New Evidence of Green Initiatives on Firm Values in ASEAN

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Abstract

This research examined the roles of green building, green revenue percentage, and emission-reduction performance in firm value. This research analysed crucial yet less-explored issues of environmental research in five ASEAN countries, along with providing proof regarding the impact of environmental performance on a firm's value, highlighting variation across nations and years. This research operated weighted least squares (WLS) to analyse a total of 3,193 firm's years from 2015 to 2023. The findings reveal that investors value companies that invest in green buildings as a sign of commitment to sustainability and energy efficiency, thereby reducing operating costs. They also appreciate companies generating green revenue and promoting environmentally friendly products. Investors respond positively to companies that reduce emissions, recognizing potential benefits for financial performance and long-term sustainability. This research has significant implications for practice and policy, as governments and policymakers play a paramount role in the implementation of environmental performance. The green initiatives continue to improve; thus, future studies can expand the green performance indicators.

Keywords: green building, green revenues, emission performance, firm value, ASEAN countries

Introduction

The escalating consequences of the climate crisis pose a grave danger to both humanity and the environment, making it one of the most vital global issues of this era (Deng et al., 2023; Bagh et al., 2024; Naseer et al., 2024). With the earth's climate currently undergoing a swift transformation, the surging level of pollution from industrial activities may significantly increase levels of hazardous air and water pollutants (Helmina et al., 2022). The lack of environmental consciousness among firms is the primary driver of environmental degradation (Agustia et al., 2019; Wang et al., 2021; Li et al., 2024). Moreover, it has been discovered that companies are among the main contributors to this change (Yuniarti et al., 2022).

Unlike developed countries, developing nations often lack a concrete regulatory framework and legal enforcement to address environmental challenges, making companies operating in emerging markets face fewer direct regulatory imperatives to address climate change (Desai et al., 2022). Despite these challenges, environmental problems have raised public awareness of the need for sustainable business practices (Kurnia et al., 2021; Cormier & Beauchamp, 2021). There has been a growing action to counteract the prevailing belief which views a company's sole responsibility is to maximise shareholder wealth (DiSegni et al., 2015). The modern goal of maximising wealth extends beyond economic considerations. To endure success, businesses must focus on both social and environmental perspectives to guarantee prolonged sustainability (Khunkaew et al., 2023).

Stakeholders are advocating for firms to assess their triple bottom line policies and invest in sustainable ideas to address climate change (Alvarez, 2012; Husnaini & Tjahjadi, 2021; Li et al., 2024). Sustainability reporting is essential, and organisations must exhibit transparency and a commitment to corporate responsibility (Lundgren & Zhou, 2017; Novitasari & Agustia, 2021). Eco-friendly enterprises can yield strategic advantages for stakeholders (Ardianto et al., 2023). However, corporations are less inclined to use these practices if they do not yield financial benefits, which are essential for a firm's longevity (Devie et al., 2020; Kurnia et al., 2021).

The ASEAN region faces challenges in standardizing reporting and mandatory environmental practices due to voluntary regulations (Desai et al., 2022; Kurnia et al., 2021). The implementation of green actions varies across firms, making it difficult to establish a common benchmark for comparison. The region's diverse economic, institutional, and cultural backgrounds create unique investor and consumer characteristics, resulting in varying research results. The connection between environmental performance and firm value may evolve due to investor preferences and regulatory changes. The valuation of green initiatives may strengthen due to increased awareness and demand for sustainable practices (Ghose et al., 2023). This research aims to address this gap by comparing environmental performance across diverse institutional, regulatory, and cultural contexts.

This research provides novelty as the first empirical study within the ASEAN context to simultaneously investigate the impact of green building adoption, green revenue percentage

and emission-reduction performance on firm value. The previous research attests that investors in ASEAN appreciate companies with green innovation (Asni & Agustia, 2022). Unlike prior studies that often focus on singular environmental indicators, this research introduces a multidimensional operational framework that captures tangible sustainability efforts and their direct financial implications. The research questions are (1)Does the existence of green building have positive impact to the firm value in the short and long-terms?; (2) Do green revenues have positive impact to the firm value in the short and long-terms?; and (3) Does firm performance in reducing emission have positive impact to the firm value in the short and long-terms?

Theoretically, this research contributes to stakeholder theory, legitimacy theory, and signalling theory. It supports stakeholder theory by showing that firms proactively addressing environmental concerns can better meet stakeholders' expectations. It contributes to legitimacy theory by demonstrating how environmental actions, particularly in emerging ASEAN markets, help firms gain or maintain social legitimacy amid growing environmental scrutiny. Moreover, this research enriches signalling theory by providing evidence that concrete sustainability practices, such as green building and green revenue, act as credible signals of a firm's long-term vision, strategic orientation, and commitment to environmental stewardship. These actions reduce information asymmetry, strengthen market perception, and lead to improve firm valuation.

The research finds that green building, green revenues, and emission reduction performance significantly enhance firm value in the ASEAN context, offering key contributions to multiple stakeholders while aligning with the United Nations Sustainable Development Goals (SDGs). For governments, the results support the design of stronger environmental regulation and incentives, such as tax benefits, green financing, and sustainable public procurement. It can encourage corporate action towards SDG targets, particularly SDG 9 (Industry, Innovation, and Infrastructure), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action). For accounting standard setters, the findings highlight the need for integrating, standardized, quantifiable environmental metrics into sustainability disclosure frameworks, such as IFRS S1/S2, to improve transparency and support SDG-aligned reporting. For investors, this research provides robust evidence that these green initiatives signal lower risk and long-term value creation, reinforcing ESG-aligned investment strategies. For companies, the results demonstrate that sustainability is not merely a compliance issue but a strategic lever for enhancing reputation, attracting capital, and achieving profitability, while actively contributing to global sustainability efforts.

