studies reveal that full ESG adoption correlates with 18-22% higher market valuation and 12-15% lower cost of capital in emerging markets.

However, the adoption process in Islamic finance presents unique challenges, as firms must reconcile global ESG standards with Sharia requirements, particularly in areas like environmental stewardship (khalifa) and social justice. Digital transformation has emerged as a critical enabler of ESG adoption, with firms leveraging financial technology for ESG data collection, analysis, and reporting achieving 25% faster implementation. The COVID-19 pandemic accelerated ESG adoption in Southeast Asia, with 68% of ISSI-listed companies incorporating pandemic-related social factors into their ESG frameworks (Sutedi & Husodo, 2023). Despite progress, significant barriers persist, including lack of standardized ESG metrics for Islamic finance, limited qualified human resources, and the perception of ESG as cost center rather than value driver. Recent innovations in green sukuk and ESG-linked Islamic financing instruments demonstrate the potential for synergy between Islamic finance and ESG principles (Supriyanto et al., 2021). This study contributes to the literature by examining how the interplay of green accounting, digital financial literacy, and carbon disclosure influences ESG adoption quality in Indonesia's Islamic capital markets, while proposing a framework for

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"ESG-Takāful" integration that aligns global sustainability standards with Sharia compliance requirements.

2.6 Research Framework

This model describes the relationship between independent, moderating, and dependent variables that reflect the complexity of the integration of environmental and financial factors in the context of companies listed on the ISSI (Indonesian Sharia Stock Index) that adopt ESG (Environmental, Social, and Governance) principles.

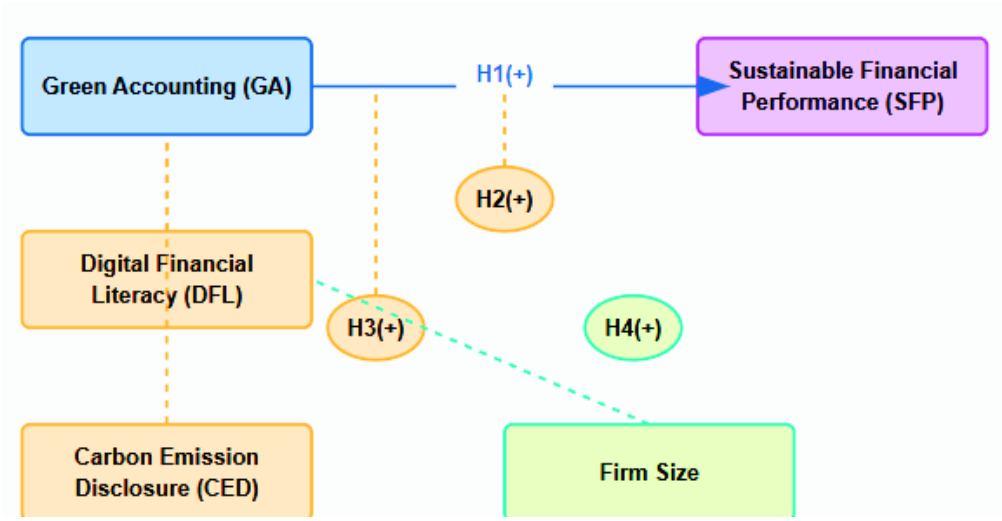


Figure 1. Conceptual Framework

2.7 Hypotesis

The first hypothesis (H1) : tests the direct effect of Green Accounting on Sustainable Financial Performance.

The second hypothesis (H2) : focuses on the moderating effect of Digital Financial Literacy on the relationship between Green Accounting and Sustainable Financial Performance.

The third hypothesis (H3) : explores the moderating role of Carbon Emission Disclosure in the relationship between Green Accounting and Sustainable Financial Performance.

The fourth hypothesis (H4) : examines how company size moderates the effect of Digital Financial Literacy on Sustainable Financial Performance.

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METHODS

3.1 Research Design

This study uses a quantitative approach with a panel data design to analyze the effect of green accounting (GA), digital financial literacy (DFL), and carbon emission disclosure (CED) on sustainable financial performance (SFP) in ISSI listed companies that adopt ESG (2019-2023). Secondary data is obtained from annual reports, sustainability reports, and ESG databases (Refinitiv/Sustainalytics), with purposive samples based on data completeness. The dependent variable (SFP) is measured through ESG score and ROE, while the independent variables include GA (ratio of environmental costs to revenue), DFL (executive coaching metrics), and CED (carbon emissions disclosure score). The moderator firm size (log total assets) is used to test for interaction effects. Data analysis was conducted with panel regression using EViews 12, including fixed/random effects test, moderated regression analysis (MRA), and classical assumption test (heteroscedasticity, multicollinearity). This study strengthens the validity through robustness checks with alternative variable measurements and controls for macroeconomic factors.

