

Does an environmentally minded board of directors affect green banking disclosure?

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Abstract

The aim of this study is to examine the impact of an environmentally minded board of directors on green banking disclosure in Southeast Asian countries. It covers banking companies that published annual reports during the period 2016-2022. This study employs multiple linear regression to test the hypothesis. This study found that companies with high environmentally minded board members have high green banking disclosure. Additional analysis found that the use of various control variables showed consistency in the effect of the independent variables on the dependent variable. The implications of the results of this research are that regulators can formulate policies that direct companies to appoint environmentally minded members to their boards of directors. Companies that have a commitment to green bank disclosure must consider and prioritize support for the existence of environmental commissioners both within the scope of management and governance. This study explains green banking disclosure using specific green-related variables, namely the environmentally minded board of directors. Some previous studies in predicting green banking disclosure were less specific in choosing independent variables or using general variables.

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1. Introduction

The average green banking score of banks in the Southeast Asian region is lower than in other regions, such as Japan, let alone the United States [1], [2]. Green banking disclosure is part of sustainable banking [3], [4], [5], which has become a global issue, and the United States is one of the countries that has regulated it. Another thing to note is that sustainable development is closely related to the banking and finance sector [6], [7]. Based on this explanation, it can be understood that green banking disclosure, sustainable banking, and sustainable development are interrelated slices.

Conceptually, green banking disclosure can be classified in the accounting scope. Referring to the Accounting Conceptual Framework, accounting consists of 3 layers: bottom, middle, and top [8]. The bottom layer consists of objectives, the middle layer consists of elements and characteristics, and the middle layer of constraints,

principles, and assumptions. The top layer includes the concepts of recognition, measurement, and financial statement presentation, which serve as the main guidelines in accounting reporting [9]. Specifically, in the principles, there is a disclosure.

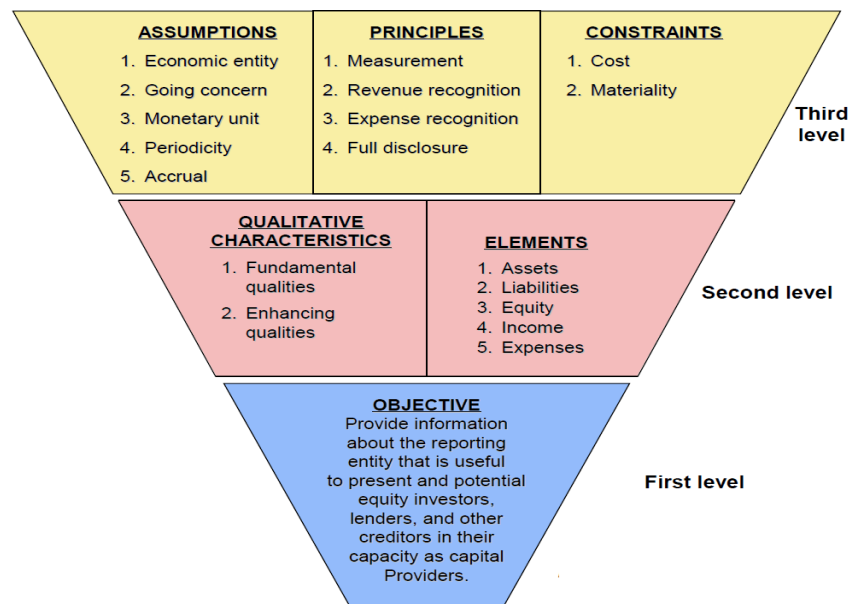


Figure 1. Accounting conceptual framework

Research on green banking in Southeast Asia is important as global banks are reported to play a major role in forest destruction in Southeast Asia [2], [10]. Pollution, as an indirect impact of the banking industry, also occurs in Southeast Asia [11], [12]. At the same time, programs to improve environmental risk management and develop green finance are being implemented [13], [14]. Based on these various reasons, research on green banking disclosure in the Southeast Asian region is very important to conduct.

Many previous studies on disclosure have used board diversity. However, the diversity of the board is general and does not specifically lead to the type of disclosure as the dependent variable. The following is the previous research in question [15], which conducted a study focusing on the dimensions of female board directors. A qualitative approach was applied to obtain the views and perceptions of the respondents to gain insights into the market.

Using a qualitative approach, meticulous interviews with 42 board members were conducted, guided by resilience theory. Likewise, research on companies listed on The Financial Times Stock Exchange (FTSE) London uses a total sample of 350 companies listed on the FTSE in the context of this research, and director diversity uses the dimensions of board gender diversity [16]. Several other studies have examined board gender diversity [17], [18], [19], [20].