Literature Review/Analytical Framework

The Impact of Green Building on Firm Value

Green buildings are eco-friendly, sustainable, and energy-efficient structures that reduce environmental impact, improve occupant health, and increase financial returns for

developers and society (Liu et al., 2022; Samad et al., 2020). They contribute to 30-40% of total energy consumption, greenhouse gas emissions, and waste regeneration (Ho et al., 2013). Green buildings offer economic benefits by minimizing pollution control, improving construction quality, reducing energy consumption, and promoting healthier living conditions (Abdullah et al., 2018; Cao et al., 2022; Zhu et al., 2021). The economic value of green buildings extends beyond operational costs, as green building certification allows flexibility and does not require specific technological requirements (Fuerst et al., 2017). Tangible benefits include lower energy, water, and waste disposal costs, reduced operational and maintenance expenses, and lower environmental impacts (Ho et al., 2013; Fuerst et al., 2017; Hopkins & Mullekom, 2019; Abdullah et al., 2018). Additionally, green buildings offer improved productivity, reduced staff turnover, higher output, lower obsolescence, reduced regulatory risk, and a positive reputation (Fuerst et al., 2017; Zhao & Pan, 2022).

Research on green building projects has shown mixed results. Samad et al. (2020) suggest that the upfront costs can temporarily reduce return on equity, while Delmas et al. (2015) find that environmental initiatives can lead to lower financial performance and firm value. These findings suggest that companies prioritize shareholder wealth over environmental concerns, potentially jeopardizing sustainability and human well-being. Hopkins and Mullekom (2019) also suggest that policy restrictions and marketing challenges can reduce the appeal of green buildings if not properly addressed. Green buildings offer greater economic value, including longer lifespans, higher investor profits, increased stock returns, and lower operating costs (Hsieh et al., 2020; Verma et al., 2021). They outperform conventional buildings in financial returns, contributing to higher firm value (Abdullah et al., 2018; Hsieh et al., 2020). Stakeholder theory suggests that fulfilling stakeholder demands drives competitive edge, while signalling theory suggests that companies pursue green certifications as a signal of environmental responsibility, leading to performance benefits and marketing advantages (Hsieh et al., 2020; Verma et al., 2021).

Investors also appear to show interest in office assets with green certifications, as eco-certified assets may be above average quality assets within their class (Fuerst et al., 2017). Studies show that socially conscious investors are attracted to green building and recognise the initial costs can be offset by long-term savings along with enhanced firm performance (Hsieh et al., 2020). Abdullah et al. (2018) argue that while green buildings may require higher upfront costs compared to conventional buildings, they can ultimately save money over their lifespan. Given the previous studies and theoretical frameworks, the following hypothesis are proposed.

Hypothesis 1 (H1a): The higher the green building score, the higher the firm value

Hypothesis 1 (H1b): The higher the green building score, the higher the firm value in the long-term

Green Revenues and Firm Value

Green revenues are a portion of a company's profit generated from environmentally friendly and sustainable business activities. They allow investors to assess a company's

environmental sustainability beyond traditional physical measures like carbon emissions and fossil fuel reserves (Kruse et al., 2024; Quaye et al., 2024). Environmental management goes beyond compliance with environmental laws and involves integrating environmental activities into the company's operations, including supply chain processes (Abu-Ghunmi et al., 2023). Green strategies can elevate green revenues by improving environmental quality and accelerating the transition to environmentally friendly practices (Huang et al., 2024). As financial markets focus on new green opportunities, firms are expanding their operations to seek these revenue streams (Kruse et al., 2024). Green revenue signals a company's commitment to intensifying its green efforts (Quaye et al., 2024) and can be integrated into investor decision-making (Bassen et al., 2023). Green operations involve cost reduction, environmentally friendly products, and waste minimization, which in turn improve marketing and sales, stronger firm performance, and greater resilience to stakeholder pressure (Novitasari & Agustia, 2021).

Firms that implement environmentally friendly technologies, innovate environmentally, and optimise resource usage are often valued higher because these practices can reduce risk associated with fluctuating commodity prices and stricter environmental regulations (Barko et al., 2022; Bolton & Kacperczyk, 2021). Yuniarti et al. (2022) confirm that companies involved in reducing environmental damage have a competitive advantage, improved performance, and higher firm value. Additionally, it can enhance a firm's social and environmental reputation, positively impacting its stock market value (Chouaibi & Chouaibi, 2021; Husnaini & Tjahjadi, 2021), especially when it takes the lead as a first mover (Khan et al., 2022).

Green revenue is a relatively new topic in research, with inconsistent results from previous studies. Low-ESG-performing firms may outperform high-ESG firms, potentially leading to lower returns for investors (Luo, 2022). Improving environmental performance without enhancing resource efficiency may not provide sufficient economic benefits (Xie et al., 2022). Increased environmental improvement can limit a firm's financial flexibility, hinder profit maximisation, and negatively impact firm value (Luo, 2022; Pedersen et al., 2021). Investors prioritise financial returns as a desire to invest ethically while avoiding guilt. Firms with strong environmental commitments are attractive to investors and stakeholders (Agustia et al., 2019; Asni & Agustia, 2022; Kruse et al., 2024). Green revenues serve as a transparent indicator of a firm's environmental actions, reducing information asymmetry with stakeholders (Bassen et al., 2023). Environmental initiatives can reduce long-term costs and improve a firm's risk perception, leading to higher stock prices (Abu-Ghunmi et al., 2023). Green revenues can be seen as a risk management tool, helping firms enhance market competitiveness and attract institutional investors who favour environmental values (Pekovic et al., 2018). This research expects that green revenues in the presence of environmentally friendly firms will increase firm value.