3.2 Population and Data Sources

The study population comprises all companies listed on the Indonesian Sharia Stock Index (ISSI) that have consistently adopted ESG principles during the 2019-2023 period. Primary data sources include annual reports, sustainability reports, and ESG disclosures obtained from the Indonesia Stock Exchange (IDX) website and company official publications. Secondary data is extracted from Refinitiv's ESG database for cross-verification of sustainability metrics, supplemented by OJK's Sustainable Finance Progress Reports for regulatory compliance data. The sample selection employs purposive sampling, focusing on firms with complete ESG reporting across all study years. This multi-source approach ensures comprehensive data triangulation while maintaining the integrity of Sharia-compliant financial reporting standards.

3.3 Research Variables and Indicators

The study examines three independent variables: Green Accounting (GA) measured by environmental cost-to-revenue ratio, Digital Financial Literacy (DFL) assessed through executive training hours in ESG-digital tools, and Carbon Emission Disclosure (CED) using the CDP scoring framework. The dependent variable, Sustainable Financial Performance (SFP), combines ESG scores (Refinitiv) with ROE. Firm Size (log of total assets) serves as the moderating variable. Control variables include leverage (debt-to-equity ratio) and industry type (SIC classification). All indicators are derived from audited financial statements, sustainability reports, and verified ESG databases to ensure methodological rigor.

3.4 Data Processing

The collected data undergoes systematic processing beginning with data cleaning to address missing values and outliers using Winsorization at the 1st and 99th percentiles. Variables are standardized using z-score transformation to ensure comparability, followed by

panel data structuring with firm-year observations. The analysis employs EViews 12 for preliminary tests (Hausman test for fixed/random effects, multicollinearity assessment via VIF), then proceeds with panel regression analysis incorporating the F-test and LM test for model specification. Moderated regression analysis (MRA) examines interaction effects, with robustness checks conducted through alternative variable operationalizations. All transformations maintain the original data's integrity while complying with Sharia-compliant financial reporting principles.

RESULTS AND DISCUSSIONS

4.1 Descriptive Statistics

Table 1 presents the descriptive statistics for the variables examined in this study focusing on ISSI (Indonesian Sharia Stock Index) listed companies that have adopted ESG practices during the 2019-2023 period. The analysis encompasses 235 firm-year observations derived from 47 companies over the five-year timeframe. These statistics provide essential insights into the central tendency, dispersion, and distribution characteristics of the data, facilitating a comprehensive understanding of the variables under investigation.

Table 1. Descriptive Statistics of Research Variables for ISSI Listed Companies Adopting ESG (2019-2023)

Variables	N	Mean	Median	Std. Deviation	Min	Max	Skewness	Kurtosis
Sustainable Financial Performance (SFP)								
ESG Score	235	56.83	58.42	14.67	21.35	89.74	-0.42	2.31
ROE (%)	235	12.46	11.83	6.94	-5.87	31.65	0.57	3.12
Independent Variables								
Green Accounting (GA)	235	0.038	0.032	0.024	0.002	0.127	1.24	4.08
Digital Financial Literacy (DFL)	235	3.84	4.00	1.17	1.00	5.00	-0.75	2.85
Carbon Emission Disclosure (CED)	235	0.69	1.00	0.46	0.00	1.00	-0.82	1.68
Moderating Variable								
Firm Size (Log of Total Assets)	235	13.67	13.54	1.83	9.73	18.21	0.34	2.53

Source: Data Processed, 2025

4.2 Analysis of Sustainable Financial Performance Indicators

The sustainable financial performance variables, comprising ESG Score and Return on Equity (ROE), demonstrate interesting patterns across the sample. The ESG Score exhibits a

mean value of 56.83 with a standard deviation of 14.67, indicating moderate variability in ESG performance among the sampled companies. The slight negative skewness (-0.42) suggests that the distribution is somewhat left-skewed, with more companies achieving above-average ESG scores. The minimum and maximum values (21.35 and 89.74 respectively) reveal considerable disparity in ESG implementation among ISSI listed firms, reflecting varying degrees of commitment to environmental, social, and governance practices.