This study has two novelties: the use of a new index to measure the dependent variable, and the use of specific variables of the environmentally minded board directors as explanatory factors. The index, called the green banking disclosure index, is constructed by combining, sorting, and compiling green banking disclosure items sourced from laws in the Southeast Asian region, previous research, and other indices that have green content. The supervisory board of directors is one of the board's diverse members, selected because it conceptually and logically has a specific influence on the green banking disclosure. Thus, green banking is an overarching component that has an influence on board diversity.

The purpose of this study is to provide empirical evidence about the effect of environmentally minded board directors on green banking disclosure. The analysis will estimate the magnitude of the coefficient and importance of this variable compared to the control variables commonly used in previous studies. The implications of the results of this study are practical, strategic and academic. Practical implications are intended for the practice of governance itself at the corporate level, suggesting that investors can prioritize environmentally minded board

directors when shaping the board structure through the general meeting of shareholders. Strategically, regulators can formulate regulations that provide space for the existence of environmentally minded board directors in the corporate boards, promoting their role in driving sustainable governance policies.

Based on the findings, this study highlights the significant role of environmentally minded board directors in influencing green banking disclosure. Empirical evidence underscores their importance relative to conventional control variables, reinforcing their strategic value in governance practices. The implications extend across practical, strategic, and academic domains—informing corporate decision-making, regulatory frameworks, and scholarly discourse. By prioritizing environmentally conscious leadership, both investors and policymakers can contribute to sustainable banking practices, ensuring long-term environmental accountability within the financial sector.

2. Literature review

2.1. Theory and concept

The relationship between the principal and agent can be explained by agency theory. The theory explains that the principal has different interests. Principal, as the owner of the company, wants a return that is as large as possible on the investment that has been made. On the other hand, the agent wants an easy job with as much income as possible. This tendency can stimulate the agent to act outside the principal's interests. To minimize the actions of agents that may harm the principal, a governance system is needed to direct and control agents. In this context, the principal appoints a board of directors to represent the, with the task of directing and controlling the agent [21]. According to the theoretical framework, the board of directors, with various diversifications and variants, influences the actions taken by agents, including disclosure.

However, not all dimensions of the board of directors can be causally related to the agent's activity and in the context of this research, green banking disclosure. It must be determined logically and specifically which dimensions of the board of directors that can influence the research theme. This study focuses on the green banking disclosure, and the board of directors dimension deemed logical and specific is the inclusion of environmentally friendly members [22].

Based on the agency theory, the governance structure plays a crucial role in directing and controlling agents to align with the principal's interests. While various dimensions of board composition can influence disclosure practices, this study logically identifies environmentally minded board directors as a key factor in the green banking disclosure. Their presence strengthens corporate sustainability efforts by encouraging transparency and responsible financial practices, ultimately fostering long-term environmental and economic benefits.

2.2. Previous research and hypothesis

Several studies discussing the theme of disclosure in general have been conducted by previous researchers. Likewise, board diversification has been widely used by researchers to explain themes such as disclosure, financial performance, and others. The next paragraphs present the relevant previous studies.

The study used qualitative research, conducting interviews with 42 board members guided by resilience theory [15]. The research focused on the female board director dimension, and the results showed that female board directors experienced gender discrimination. In the early stages, the strategies they used to deal with this discrimination tended to involve avoidance, denial, and disengagement from many activities. In the next stage, after gaining experience and confidence, they used active strategies by seeking and expanding support. The upper echelon theory and gender socialization theory are used as the basis to combine the research [16]. The results provide empirical evidence that corporate social responsibility (CSR) strategies can mediate the effect of gender diversity on environmental innovation. In the context of this research, director diversity is measured by using the dimension of board gender diversity. The research was conducted after a campaign by the big three investors in America to increase gender diversity on corporate boards by up to 2.5 times [17]. The results showed that the number of women on boards of directors was not as high as expected, even after the campaign. However,

the campaign did lead to changes, making companies easier to monitor on a larger scale. The study examined board directors' diversity, using the gender board diversity dimension to explain sustainable performance, guided by gender social role theory and upper echelon theory [18]. The sample consisted of 205 companies listed on Nordic exchanges during the period from 2002 to 2022. The results showed that board diversity, with the dimension of gender board diversity, has a significant positive effect on environmental performance.

The following study examines the proportion of female managers, using female board directors as an explanatory variable [19]. The research was conducted in the UK from 1999 to 2019. Multiple theories were used to explain causality in the study, including critical mass theory and agency theory. The results showed that the presence of women affects the number of women in the managerial ranks. Another study examined the effectiveness of both the number of independent female directors and board independence, using the predictor of board diversity. The sample consisted of 82,613 directors from 10,313 companies and 41 countries. The results showed that board diversity decreased the number of independent female directors and board independence [20].