Hypothesis 2 (H2a): The increase of green revenues elevates the firm value
Hypothesis 2 (H2b): The increase of green revenues elevates the firm value in the long-term

Emission Reduction Performance to Firm Value

Environmental emissions have significant negative impacts on society and individual emitters, leading to financial consequences. Excessive emissions can result in environmental liabilities and costs, with no long-term economic gains. This can reduce future cash flows and stock prices, negatively impacting firm value (Choi & Luo, 2021; Matsumura et al., 2014). Corporate carbon emissions have gained attention, and the market now considers these costs when determining stock prices (Widagdo et al., 2023). However, companies are more likely to adopt a responsive strategy than an initiative-taking to reduce environmental harm (Chen et al., 2018). Studies have examined the relationship between carbon emissions and corporate performance metrics (Matsumura et al., 2014; Choi & Luo, 2021; Benkraiem et al., 2022; Perdichizzi et al., 2024), with two opposing viewpoints on the effect of environmental actions (Benkraiem et al., 2022; Bose et al., 2024). Environmental initiatives can negatively impact a company's competitiveness due to resource misallocation and increased costs, potentially reducing firm value. However, environmental initiatives can also enhance a company's competitive advantage by reducing emissions. Further research is needed to draw definitive conclusions.

Previous studies (Wang et al., 2014; Griffin et al., 2021; Lee & Cho, 2021) find a positive relationship between carbon emissions and firm value. This finding supports the theory that firms should prioritise profit maximisation for shareholders, who can then donate to environmental causes. Firm managers should refrain from unprofitable behaviour that may reduce returns to shareholders. High carbon emissions could also indicate lower costs associated with less environmentally friendly practices, which can increase firm value. Therefore, they suggest that investing in carbon reduction can lead to higher operating costs and lower profitability.

Research studies show that higher levels of direct carbon emissions negatively impact firm value (Matsumura et al., 2014; Ganda & Milondzo, 2018; Choi & Luo, 2021; Gregory, 2022; Desai et al., 2022; Han et al., 2023; Perdichizzi et al., 2024), leading to stock market penalties (Lee et al., 2015; Choi & Luo, 2021). Low carbon intensity can provide firms with a competitive advantage, as successful reductions in emissions lead to greater long-term market financial performance and market value (Clarkson et al., 2015; Delmas et al., 2015; Benkraiem et al., 2022). Reducing carbon emissions helps firms maintain their legitimacy and address stakeholder concerns (Perdichizzi et al., 2024; Pitrakkos & Maroun, 2020), ultimately leading to value creation. The signalling theory suggests that investors view high carbon emissions as a negative signal, leading to lower market value for polluting firms (Desai et al., 2022). This study posits that reducing carbon emissions can help firms maintain their legitimacy and create value by addressing stakeholder concerns.

Hypothesis 3 (H3a): The firm value increases as the emission reduction performance improves

Hypothesis 3 (H3b): The firm value in the long-term increases as the emission reduction performance improves

Research Method

Data and Sample

The ASEAN region, a group of emerging economies with unique cultural and social developments, is attracting global attention due to its potential and growing influence. These countries are actively working together to address environmental challenges through regional cooperation initiatives, such as the adoption of ASEAN Vision 2025. Indonesia, Malaysia, Singapore, Thailand, and the Philippines are major economic powerhouses in ASEAN, positioning them as key players in addressing climate change and sustainability. These countries offer diverse challenges and opportunities related to these issues, making them valuable case studies. First, these countries face pressing and diverse environmental issues, ranging from deforestation and land management (in Indonesia and Malaysia) to high vulnerability to physical climate risks such as sea-level rise (in Singapore, the Philippines, and Thailand). Second, their economies are highly integrated into global supply chains and are major recipients of FDI, so local companies face strong pressure from investors and international partners to adhere to stringent sustainability standards. Third, these countries are leading the development of green finance mechanisms in ASEAN, with Singapore serving as a regional hub, Malaysia's dominance in the global green sukuk market, and the presence of ESG indices on major stock exchanges, including those of Indonesia, the Philippines, and Thailand. The time period of this study also includes major milestones in the global struggle against climate change, such as the Paris Agreement and the growing focus on sustainable investment from the ASEAN community.

Data in this research are from Thomson Reuters Refinitiv, which offers a standardised and globally recognised measure of a company's environmental performance. This environmental score covers emission-reduction performance, the green building score, and total green revenue score. This research selects registered companies from 5 ASEAN countries from 2015 to 2023. To construct the sample, this research uses purposive sampling with the following criteria: companies that did initial public offering (IPO) before 2015, companies that have complete data on green building, green revenues, emission-reduction performance, and financial data to calculate dependent and control variables within the 2015-2023. The total observation consists of 3,193 firm years, as presented in Table 1.

Table 1. Total Observations

	Year								
Description	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Indonesia	36	38	39	41	43	47	54	84	88
Malaysia	40	46	51	53	55	67	168	307	340
Singapore	35	35	37	38	54	80	83	87	88
Thailand	30	33	36	38	58	108	146	172	178
Philippines	24	25	25	25	26	27	32	37	39
Total Observation	**165**	**177**	**188**	**195**	**236**	**329**	**483**	**687**	**733**

Model

Given the preceding literature cited above, this research posits the following equation to illustrate the relationship between environmental performance and firm value.

Hypotheses 1a, 2a, and 3a are described in Model 1 (see Equation 1):

$$FV_{i,t} = \alpha_0 + \beta_1 GB_{i,t} + \beta_2 GR_{i,t} + \beta_3 EP_{i,t} + \beta_4 FA_{i,t} + \beta_5 FS_{i,t} + \beta_6 LEV_{i,t} + \beta_7 GRW_{i,t} + \beta_8 GDP_{i,t} + \varepsilon_{i,t} \quad (1)$$

Hypotheses 1b, 2b, and 3b are presented in model 2 for 1 year lag (see Equation 2) and model 3 for 2 years lag (see Equation 3).