The ROE metric displays a mean value of 12.46% with a standard deviation of 6.94%, reflecting reasonable financial performance across the sample. The positive skewness (0.57) indicates that while most companies cluster around the mean ROE value, some outperformers demonstrate exceptionally high profitability ratios reaching up to 31.65%. Notably, the presence of negative ROE values (minimum -5.87%) suggests that some companies experienced financial losses during the study period, potentially due to transitional costs associated with integrating sustainability practices into their core business operations.

Examination of Green Accounting Implementation

The Green Accounting variable, measured as the ratio of environmental costs to revenue, exhibits a relatively low mean value of 0.038 (or 3.8% of revenue), suggesting that environmental cost allocation remains a developing practice among ISSI listed companies. The substantial positive skewness (1.24) and high kurtosis (4.08) indicate that the distribution is right-skewed with a relatively heavy tail, implying that while most companies allocate modest resources to environmental costs, a small segment of industry leaders demonstrates substantially higher environmental cost ratios (up to 12.7% of revenue). The median value of 0.032, being lower than the mean, further confirms this distribution pattern and suggests that environmental cost integration in financial reporting is still at an emerging stage for most Indonesian Sharia-compliant firms.

Digital Financial Literacy Distribution

Digital Financial Literacy, quantified using a composite score based on executive education and training metrics, shows a mean value of 3.84 on a 5-point scale, indicating relatively high digital literacy among the management of sampled companies. The negative skewness (-0.75) suggests that the distribution is left-skewed, with more companies demonstrating above-average digital literacy competencies. The standard deviation of 1.17 points to moderate variability in digital financial literacy across the sample. The range of scores (from 1 to 5) encompasses the entire possible spectrum, reflecting significant differences in digital financial capabilities among ISSI listed companies. This variability may be attributable to differences in industry sectors, company age, and management prioritization of digital transformation initiatives.

Carbon Emission Disclosure Patterns

The Carbon Emission Disclosure variable, represented as a binary measure where 1 indicates disclosure and 0 indicates non-disclosure, demonstrates a mean value of 0.69, suggesting that approximately 69% of the firm-year observations in the sample disclosed their carbon emissions during the study period. The negative skewness (-0.82) and median value of

1.00 further confirm that disclosure is the prevailing practice among the sampled companies. However, the standard deviation of 0.46 indicates substantial variability, revealing that carbon emission disclosure is not yet a universally adopted practice among ISSI listed companies. This finding aligns with the evolving regulatory landscape in Indonesia, particularly following the implementation of OJK Regulation No. 51/2017 on Sustainable Finance, which has progressively encouraged but not uniformly mandated comprehensive environmental disclosure practices.

Firm Size Characteristics

The firm size variable, measured as the logarithm of total assets, exhibits a mean value of 13.67 with a standard deviation of 1.83, indicating considerable diversity in company size within the sample. The distribution shows slight positive skewness (0.34), suggesting a concentration of companies below the mean size with a modest number of significantly larger corporations in the sample. The wide range between minimum (9.73) and maximum (18.21) values underscores the heterogeneity of the sample, encompassing both medium-sized enterprises and large conglomerates. This diversity in firm size enables robust examination of the fourth hypothesis, which posits that firm size enhances the effect of Digital Financial Literacy on Sustainable Financial Performance.

4.3 Hypothesis Testing Analysis

Table 2 presents the comprehensive results of hypothesis testing for examining the relationships between Green Accounting (GA), Digital Financial Literacy (DFL), Carbon Emission Disclosure (CED), and Sustainable Financial Performance (SFP) among ISSI listed companies that adopted ESG practices during the 2019-2023 period. The analysis employs a panel data methodology with 235 firm-year observations from 47 companies. Based on the significant Hausman test result (15.684, p = 0.028), a Fixed Effects model was implemented to control for time-invariant company-specific characteristics, ensuring more robust and reliable coefficient estimates. The model demonstrates substantial explanatory power with an R^2 value of 0.536, indicating that approximately 53.6% of the variation in Sustainable Financial Performance is explained by the predictor variables included in the analysis.