Research using board diversity is also used to explain the phenomenon of climate change exposure at the company level [23]. The sample included 14,685 from 2,469 companies and 63 countries, with the result that boards with more gender diversity had lower climate change exposure. Using a sample of 1,500 companies listed on Standard Poor's from 2015 to 2019, the study found that a high presence of women on the board of directors positively influences corporate carbon commitment [24].

Another example is the research conducted on financial performance using board diversity as one of the explanatory factors [25]. The results showed that board diversity and firm performance have an inverted U-shaped non-linear relationship: firm performance increases when board diversity is more diverse but decreases when board diversity reaches a turning point. Another study examined biodiversity initiative disclosure, using board diversity as an explanatory factor. Resource dependency theory and upper echelon theory provided the theoretical basis for the study. The observations included 7,890 non-financial companies across 13 European countries from 2002 to 2021. The results showed that board diversity has a positive effect on biodiversity initiative disclosure [26].

Research with board diversity, using the independent variables of board gender diversity and environmental committee, is used to explain corporate environmental disclosure [27]. The research was conducted from 2010 to 2019, involving 113 companies with a total of 1,123 observations. The results showed that board diversity has a positive effect on corporate environmental disclosure, as long as the causality depends on the existence of an environmental committee. Climate change exposure research at the firm level is also conducted using board gender diversity as an explanatory variable [28]. The study was conducted in 63 countries from 2000 to 2021 and involved a total of 14,685 observations. The results showed that companies with diverse boards of directors have low climate change exposure.

Research themes that use board diversity, especially gender, are also used to examine the performance of family firms in Spain [29]. The study was conducted from 2003 to 2020 and involved a total number of 1,134 observations. The results showed that a non-family female board of directors effectively improves company performance. A study conducted from 2006 to 2021 across 13 European countries examined clean energy adoption, with director diversity, particularly gender, as the explanatory variable [30]. During this period, the study included a total of 2,395 company annual report observations, using gender socialization theory and diversity theory. The results of the analysis provide empirical evidence that companies with at least one female board member use clean energy more extensively.

This study examines the disclosure of corporate social responsibility, using CEO characteristic diversity as the explanatory variable [31]. The Generalized method of moments (GMM) was used as an analytical tool, involving 322 companies from 2012 to 2019, with a total of 1,809 total observations. The results of the analysis provide evidence that highly narcissistic CEOs are more likely to disclose corporate social responsibility.

Corporate governance and social performance have also been studied using the explanatory variables of board gender diversity and board cultural diversity [32]. A total of 373 companies from 2010 to 2019 were involved in the study and examined using the generalized method moments (GMM) model. The results showed that board diversity in the form of gender diversity and board cultural diversity has a positive effect on corporate governance and social performance.

The public has shown interest in board diversity, including gender, ethnic, and other forms of diversity [33]. The results showed an increase in board diversity, including gender, over the observation period in companies that have a culture that supports diversity. The research provides evidence that public attention is driven primarily by internal top management initiatives rather than by external pressures or pro-diversity institutional investors. Research using the literature review method has been conducted to map the theme of gender diversity and corporate sustainability [34]. The study showed that European countries have relatively high gender representation. In addition, the United States produced the largest number of documents on the topic, while Australia accounted for the highest number of citations. In the GDCS domain, the study states that the opportunity for future research is still very wide open, and many dimensions can be explored.

Research on financial and non-financial performance has also been carried out using board diversity, particularly gender [35]. A total of 40 observations were used to reflect the situation of the object under study: universities in Italy. The results showed that board diversity, especially gender, leads to more favorable financial performance. However, female directors must go through a critical period first. The factors that influence the presence of women on boards of directors were examined in the study that involved 100 world bear companies according to the 2019 Fortune Global 500 ranking. The results showed that factors affecting the presence of women on boards of directors include experience, expertise, and director network or company visibility [36]. Another researcher examined company performance using board diversity as an explanatory variable, consisting of board gender diversity, board gender independence, and board size. The study involved 204 companies listed on the Bombay Stock Exchange with a total of 1,071 observations [37]. The results showed that greater gender diversity can reduce the negative impact of CEO duality and financial performance.

Board diversity has also been used as an explanatory factor for the Environment, Social, and Governance (ESG) Separation phenomenon [38]. The large international sample consisted of 1,876 companies across 39 countries. Using the guidance of the upper echelon theory and the gender socialization theory, the research results showed that board diversity can improve ESG practices and reduce managerial opportunism. Board diversity, together with environmental committee moderation, is used as an explanatory variable to examine corporate environmental disclosure (CED). The sample consisted of 1,130 observations from 113 companies listed across five sub-Saharan Africa (SSA) stock markets from 2010 to 2019 [27]. The results showed that CED in sub-Saharan Africa (SSA) is still very low compared to more developed countries. Other results also showed that board diversity, especially gender, has a positive effect on CED, which depends on the environmental committee.