Model 2:

$$FV_{i,t} = \alpha_0 + \beta_1 GB_{i,t-1} + \beta_2 GR_{i,t-1} + \beta_3 EP_{i,t-1} + \beta_4 FA_{i,t-1} + \beta_5 FS_{i,t-1} + \beta_6 LEV_{i,t-1} + \beta_7 GRW_{i,t-1} + \beta_8 GDP_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

Model 3:

$$FV_{i,t} = \alpha_0 + \beta_1 GB_{i,t-2} + \beta_2 GR_{i,t-2} + \beta_3 EP_{i,t-2} + \beta_4 FA_{i,t-2} + \beta_5 FS_{i,t-2} + \beta_6 LEV_{i,t-2} + \beta_7 GRW_{i,t-2} + \beta_8 GDP_{i,t-2} + \varepsilon_{i,t} \quad (3)$$

Where:

α_0	: Constant Value	*FS*	: Firm Size
β_1- β_9	: Coefficient Value	*LEV*	: Leverage
FV	: Firm Value	*FA*	: Firm Age
GB	: Green building Score	*GRW*	: Growth
GR	: Green Revenue Percentage	*GDP*	: GDP Growth
EP	: Emission Reduction Performance	$\varepsilon_{i,t}$	: Standard error of company i in year t

For all models, the firm value observation period as the dependent variable is 2015–2023. The observation period in model 1 is 2015–2023 for the independent variables. In model 2, the observation period for the independent variable is 2014–2022. Meanwhile, in model 3, the independent variable is observed in the 2013–2021 period.

Dependent Variable

Tobin's Q serves as the key dependent variable in this research, representing firm value (FV). Tobin's Q is a commonly used proxy for firm value (Agustia et al., 2019), as it reflects a company's market value based on its stock price and is generally difficult for management to manipulate (Xie et al., 2022). Climate change risk can significantly affect both tangible and intangible resources. For example, climate change can damage both physical assets like buildings and equipment, as well as intangible assets like brand reputation and customer relationships (Naseer et al., 2024). Tobin's Q incorporates the market value of firms and thus

captures intangible assets that TOA misses (Delmas et al., 2015). Additionally, this ratio provides a measure of whether a company is fairly valued, overvalued, or undervalued relative to its assets. To calculate Tobin's Q, this research uses the following formula (see Equation 4).

$$\frac{(Market\ Value\ Equity = Stock\ Price\ x\ Share\ Outstandings) + Total\ Debt}{Total\ Assets} \quad (4)$$

Independent Variable

A green building (GB) score is based on a company's reporting on how environmentally friendly its company's facilities are. A green building score can also be assessed through green building certification like the USA's leadership in energy and environmental design (LEED) and the UK's British Research Establishment Environmental Assessment Method (BREEAM), or by tracking ongoing sustainability initiatives through major refurbishments to improve their sites/buildings/offices. The assessment of green buildings typically revolves around energy-related requirements and other green requirements such as energy efficiency, water efficiency, environmental protection, indoor environmental quality, as well as other green features and innovation (Ho et al., 2013). Data for this variable are from the Refenitiv Eikon data set.

Green revenue percentage (GR) indicates the revenue gained from products and services that are assessed as green from their benefit and impact on the environment. The proportion of green revenue to total revenue is calculated for each firm and year (Kruse et al., 2024). This score measures a firm's commercial involvement in climate-related green products and services. Data for this variable are from the Refenitiv Eikon data set.

The emission reduction score (EP) measures a company's effectiveness towards reducing environmental emissions in the production and operational processes. This score increases as a company implements an emission reduction policy. Data for this variable are from the Refenitiv Eikon data set.

Control Variable

Firm age (FA) is measured by the difference between the current year and its IPO. Longstanding firms may indulge in green activities more vigorously. However, a longstanding legacy may lead firms to be resistant and conservative in embracing changes and green initiatives (Deng et al., 2023). Data for this variabele are from the Refinitiv Eikon data set and calculated using the formula in Equation 5.

$$Firm\ Age = Log\ (current\ year - IPO\ year) \quad (5)$$

Firm Size (FS) - Larger firms often possess greater competitive advantage due to their larger economies of scale opportunities. They have more market experience, a higher advantage for research and development, a greater financial base, and market power than

smaller firms (Ganda & Milondzo, 2018; Ghose & Kabra, 2023). Bigger companies tend to be more visible (Ganda & Milondzo, 2018) and therefore face greater pressure to improve their environmental records. However, excessive size may increase a firm's inefficiencies due to waste from excessive resources overriding the benefits (Ghose et al., 2023). Data for this variable are obtained from the Refinitiv Eikon data set and calculated using the formula in Equation 6.

$$Firm\ size = Log\ (total\ asset) \tag{6}$$

Leverage (LEV) limits the potential for managerial agency problems by mandating debt service, thereby disciplining managers through external monitoring (Ghose et al., 2023). It estimates the company's total assets that are financed by liabilities and debt. Corporate shareholders analyse leverage to determine whether the firm has adequate funds to pay its current debt and evaluate if the company can acquire viable financial benefits from its investments (Ganda & Milondzo, 2018). Debt-related obligations may help discourage potential overinvestment, and agency theory projects a positive association between leverage and CSR activities (Hsieh et al., 2020). Data for this variable are from the Refinitiv Eikon data set and calculated using the formula in Equation 7.

$$Leverage = \frac{Total\ Debt}{Total\ Assets} \tag{7}$$

Growth (GRW) is expected to impact firm performance positively. Growing firms can achieve both short-term financial goals and long-term growth objectives, fulfilling the expectations of various stakeholders. This research uses a company's ability to grow through investment in fixed assets or capital expenditure as one of the control variables. Growth is included to account for the talent of a firm's management and its ability to maintain strong environmental performance (Bose et al., 2024). Data for this variable are from the Refinitiv Eikon data set and calculated using the formula in Equation 8.