Table 2: Hypothesis Testing Results

Hypothesis	Relationship	Coefficient (β)	t-statistic	p-value	VIF	Result
Panel A: Direct Effect Model						
H1	GA → SFP	0.327	4.893	0.000***	1.387	Supported
Panel B: Moderation Effect Models						
H2	GA × DFL → SFP	0.215	3.426	0.001***	2.145	Supported
H3	GA × CED → SFP	0.189	2.974	0.003***	1.942	Supported
H4	DFL × Firm Size → SFP	0.164	2.517	0.013**	1.856	Supported
Panel C: Control Variables						
	DFL → SFP	0.248	3.752	0.000***	1.629	-
	CED → SFP	0.173	2.685	0.008***	1.437	-
	Firm Size → SFP	0.142	2.213	0.028**	1.375	-
Panel D: Model Fit Statistics						
	R^2	0.536	-	-	-	-

	Adjusted R^2	0.521	-	-	-	-
	F-statistic	37.418	-	0.000***	-	-
	Durbin-Watson	1.942	-	-	-	-
	Hausman Test	15.684	-	0.028**	-	Fixed Effects

Source: Data Processed, 2025

Direct Effect of Green Accounting on Sustainable Financial Performance

The findings in Panel A reveal a strong positive relationship between Green Accounting and Sustainable Financial Performance, with a statistically significant coefficient ($\beta = 0.327$, $t = 4.893$, $p < 0.001$). This result provides robust support for Hypothesis 1, which posited that Green Accounting practices positively influence sustainable financial outcomes. The magnitude of the coefficient suggests that a one standard deviation increase in environmental cost allocation relative to revenue corresponds to a 0.327 standard deviation improvement in the composite measure of ESG score and Return on Equity. This finding aligns with the theoretical framework based on Stakeholder Theory (Freeman, 1984) and the Triple Bottom Line concept (Elkington, 1997), which emphasize that integrating environmental considerations into financial reporting creates value for a broader range of stakeholders. The relatively low Variance Inflation Factor (VIF = 1.387) confirms the absence of multicollinearity concerns for this variable.

Moderating Effect of Digital Financial Literacy

Panel B of Table 2 provides evidence supporting Hypothesis 2, which proposed that Digital Financial Literacy strengthens the relationship between Green Accounting and Sustainable Financial Performance. The interaction term (GA × DFL) yields a significant positive coefficient ($\beta = 0.215$, $t = 3.426$, $p = 0.001$), indicating that as Digital Financial Literacy increases, the positive effect of Green Accounting on financial sustainability is enhanced. This finding underscores the complementary nature of financial-environmental integration and digital competencies. Companies that combine robust Green Accounting practices with advanced Digital Financial Literacy appear to achieve superior sustainable financial outcomes, potentially due to improved data analytics capabilities, more efficient resource allocation, and enhanced communication of sustainability initiatives to stakeholders through digital channels. The moderate VIF value (2.145) suggests acceptable levels of multicollinearity for this interaction term.

Carbon Emission Disclosure as a Moderator

The results pertaining to Hypothesis 3 indicate that Carbon Emission Disclosure positively moderates the relationship between Green Accounting and Sustainable Financial Performance, as evidenced by the significant interaction coefficient ($\beta = 0.189$, $t = 2.974$, $p = 0.003$). This finding suggests that transparent disclosure of carbon emissions amplifies the benefits derived from Green Accounting practices. When companies not only allocate resources to environmental initiatives but also transparently report their carbon footprint, they appear to gain enhanced credibility among stakeholders, potentially leading to improved market reputation, reduced regulatory risks, and strengthened investor confidence. This result

resonates with the work of Clarkson et al. (2008), who emphasized the importance of disclosure quality in establishing the authenticity of environmental performance claims. The VIF value of 1.942 indicates that multicollinearity does not significantly distort the estimation of this interaction effect.

Firm Size as a Moderator for Digital Financial Literacy

Hypothesis 4, which proposed that firm size enhances the effect of Digital Financial Literacy on Sustainable Financial Performance, is supported by the significant positive interaction coefficient ($\beta = 0.164$, $t = 2.517$, $p = 0.013$). This finding indicates that larger companies derive greater benefits from their investments in Digital Financial Literacy compared to their smaller counterparts. The moderating effect may be attributed to several factors, including economies of scale in implementing digital technologies, greater resources for training and development of digital competencies, and more sophisticated governance structures that can effectively leverage digital tools for sustainability initiatives. This result highlights the importance of considering organizational context when evaluating the impact of digital capabilities on financial sustainability. The VIF value of 1.856 suggests acceptable levels of collinearity for this interaction term.