One research examined risk disclosure through Internet reporting using governance mechanisms, particularly board diversity as an explanatory factor. The sample included 95 company reports from 24 countries during 2018 [39]. The results indicated that diversity on the board of commissioners positively drives risk disclosure through Internet reporting. Exploratory research has also highlighted the importance of board diversity in the governance perspective. Most of the literature focuses on demographic diversity, including gender, but other forms identified include social capital, political capital, and human capital [40]. Another study examined corporate social responsibility (CSR) disclosure using board diversity as an explanatory variable. Variations in board diversity include education, gender, nationality and royalty [41]. The results showed that board diversity has a positive causality on CSR disclosure.

Another research that examined firm performance using board diversity as an explanatory variable was conducted [42]. The sample comprised of 200 samples sourced from 40 specialized companies from the Indonesian stock exchange. The results showed that the diversity of the board of directors in terms of gender

has no effect on company performance. The company's performance was studied using board diversity with female attributes. Another study investigated company performance using board diversity with female attributes, based on data from 100 companies listed on the UK FTSE from 2005 to 2016 [43]. The results showed that the diversity of the board of commissioners with female attributes has a positive effect on financial performance. The financial performance of family companies is examined using board diversity as an explanatory variable, based on the sample of 1,134 companies listed on the Spanish stock exchange during the observation period from 2003 to 2020 [44]. The results showed that non-family board diversity is an effective way to improve company performance.

Board diversity, using gender as a proxy, is used to explain corporate social responsibility disclosure. Sourced from data on the stock exchange in Kazakhstan during the observation period from 2010 to 2016, a total sample number of 247 was obtained [45]. The results showed that board diversity has a positive effect on corporate social responsibility disclosure. Another examination was about corporate social and environmental disclosure in Pakistan from 2013 to 2015 [46]. The diversity of the board of directors is one of the factors used to explain the theme. The results showed that board diversity affects corporate social and environmental disclosure. Increased stock price informativeness was also investigated using the explanatory variable of board diversity [47]. The sample consisted of 5,021 observation, and the research results provide empirical evidence that board diversity increases stock price informativeness.

Based on previous research, it can be concluded that the diversity of the board of commissioners can affect disclosure. In the context of green banking disclosure, this diversity is represented specifically by environmentally minded members of the board of commissioners. Based on theory and prior studies, the hypothesis is formulated as follows:

H_a : Environmentally minded members of the board of directors have a positive effect on green banking disclosure.

3. Research method

3.1. Development of green banking disclosure index

The green banking disclosure index is created through several stages that must be carried out during the research process. These stages, in detail, include: 1) determining the definition and keywords of the topic to be indexed [48], [49]; 2) examining the defined keywords [50], [51]; 3) making adjustments based on international standards [52], [53], [54]; and 4) creating a new index [55], [56], [57], [58]. Figure 2 provides a demonstration that clarifies the stages involved in creating the index.

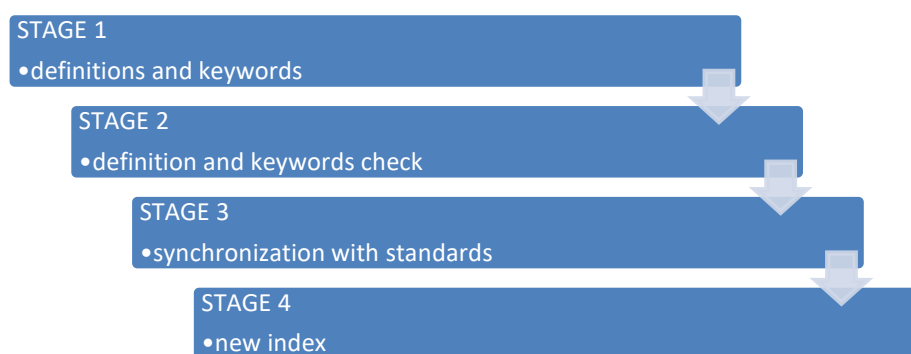


Figure 2. The stages of creating an index

The green banking disclosure index was successfully developed by researchers based on the stages outlined above. The index consists of 32 disclosure items that must be disclosed to meet full disclosure requirements. The first sixteen disclosure items consist of: 1) environmental conservation policy; 2) reduction of paper waste: e-mail, duplex printing, paper recycling; 3) use of online/mobile banking, SMS banking, and ATM banking;

4) use of information technology for product introduction; 5) use of e-banking transparency features; 6) use of information and communication technology for complaint handling/resolution services; 7) use of environmentally friendly materials; 8) energy conservation in business operations; 9) steps to combat climate change and reduce emissions; 10) introduction of green products; 11) plans and/or implementation of clients' business impact on the environment; 12) plans and/or implementation of environmental awareness seminars/workshops; 13) awards received by the bank for environmentally friendly activities; 14) awards received by clients for environmentally friendly activities; 15) sponsoring activities that are in harmony with the environment; 16) green branch arrangements.