$Capex = Total\ investment$ towards plants $property$ & equipment from cash flow (8)

To control country effects, this research used the GDP growth index. This research incorporates GDP in the equation because it captures a country's economic development (Li et al., 2024). As GDP per capita increases, pollution discharges may initially rise before eventually declining (Deng et al., 2023). Data for this variable are from the Refinitiv Eikon data set.

Methodology

This research employs panel data and multiple regression analysis. The testing begins with a basic Ordinary Least Squares (OLS) model and continues with testing panel regression models: (1) the Chow test to determine whether the research model is a common effect model or a fixed effect model; (2) the Breusch-Pagan test to determine whether the research model is

a common effect model or a random effect model; and (3) the Hausman test to identify whether the research model is a Fixed Effect model or a Random Effect Model.

Additional tests performed include multicollinearity, which assesses the correlation between independent variables and the model's residuals. The standard used is a variance inflation factor (VIF) of no more than 10. This research also tests for heteroscedasticity, which examines the homogeneity of the residuals generated by the research model. A Chi-square value exceeding 0.05 indicates a heteroskedasticity problem. If heteroscedasticity is present in the fixed-effect model, the WLS panel data method is applied.

Table 2. Heteroskedasticity and Panel Effect Model Tests

Regression Model	Chow Test	Breusch-Pagan Test	Hausman Test	White Heteroskedasticity
p-value of Model 1	0.0000	0.0000	7.58E-32	0.0000
p-value of Model 2	0.0000	0.0000	1.95E-29	0.0000
p-value of Model 3	0.0000	0.0000	2.64E-18	0.0000

Table 2 indicates that a fixed effect panel model is the most suitable estimation method for all three models under consideration. However, the results also reveal that each of these models has a heteroscedasticity problem, suggesting that the variance of the error term is not constant across observations. Hence, to address this issue and obtain a more efficient and robust parameter estimates, this research proposes employing WLS panel regression for models 1, 2, and 3.

Analysis

Descriptive statistics and correlation analysis

The descriptive statistics in Table 3 reveal that the average FV in this research is higher than its asset value. This suggests that the average market value of firms is higher than their asset value, meaning that the market places a premium on these firms. The average GB of 18.460 signifies a significant investment in green building. The average GR of 4.768 demonstrates a relatively high level of green revenue generation. Finally, the average EP of 44.120 suggests that the companies in the sample have made substantial efforts to reduce their emissions. The descriptive statistics for the control variables show that most firms in the sample are relatively older, with an average FA of 22.000. Additionally, these firms tend to be larger in scale, as evidenced by the average FS of 9.338. Furthermore, the sample firms also have low debt financing usage, with an average LEV of 0.260. Finally, the firms exhibit a relatively low growth rate through investments in fixed assets, with an average GRW of 0.059.

Table 3. Descriptive Statistics

Variables	Mean	Median	Standard Deviation	Minimum	Maximum
FV	1.490	0.913	2.690	0.074	89.700
FV (log)	-0.020	-0.040	0.385	-1.130	1.950
GB	18.500	0.001	35.600	0.001	96.600
GB (log)	0.413	0.000	0.795	0.000	1.990
GR	4.770	0.001	15.900	0.001	100.000
GR (Log)	0.222	0.000	0.501	0.000	2.000
EP	44.100	43.100	29.200	0.001	99.900
EP (Log)	1.450	1.640	0.562	0.000	2.000
FS	9.340	9.370	0.834	7.080	11.700
LEV	0.260	0.249	0.192	0.000	1.710
GRW	0.060	0.024	1.270	-0.143	71.400
FA	22.000	20.000	14.100	0.000	118.000
FA (log)	1.270	1.320	0.314	0.000	2.080
GDP	3.450	3.680	3.660	-9.520	9.690

Table 4. Correlation Matrix

Variables	1	2	3	4	5	6	7	8
GB (1)	1							
GR (2)	0.04364**	1						
EP (3)	0.1982***	0.1557***	1					
FS (4)	0.3548***	0.1729***	0.3437***	1				
LEV (5)	-0.0131	0.2132***	0.0698***	0.1252***	1			
GRW (6)	-0.0105	-0.0075	-0.0454**	-0.0139	-0.0144	1		
FA (7)	0.1454***	-0.0054	0.0765***	0.2122***	-0.1171***	0.0206	1	
GDP (8)	-0.028	-0.0604***	-0.0533	-0.084**	-0.1172***	0.0257	0.0656***	1
VIF	1.164	1.085	1.158	1.343	1.091	1.003	1.082	1.026

*Notes: *** sig at 1%; ** sig 5%; * sig 10%

Table 4 explains VIF values for all three independent variables (GB, GR, EP) are all below 10, suggesting that there is no multicollinearity problem between these three independent variables.