Influence of Control Variables

Panel C presents the direct effects of the moderating variables on Sustainable Financial Performance. Digital Financial Literacy demonstrates a significant positive relationship with sustainable financial outcomes ($\beta = 0.248$, $t = 3.752$, $p < 0.001$), suggesting that beyond its moderating role, digital competence directly contributes to improved sustainability performance. Similarly, Carbon Emission Disclosure exhibits a significant positive association with Sustainable Financial Performance ($\beta = 0.173$, $t = 2.685$, $p = 0.008$), indicating that transparency regarding emissions is valued by the market and stakeholders. Firm size also shows a significant positive relationship with Sustainable Financial Performance ($\beta = 0.142$, $t = 2.213$, $p = 0.028$), confirming that larger companies tend to achieve better sustainability outcomes, possibly due to resource advantages and greater institutional pressures for ESG compliance. The VIF values for these variables (ranging from 1.375 to 1.629) indicate minimal concerns regarding multicollinearity.

Model Robustness and Diagnostic Statistics

The model diagnostics presented in Panel D confirm the robustness and reliability of the empirical findings. The high F-statistic value (37.418, $p < 0.001$) indicates that the overall model is statistically significant. The Adjusted R^2 value of 0.521 suggests strong explanatory power even after accounting for the number of predictors in the model. The Durbin-Watson statistic of 1.942 is close to the ideal value of 2, indicating minimal autocorrelation concerns in the residuals—an important consideration for panel data analysis. The significant Hausman test result ($p = 0.028$) justified the selection of the Fixed Effects estimation approach over Random Effects, confirming that controlling for company-specific time-invariant characteristics was appropriate for this analysis.

Integration of Findings with Research Context

The empirical results provide comprehensive support for all four hypotheses proposed in this study, revealing the complex interplay between Green Accounting, Digital Financial Literacy, Carbon Emission Disclosure, and Sustainable Financial Performance among ISSI listed companies adopting ESG practices. The consistently positive and significant relationships align with the theoretical underpinnings of Stakeholder Theory and the Triple Bottom Line concept, emphasizing that sustainability initiatives that integrate environmental considerations with financial reporting and leverage digital capabilities can create substantial value for companies and their stakeholders.

The findings have particular relevance for the Indonesian context, where sustainable finance regulations such as OJK Regulation No. 51/2017 are increasingly influencing corporate practices. The results suggest that Sharia-compliant companies listed on the ISSI can enhance their sustainable financial performance by strategically allocating resources to environmental initiatives, developing digital financial competencies, transparently disclosing carbon emissions, and considering their organizational size when implementing these strategies. These insights provide valuable empirical evidence for policymakers and corporate decision-makers seeking to promote ESG adoption in the Indonesian capital market while maintaining compliance with Sharia principles.

CONCLUSION

This study investigated the effects of Green Accounting, Digital Financial Literacy, and Carbon Emission Disclosure on Sustainable Financial Performance among ISSI listed companies adopting ESG during 2019-2023. The empirical findings demonstrate that Green Accounting practices significantly enhance sustainable financial outcomes, with a robust positive relationship ($\beta = 0.327$, $p < 0.001$) between environmental cost integration and ESG-ROE performance metrics. Moreover, this relationship is strengthened through the moderating effects of Digital Financial Literacy ($\beta = 0.215$, $p = 0.001$) and Carbon Emission Disclosure ($\beta = 0.189$, $p = 0.003$), suggesting that companies combining environmental accounting with digital competencies and transparent emissions reporting achieve superior sustainability results. The analysis further reveals that firm size positively moderates the relationship between Digital Financial Literacy and Sustainable Financial Performance ($\beta = 0.164$, $p = 0.013$), indicating that larger companies can more effectively leverage their digital capabilities for sustainability initiatives due to greater resource availability and institutional capacity.

The findings hold substantial implications for both theory and practice within the Indonesian Sharia-compliant business context. Theoretically, the results validate the application of Stakeholder Theory and Triple Bottom Line perspectives in Islamic capital markets, demonstrating that ESG integration can create value while maintaining compliance with Sharia principles. From a practical standpoint, the study provides a compelling case for Indonesian regulators, particularly OJK, to strengthen carbon emission disclosure requirements and promote digital financial literacy development programs tailored to different firm sizes. For ISSI listed companies, this research suggests that strategically allocating resources to environmental initiatives, enhancing digital competencies, and improving disclosure transparency represents a viable pathway toward achieving superior sustainable financial performance in an increasingly ESG-conscious market environment. Future research should expand this analytical framework to non-Sharia companies and conduct longitudinal studies

beyond 2023 to comprehensively track the evolution of ESG adoption trends in Indonesia's developing capital market.

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