Next are listed disclosure items from seventeen to thirty-two which include: 17) internalization of green marketing; 18) budget for green banking practices; 19) actual expenditure on green banking activities; 20) separate reporting specifically for green banking; 21) general statement on climate change and global warming; 22) mention of emissions of carbon footprint; 23) climate change responsibility; 24) environmentally friendly banking products; 25) creation of social warnings; 26) granting of credit accompanied by environmental permit requirements; 27) Waste processing, utilization, and recycling by management; 28) providing supporting infrastructure for energy savings; 29) initiating greenhouse gas emission mitigation; 30) educating customers on online transactions; 31) guidelines/notices/regulations to minimize environmental impact; and 32) green partnerships. The complete green banking disclosure can be found in the attached appendix.

3.2. Data and sample

This study uses bank annual report data in the Southeast Asia region for the observation period 2016 - 2021 with a total population of 1,212. This period was selected because regulations on green banking were simultaneously issued in Southeast Asia during that time frame to ensure that all countries in the region had a balanced response to the issue of green banking. Using the Slovin formula, the minimum sample was calculated to be 302; however, this study used a sample of 323, which exceeds minimum requirements. Table 1 provides a summary of the sample distribution used in this study.

Table 1. Sample selection and distribution

Description	Total
Number of published reports 2017-2022	1,212
Missing data	832
Sample used	323

3.3. Measurement

Table 2 shows the size of the variables involved in this research model. Green banking disclosure is measured using a 32-item index that has been developed. Environmentally minded board members are measured as the proportion of environmentally minded board members divided by total board members, where environmental insights are identified based on formal education, experience, environmental certification as well as affiliation of environmental organizations. Firm size is measured using the natural logarithm of total assets, and financial performance is measured using total profit divided by total assets. The governance system and legal system are measured using dummies.

Table 2. Variable measurement

Variable	Acronym	Measurement
Green banking disclosure	GBD	32 index items of green banking disclosure
Environmentally minded-board directors	EMB	Proportion of environmentally minded board members (EMB) divided by total board members, where the EMB criteria are based on the: formal education, experience,

Variable	Acronym	Measurement
		environmental certification as well as affiliation of environmental organizations
Firm Size	Size	Natural logarithm of total assets
Performance	FP	Total profit / total assets
Governance system	Gov sys	Dummy, 1 for two-tier, 0 for one-tier
Law system	Law sys	Dummy, 1 for civil law, 0 for command law

Regression model

$Y = a + \text{Size} + \text{Perform} + \text{Govsys} + \text{Lawsys} + e$	(model I)
$Y = a + bx_1 + e$	(model II)
$Y = a + bx_1 + \text{Size} + e$	(model III)
$Y = a + bx_1 + \text{Perform} + e$	(model IV)
$Y = a + bx_1 + \text{Govsys} + e$	(model V)
$Y = a + bx_1 + \text{Lawsys} + e$	(model VI)
$Y = a + bx_1 + \text{Size} + \text{Perform} + \text{Govsys} + \text{Lawsys} + e$	(model VI)

Description:

a	: constant
X_1	: environmentally minded board directors (EMB)
Size	: size
Performance	: financial performance
Gov sys	: governance system
Law sys	: law system

4. Results and discussion

4.1. Descriptive statistics

Table 3 is a descriptive statistical output about the variables involved in this research model, consisting of green banking disclosure (GBD) as the dependent variable, environmentally minded board of directors as the independent variable, as well as several control variables, including size, performance, governance system, and law system. Based on the output, the mean of each variable is smaller than its corresponding standard deviation. This suggests that the data distribution in this study is normal.

Table 3. Descriptive statistics

Variable	Obs.	Mean	Std. dev.	Min.	Max.
GBD (Y)	323	0.418150	0.152201	0.125	0.65625
EMB (X1)	323	0.147833	0.069842	0.04	0.5
Size (Control)	323	0.498452	0.500773	0	1
Performance (control)	323	0.371517	0.483960	0	1
Governance system (control)	323	0.356037	0.479569	0	1
Law system (control)	323	0.504644	0.500754	0	1

Based on Table 3, the mean of the green banking disclosure (GBD) variable, that is the dependent variable, is equal to 0.418, which is below the maximum value of 0.50, representing 100%. The results of this statistical output show support for the phenomenon conveyed in the introduction, which states that the average green banking score of banks in the Southeast Asian region is lower than in other regions, such as Japan, let alone the United States [1], [2].