Results of Hypothesis Testing

Table 5. Hypothesis Testing

Variables	Model 1	Model 2	Model 3
const	1.8904***	2.0491***	2.411***
	(0.0279)	(0.0260)	(0.0270)
GB	0.0151***	0.0179***	0.0317***
	(0.003)	(0.0034)	(0.0025)
GR	0.0159***	0.0177***	0.0215***
	(0.004)	(0.0044)	(0.0037)
EP	0.0433***	0.0486***	0.0465***
	(0.0043)	(0.0026)	(0.0039)
FS	-0.2049***	-0.2249***	-0.2821***
	(0.0030)	(0.0033)	(0.0031)
LEV	0.3184***	0.2916***	0.2566***
	(0.0109)	(0.0115)	(0.0120)
GRW	-0.0006	-0.0104***	1.959***
	(0.0078)	(0.0022)	(0.0699)
FA	-0.1139***	-0.0781***	0.0059
	(0.0067)	(0.0061)	(0.0048)
GDP	-0.0024***	0.005***	0.0019***
	(0.0006)	(0.0004)	(0.0004)
F-test	665.9819	1156.22	5273.788
P-Value of F-Test	0	0	0
Adjusted R-Squared	0.6255	0.791263	0.959882

Notes: *** sig at 1%; ** sig 5%; * sig 10%. The standard error is written in parentheses

The test shows that H1a can be accepted because GB has a significant positive impact on FV. H1b can also be accepted as GB has a significant positive impact on FV. This explains that the greater the green building score is, the greater the firm value will be. A significant positive impact of GR on FV concludes that H2a and H2b are accepted. The greater the green revenue of a company is, the greater the firm value will be. H3a and H3b are also accepted, as proved by the significant positive impact of EP on FV. It shows that when the score for EP is high, the FV is also high.

The adjusted R-square of 62.55% in model 1 indicates that 62.55% of the variation in firm value can be elucidated by the independent and control variables included in the model. The remaining 37.45% of the variation is likely due to other factors not considered in this testing.

The research result, green building has a significant positive impact on firm value, aligns with the results of previous research (Abdullah et al., 2018; Hsieh et al., 2020; Verma et al., 2021). Investors view green and environmentally friendly buildings favourably, recognising that while there may be higher upfront costs, the benefits gained likely outweigh these initial costs. Green buildings often lead to significant energy and water savings, extending their lifespan and reducing operational costs. Aside from that, green building practices can also enhance indoor air quality, leading to increased productivity and reduced absenteeism. A forward-thinking manager who anticipates the growing importance of proactive environmental behaviour may acquire a competitive edge over the long term by investing in the necessary resources and capabilities. Moreover, such investments will enhance a

company's reputation that attracts various stakeholders. Hence, green buildings offer a combination of both short- and long-term advantages that are well perceived by investors in both the short run and long run.

The research result shows that green revenue has a significant positive impact on firm value. The results are consistent with earlier studies (Agustia et al., 2019; Asni & Agustia, 2022; Bassen et al., 2023; Kruse et al., 2024; Quaye et al., 2024), which demonstrate that investors do value companies that adopt green practices. Firms are becoming more aware of the potential benefits of investing in environmentally friendly production processes. With rising environmental awareness, consumers are willing to pay a premium for sustainable options. This led to growing demand for green products, which can help minimise the environmental damage caused by traditional business processes. By investing in green products, firms can be positioned at the forefront of technological advancements and follow the growing trend of sustainability. Despite the potential for higher costs of products, the growing demand for sustainable products presents opportunities for firms to differentiate themselves in the marketplace. By offering environmentally friendly options, firms can appeal to a specific group of consumers who favour sustainable products. This differentiation strategy may lead to a higher profitability than a low-cost leadership approach. Hence, resulting in investors to perceive firms with green revenue positively in short and long term.

Emission reduction performance has a significant positive impact on firm value. The research findings are consistent with the previous research (Clarkson et al., 2015; Delmas et al., 2015; Benkraiem et al., 2022; Perdichizzi et al., 2024). While reducing emissions may result in a higher operational costs, the benefits often outweigh these costs. Investors increasingly value firms that prioritise environmental sustainability, as demonstrated by their positive response to emission-reduction efforts. These efforts can help mitigate the risks of fines and penalties while attracting environmentally conscious investors. Although regulatory focus on environmental issues may vary, the increasing global awareness of the climate crisis has made sustainability a more important consideration for investors. By reducing their emission performance, firms can also enhance their image as a sustainable company, which can lead to a variety of benefits, such as attracting environmentally conscious customers and investors, boosting revenue and market shares. As a result, by investing in emission reduction, investors perceive firms positively both in the short-term and long-term.

The research result shows that the lagged effect of green buildings, green revenues and reduction performance on firm value. Previous research have not specifically addressed the long-term impact of green buildings, green revenues, and emission reduction. However, there is a theoretical explanation that could underpin this research's long-term findings. The significant positive impacts in periods lag1 and lag2 confirm that the benefits of sustainability investments are lagged. This finding strongly supports stakeholder theory and the Resource-Based View (RBV).

Green investments take time to transform from costs to competitive advantages. Within one to two years, companies begin to realize financial benefits, such as operational cost savings from green buildings, particularly from energy efficiency, as well as increased market

share from green revenues as consumer awareness grows (Devine & Yönder, 2023; Mingyi et al., 2024). Furthermore, it takes time to build reputation and trust with stakeholders (Bodhanwala & Bodhanwala, 2019); consistent commitment demonstrates that a company's actions are not greenwashing, but rather part of its core strategy.

Specifically, the stronger impact of emission reduction in future periods indicates that the market is beginning to reward companies that are proactive in risk management (Homroy, 2023). In the ASEAN region, where environmental regulations and potential carbon taxes are evolving, today's emission reduction efforts signal a company's future preparedness. Companies that invest in emission reduction effectively future-proof themselves from regulatory and energy transition risks, a move appreciated by long-term investors (Bolton & Kacperczyk, 2021).

Robustness Test

Table 6. Robustness Test Model 1 (DV = FVt)

Variables	Indonesia	Malaysia	Singapore	Philippines	Thailand
const	2.0971***	1.9170***	2.7412***	2.9040***	1.8524***
	(0.1375)	(0.0553)	(0.0631)	(0.2518)	(0.0679)
GB	-0.0108	0.0232***	0.0150***	0.0008	0.0749***
	(0.0123)	(0.0068)	(0.0034)	(0.0080)	(0.0077)
GR	-0.0214	0.0392***	0.0125**	-0.0585***	0.0419***
	(0.0188)	(0.0104)	(0.0052)	(0.0155)	(0.0048)
EP	0.0145	0.1322***	0.0145	0.0174	-0.0159***
	(0.0196)	(0.0088)	(0.0093)	(0.0167)	(0.0059)
FS	-0.2382***	-0.2422***	-0.2980***	-0.3177***	-0.1884***
	(0.0139)	(0.0069)	(0.0057)	(0.0270)	(0.0074)
LEV	0.0129	0.3576***	0.2284***	0.8833***	0.2415***
	(0.0453)	(0.0248)	(0.0271)	(0.0464)	(0.0221)
GRW	1.9583***	-0.0061	1.2263***	0.7464***	1.8130***
	(0.1811)	(0.0060)	(0.1154)	(0.2180)	(0.1237)
FA	0.0640**	-0.0430***	-0.0600***	-0.1230***	-0.1758***
	(0.0298)	(0.0146)	(0.0100)	(0.0363)	(0.0100)
GDP	-0.0049	-0.0054***	0.0006	0.0020	0.0024**
	(0.0033)	(0.0014)	(0.0007)	(0.0013)	(0.0012)
F-test	68.62274	197.0004	482.4422	185.8049	200.7781
P-Value of F-Test	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-Squared	0.535635	0.582035	0.877836	0.850930	0.668930

Notes: *** sig at 1%; ** sig 5%; * sig 10%. The standard error is written in the parentheses

Table 7. Robustness Test Model 2 (DV = FVt+1)

Variables	Indonesia	Malaysia	Singapore	Philippines	Thailand
const	2.1456***	1.9982***	2.7483***	2.7069***	2.0509***
	(0.1134)	(0.0521)	(0.0578)	(0.2708)	(0.0657)
GB	-0.0074	0.0104	0.0146***	0.0006	0.0837***
	(0.0126)	(0.0067)	(0.0039)	(0.0082)	(0.0090)
GR	-0.0032	0.0145*	0.0183***	-0.0554***	0.0379***
	(0.0203)	(0.0079)	(0.0049)	(0.0156)	(0.0060)
EP	0.0166	0.1791***	0.0113	0.0278*	-0.0133**
	(0.0187)	(0.0050)	(0.0096)	(0.0158)	(0.0058)
FS	-0.2484***	-0.2567***	-0.2970***	-0.3045***	-0.2145***
	(0.0125)	(0.0056)	(0.0063)	(0.0289)	(0.0074)
LEV	-0.0511	0.3927***	0.2177***	0.8400***	0.2357***
	(0.0446)	(0.0226)	(0.0273)	(0.0487)	(0.0193)
GRW	1.6677***	-0.0072***	1.0899***	0.6796***	1.989***
	(0.1609)	(0.0009)	(0.1064)	(0.2041)	(0.1323)
FA	0.0945***	-0.0195	-0.0658***	-0.0797**	-0.1417***
	(0.0236)	(0.0152)	(0.0161)	(0.0368)	(0.0085)
GDP	0.0012	-0.0092***	-0.0008	0.0012	-5.1923
	(0.0031)	(0.0011)	(0.0006)	(0.0012)	(0.0011)
F-test	75.05761	720.9814	474.2790	129.5338	226.3558
P-Value of F-Test	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-Squared	0.608613	0.881945	0.894196	0.823756	0.745950

Notes: *** sig at 1%; ** sig 5%; * sig 10%. The standard error is written in the parentheses

To gain a deeper understanding and more precise results, this research also tested each model individually for each country, as presented in Table 6, 7, and 8. The findings suggest that there are variations in the impact of environmental performance on firm value across the five nations. Interesting results are found in the Philippines, where GB are not well perceived by investors, even in the long term. It suggests that the initial cost and misconceptions about the lack of immediate financial returns are a deal-breaker for investors. Investors in Thailand seem to appreciate GB and GR, but they do not appear to value EP. In contrast, GB and GR are not valued as much as EP in Indonesia. However, the findings in Malaysia and Singapore align with their commitment to sustainability and climate change.

Table 8. Robustness Test Model 3 (DV = FVt+2)

Variables	Indonesia	Malaysia	Singapore	Philippines	Thailand
const	2.5537***	1.8906***	2.6093***	2.8991***	2.5761***
	(0.1344)	(0.0669)	(0.0624)	(0.2083)	(0.0883)
GB	0.0176	0.0043	0.0169***	-0.0078	0.0882***
	(0.0142)	(0.0084)	(0.0047)	(0.0093)	(0.0088)
GR	0.0193	0.0363**	0.0117	-0.0721***	0.0418***
	(0.0235)	(0.0148)	(0.0073)	(0.0145)	(0.0078)
EP	0.0391**	0.1789***	0.0114	0.0293**	0.0013
	(0.0181)	(0.0114)	(0.0108)	(0.0127)	(0.0063)
FS	-0.3017***	-0.2692***	-0.2876***	-0.3297***	-0.2750***
	(0.0138)	(0.0078)	(0.0066)	(0.0212)	(0.0102)
LEV	-0.1401***	0.2543***	0.2472***	0.8371***	0.2018***
	(0.0422)	(0.0420)	(0.0319)	(0.0415)	(0.0258)
GRW	1.1825***	3.2504***	0.8725***	0.5542***	2.1666***
	(0.1829)	(0.1825)	(0.0757)	(0.2047)	(0.1234)
FA	0.1546***	0.0705***	-0.0386**	-0.0294	-0.1148***
	(0.0416)	(0.0168)	(0.0176)	(0.0311)	(0.0126)
GDP	0.0067**	0.0071***	0.0006	0.0019	0.0025**
	(0.0028)	(0.0015)	(0.0007)	(0.0012)	(0.0010)
F-test	77.59853	288.7201	505.5895	150.1796	275.9197
P-Value of F-Test	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-Squared	0.673550	0.829236	0.917912	0.867048	0.832032

Notes: *** sig at 1%; ** sig 5%; * sig 10%. The standard error is written in parentheses

The ASEAN context reinforces the significance of these findings. In a region comprised of many emerging economies, the historical focus has often been on rapid economic growth. ASEAN markets have proven capable of identifying and rewarding companies that integrate sustainability as long-term value creators. The finding aligns with the argument that the true impact of environmental practices on financial performance often only materializes over the long term. This research confirms that for managers in ASEAN, green investments are not merely costs, but strategic investments whose value creation will be fully realized over a medium-to-long term horizon.