4.2. Matrix correlation

Table 4 presents the correlation table using Pearson correlation. Based on this table, it can be observed that there is no correlation between variables that exceed 0.80. This shows that there is no multicollinearity in all variables used, both independent and control variables. The highest correlation of 0.632 occurs between the independent variable, environmentally minded board, and the green banking disclosure variable. The lowest correlation of 0.015 occurred between the law system variable and the green banking disclosure.

Table 4. Pearson correlation between independent variables

Variable	GBD	EMB	Size	Perform	Gov sys	Law sys
GBD (Y)	1.000					
EMB (X1)	0.632	1.000				
Size (control)	0.044	0.135	1.000			
Performance (control)	-0.249	-0.057	-0.549	1.000		
Governance system (control)	0.099	0.054	-0.095	-0.010	1.000	
Law system (control)	0.015	0.088	0.108	0.185	-0.751	1.000

4.3. Main result

Table 5 is a basic model that demonstrates the causal relationship between the dependent variable and all control variables without the independent variable. This model is intended to determine the strength of the model using the Adjusted R square value before the main independent variable is entered. Furthermore, the Adjusted R square value in this section will be compared with the adjusted R square value with the model after the main independent variable is entered to see the increase or decrease and the amount of change. The test results show that the Adjusted R square in this model is 0.129.

Table 5. Basic model regression

GBD (Y)	Coef.	Std. Err.	t	P>t
Size (control)	(0.06)	0.02	(3.04)	0.003 ****
Performance (control)	(0.13)	0.02	(6.37)	0.000 ****
Governance system (control)	0.12	0.03	4.60	0.000 ****
Law system (control)	0.12	0.03	4.67	0.000 ****
_cons	0.40	0.02	16.85	0.000 ****
Number of observations	=	323		
F (4, 318)	=	12.940		
Prob > F	=	0.000		
R-squared	=	0.140		
Adj R-squared	=	0.129		

Significant Level: (****) $p < 1\%$, (***) $p < 5\%$, (*) $p < 10\%$

Table 6 represents the main regression between green banking disclosure as the dependent variable with environmentally minded board directors (EMB) as the independent variable, as well as several independent variables, including size, performance, governance system, and law system. The test results show an adjusted R square value of 0.489. When compared with the adjusted R square value in Table 3 of 0.129, it can be observed

that there is a significant increase in value. This shows how meaningful the position of environmentally minded board directors is as a variable that explains the theme of green banking disclosure.

Table 6. Main model regression

GBD (Y)	Coef.	Std. err.	t	P>t	
EMB (X1)	1.342	0.08955	14.98	0.000	****
Size (control)	-0.078	0.01514	-5.16	0.000	****
Performance (control)	-0.123	0.01613	-7.61	0.000	****
Governance system (control)	0.061	0.02004	3.02	0.003	****
Law system (control)	0.062	0.02006	3.09	0.002	****
_cons	0.252	0.02037	12.35	0.000	****
Number of observations	=	323			
F (5, 317)	=	62.540			
Prob > F	=	0.000			
R-squared	=	0.497			
Adj R-squared	=	0.489			

Significant Level: (****) $p < 1\%$, (***) $p < 5\%$, (*) $p < 10\%$

Empirical evidence of test results also shows that the environmentally minded Board (EMB) variable has a positive coefficient of 1.342 with a convincing significance of 0.000. This illustrates that any increase in environmentally minded board directors will be followed by an increase in the green banking disclosure. The control size variable is significant at the 5% level but has a coefficient of -0.078. This means that an increase in size will be followed by a decrease in the green banking disclosure. Similarly, the performance control variable is significant at the 5% level but has a negative coefficient of -0.0123, which indicates that any increase in performance will be followed by a decrease in the green banking disclosure. At the same time, the two state-level control variables, including the governance system and law system, both have positive coefficients of 0.062 and 0.252, respectively, and are significant at the 5% level. This means that any increase in the governance system and law system will be followed by an increase in the green banking disclosure.

Attributed to the agency theory used to guide this research, the results of the study show support and consistency with the theory [21]. Environmentally minded board is part of governance, where agents are directly involved in these activities. On the other hand, the green banking disclosure is a form of accountability that must be conveyed by the agent to the main principal, namely, Shareholders and creditors, as well as the government as a regulator.