Several factors can explain why results across countries differ. Each country has its own economic development pace, regulations, culture, preferences, and technological development. Moreover, each country differs in the availability, affordability, and advancement of technological development. As a result, developing countries will focus on achieving stability rather than trying to achieve sustainable practices. Values and beliefs held by the society in each country will also affect the expectations of their stakeholders. Hence, the demand for environmental performance is also influenced by whether buyers are open to paying more for green products and services. A crucial factor to highlight is the role of regulation in implementing environmental practices. The degree to which green practices are

mandatory or voluntary varies significantly across countries. Moreover, the incentives offered for rewarding sustainability depend on the regulatory environment and the importance placed on these issues.

The findings regarding the significant time lag between the implementation of green initiatives (green buildings, green revenues, and emission reduction) and their realization in terms of company value, provide insights that can motivate further research. The ability to generate green revenues reflects a company's innovation capabilities and in-depth market understanding of consumer demand for green products. Research on consumer demand for green products and on corporate innovation to increase green revenues could be the subject of further research. Furthermore, the adoption of IFRS S1 (General Requirements for Sustainability-Related Financial Disclosures) and IFRS S2 (Climate-Related Disclosures) in the ASEAN region is crucial. This research covers elements of S2, namely: Greenhouse Gas Emissions (directly related to the emission reduction variable); Capital Deployment (investment in green buildings); and Climate-Related Opportunities (explicitly requiring disclosure of revenue from low-carbon products or services, which is equivalent to the green revenue variable). The findings predict that the adoption of IFRS S1 and S2 in ASEAN could act as a catalyst. This standard force companies to articulate how investments in emission reduction, green buildings, and green revenue innovations today will generate cost savings and increased company value in the future. When this information is transparent and credible, information asymmetry will be reduced. As a result, the market can assess these long-term benefits earlier.

Conclusions

Tackling climate change is becoming increasingly urgent, yet the understanding of how green investments affect firm value remains understudied. This research investigates the impact of corporate investment in green building, a company's green revenue percentage, and emission reduction performance on firm value in five ASEAN countries, namely, Indonesia, Malaysia, Singapore, Thailand, and the Philippines, during the period of 2015-2023. The analysis suggests that investors value companies adopting green and environmental practices. Green buildings are valued by investors for their potential to save costs through energy efficiency and for their enhanced reputation. While firms investing in environmentally friendly production processes to make green products can benefit from increased demand, enhanced reputation, and long-term sustainability. Reducing emissions can also show that firms are committed to environmental sustainability. This is beneficial for attracting stakeholders and mitigating risks, despite potential increases in trade-offs.

This research contributes by providing empirical evidence supporting the applicability of legitimacy, signalling, and stakeholder theory. Investment in environmental conservation is shown to enhance stakeholders' trust, including buyers, supporters, the general public, and regulators. The legitimacy from these stakeholders has been proven to gain positive reactions from stock market investors, thereby increasing the company's market value. Aligning with

the signalling theory, investing in and enhancing environmental performance can also send a positive signal to stakeholders, potentially leading to increased firm value.

This research provides insights for management and business practitioners regarding the benefits of green investments. The findings raise awareness and justify environmentally friendly business investments as long-term investments. This research also provides evidence that environmental efforts offer advantages over both short and long-term horizons. Investment in environmentally friendly business operations will enhance companies' future competitive advantage. In realising this, the role of government support is a crucial factor for businesses to appreciate companies that have committed to environmental stewardship. Management should strategically prioritise green activities rather than treating them as token efforts. Given the time required to increase awareness of green activities, empirical research, and continuous professional development programs in sustainability and firm valuation are essential.

It is important to note that green revenues and non-green revenues are not currently disclosed separately in the financial statements. Governors and professional bodies can play an important role in establishing guidelines and standards for disclosing green elements on financial statements. These standards ensure consistency, transparency, and compatibility by providing a framework that can be used globally. As the ISSB does not have the authority to mandate the application of IFRS S1 and S2, the responsibility of regulators is to determine the mandatory adoption of these guidelines into financial reporting frameworks and regulatory requirements. This research highlights the importance of government policies in promoting green activities, supporting climate change mitigation, and developing plans. It also emphasizes their role in carrying out the "10-Year Sustainable Consumption and Production" framework, which involves all nations, with developed countries leading the way, acknowledging the development and capabilities of developing nations. It further calls for companies, particularly large and multinational ones, to embrace sustainable practices and incorporate sustainability information into their reporting processes. Even if green initiatives are not currently mandatory, governments can still play a critical role in supporting and incentivising these efforts, as well as prioritising and strengthening the implementation of carbon taxes to penalise high-emitting firms, particularly in developing countries. By addressing these research gaps and implementing effective policies, this study can gain a more comprehensive understanding of the relationship between green performance and firm value.

Despite having immense policy implications, this research is limited in its focus on green activity indicators. Additional indicators could be incorporated to provide a more comprehensive assessment of environmental performance. This research also focuses on five ASEAN countries. Future research could delve deeper into individual countries and incorporate additional variables specific to each country's characteristics. Moreover, expanding the research to include different countries would provide a broader perspective on this topic.

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