The results of this study show support and consistency with several previous studies on the topic of disclosure in general. The research shows that the religiosity of the board of directors can affect the company [18]. Likewise, other studies indicate that the diversity of the board of directors also affects the diversity of management [19]. High diversity on the board of directors has a positive influence on corporate carbon commitment [24]. Other studies also stated that board diversity has a positive effect on biodiversity initiative disclosure [26]. In addition, research states that board gender diversity has a positive effect on corporate environmental disclosure [27]. Furthermore, some research shows that board diversity is effective in improving company performance [29]. Empirical evidence shows that companies with at least one female board member have greater net energy use [30]. In line with the research above, which illustrates the importance of the religiousness of the board of directors, there are still many of them [31], [32].

However, this study does not support other studies that state that board diversity actually decreases management diversity [20]. Similarly, it does not align with research showing that firms with highly diverse boards have lower climate change exposure [23], [33].

Table 7. The regression results of the six models

GBDY	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Environmentally minded Board (X1)		14.59/0.000 ****	14.84/0.000 ****	14.52/0.000 ***	16.62/0.000 ****	14.98/0.000 ***
Size (Control)	-3.04/0.003 ***	-0.96/0.340				-5.16/0.000 ***
Performance (Control)	-6.37/0.000 ***		-5.11/0.000 ***			-7.61/0.000 ***
Governance System (Control)	4.60/0.000 ***			1.50/0.134 ***		3.02/0.003 ***
Law System (Control)	4.67/0.000 ***				-0.94/0.348	3.09/0.002 ***
cons	16.85/0.000 ***	13.60/0.000 ***	15.33/0.000 ***	13.09/0.000 ***	13,45/0.000 ***	12.35/0.000 ***
Number of obs	323	323	323	323	323	323
F(5, 317)	12.940	106.930	127.900	108.040	106.900	62.540
Prob > F	0.000 ***	0.000 ***	0.000 ***	0.000 ***	0.000 ****	0.000 ***
R-squared	0.140	0.401	0.444	0.403 ***	0.401	0.497
Adj R-squared	0.129	0.397	0.441	0.399 ***	0.397	0.489

*Sig. at 0,10 level; ***Sig. at 0,05 level; ****Sig. at 0,001

Model 1 in Table 7 is a regression to predict green banking disclosure using only control variables without independent variables. The results of this model will be used as a basis for assessing the strength of the model before and after the independent variables are included. In model 1, the adjusted R square result of 0.129 is significant at the 5% level. If the next model shows a change in the adjusted R square value, it indicates that the variable of environmentally minded board members is very important and has a contribution to the green banking disclosure. More detailed test results for this model are presented in Table 5, accompanied by the coefficient values.

Model 2 in Table 7 is the main regression with the independent variable members of the board of directors with environmental awareness and the control variable company size. The test results show an adjusted R square value of 0.397, which is significant at the 5% level. When comparing model 2 with model 1, an increase in the adjusted R square value can be observed, rising from 0.129 to 0.397. This means that the selected independent variables can increase the model's ability to predict phenomena and show the importance of these variables. The test support is also shown by the t-value of 14.84, which is significant at a probability of 0.000.

The next model mentioned is model 3, which represents the main regression test with the independent variable of environmentally minded board members and the control variable of corporate financial performance. The test results show that the t-value is 14.84, the adjusted R-squared is 0.441, and the significance is 0.000 at the 5% level. Based on this test, the use of financial performance control variables leads to an increase in the adjusted R-squared when compared to company size, from 0.397 to 0.441 with significance of 0.000 at the 5% level. This shows that this variable has a significant effect on the green banking disclosure practices.

The next model, model 4, is the main regression test with the independent variable of environmentally minded members of the board of directors, along with the control variable, governance system adopted by the company. The test results show that the t-value is 14.52, adjusted R-squared 0.399, and significance of 0.000 at the 5% level. Based on this test, the use of the governance system control variable can increase the adjusted R-squared value, when compared to company size in model 2 from 0.397 to 0.399. However, the governance system is still inferior to financial performance in model 3. The significance of 0.000 indicates that the governance system variable has a significant effect on the green banking disclosure practices.

Model 5 represents the main regression test with the independent variable of environmentally minded board members and the control variable of the law system, followed by the company. The test results indicate that the t-value is 16.62, the adjusted R-squared is 0.397, and the significance is 0.000 at the 5% level. Based on this test, the use of the law system control variable has an adjusted R-square value of 0.397 when compared to company size. The significance of 0.000 shows that this variable has a significant effect on the practice of the green banking disclosure.

The last model, model 6, is the main regression test with the independent variable of environmentally minded board members, accompanied by all control variables, including company size, financial performance, governance system, and the law system. The test results show that the t-value is 14.98, the adjusted R-squared is 0.489, and the significance is 0.000 at the 5% level. Based on this test, the use of all control variables can increase the adjusted R-squared when compared to the use of one control variable. The significance of 0.000 indicates that these variables have a significant effect on the green banking disclosure practices.

Reflecting the low average green banking disclosure in Southeast Asia, the results indicate that environmentally minded board members have a limited impact on green banking disclosure across all tested models. H_a is supported by descriptive test output in Table 1, which shows the average green banking disclosure score of 0.41815 with a maximum of 100%. This means that the achievement of green banking disclosure is less than half of the maximum value, and the results of testing the independent variable, board of directors members, with an adjusted R-squared of 0.397, are also less than half of the maximum value of 100%. However, the variable members of the board of directors with environmental insight still have an important and strategic value on the practice of green banking disclosure because the test results with various models are positive and significant, with a range of strength varying from 39.7% to 48.9%, which can be notices from the adjusted R-squared value represented in the tables.

4.4. Robustness

Robustness testing is a test conducted to determine the strength of an analysis method to maintain analysis results with small changes in test conditions [59]. In this study, the robustness test uses various control variables to see the consistency of the research results model [39], [60]. The test results in model 2, model 3, model 4, model 5, and model 6 are a form of testing with the use of various control variables. The use of these various control variables obtained consistent results on the testing of the variable members of the board of directors with environmental insight on the green banking disclosure, with significant positive results. This shows that the research model and the independent variables, selected based on theory and logical reasons, have robustness. Table 7 summarizes the regression results of the six models used to test the effect of environmentally minded board (EMB) on green banking disclosure (GBD) with various combinations of control variables.

5. Conclusions

The results of this study conclude that environmentally minded members of the board of commissioners have a significant positive effect on the green banking disclosure in Southeast Asia. The implication of these results is that regulators can formulate policies encouraging companies to ensure that investors appoint environmentally minded members to the board of directors. Companies that have a commitment to the green bank disclosure must consider and prioritize support for the existence of environmental commissioners both within the scope of

management and governance. The limitation of this study is that the sample is restricted to bank reports in the Southeast Asia region, while using wider sample is expected to improve the generalizability of the results. Another weakness is that this research is based on quantitative data, which has not been verified in depth with the parties directly involved in the business. The results of this study have important practical, strategic, and academic implications. Practically, the findings encourage companies, especially in the banking sector, to consider appointing board members who have insight and commitment to environmental issues as part of the company's sustainability strategy. This appointment not only strengthens socially and ecologically responsible governance but also improves the quality of green banking disclosures that global stakeholders demand.

Limitations and future studies

The limitation of the research is that the source is a secondary source in the form of the company's annual report, which has not been accompanied by confirmation from internal or external stakeholders of the company. Future research is recommended to confirm the test results by asking for confirmation from stakeholders with in-depth interviews.

Declaration of competing interest

The authors declare that they have no known financial or non-financial competing interests in any material discussed in this paper.

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Author contribution

The contribution to the paper is as follows: Nur Kabib, Djoko Suhardjanto: study conception and design; Nur Kabib, Agung Nur Probodono, Setianingtyas Honggowati: data collection, analysis and interpretation of results; Nur Kabib, Setianingtyas Honggowati: draft preparation. All authors approved the final version of the manuscript.

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Appendix B. Item green banking disclosure index

No	Item disclosure
1)	Environmental conservation policy
2)	Reduction of paper waste: email, duplex printing, paper recycling
3)	Use of online/mobile banking, SMS banking, and ATM banking
4)	Use of Information Technology for product introduction
5)	Use of e-banking transparency features
6)	Use of Information and Communication Technology for complaint handling/resolution services
7)	Use of environmentally friendly materials
8)	Energy conservation in business operations
9)	Steps to combat climate change and reduce emissions
10)	Introduction of green products
11)	Plans and/or implementation of clients' business impact on the environment
12)	Plans and/or implementation of environmental awareness seminars/workshops
13)	Awards received by the bank for environmentally friendly activities
14)	Awards received by clients for environmentally friendly activities
15)	Sponsoring activities that are in harmony with the environment
16)	Green branch arrangements
17)	Internalization of green marketing
18)	Budget for green banking practices
19)	Actual expenditure on green banking activities
20)	Separate reporting specifically for green banking
21)	General statement on climate change and global warming
22)	Mention of carbon footprint emissions
23)	Climate change responsibility
24)	Environmentally friendly banking products
25)	Creation of social warnings
26)	Granting of credit accompanied by environmental permit requirements
27)	Waste processing & utilization /recycling by management
28)	Providing supporting infrastructure for energy savings
29)	Initiating greenhouse gas emission mitigation
30)	Educating customers on online transactions
31)	Guidelines/notices/regulations to minimize environmental impact
32)	Green partnerships