Board Characteristics and Sustainability Performance: Evidence from Indonesia's Energy Sector

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ABSTRACT

This study provides empirical evidence on the effect of board characteristics—specifically board size, board gender diversity, board educational background, and board meeting frequency—on the sustainability performance of energy sector companies listed on the Indonesia Stock Exchange over the 2021–2023 period. Multiple linear regression analysis was employed, using a sample of 26 energy firms (78 firm-year observations) selected through purposive sampling. The findings indicate that board educational background and board meetings have a positive and significant effect on sustainability performance, while the other board attributes show no such effect. These results are consistent with stakeholder theory, which underpins the link between board characteristics and sustainability performance by suggesting that more competent and actively engaged boards are better able to respond to stakeholder expectations regarding sustainability.

Keywords: Sustainability Performance, Board Characteristics, Stakeholder Theory

Pengaruh Karakteristik Dewan pada Kinerja Keberlanjutan Perusahaan Sektor Energi di Indonesia

ABSTRAK

Penelitian ini bermaksud untuk memberikan bukti empiris terkait pengaruh karakteristik dewan, yakni ukuran dewan direksi, keragaman gender dewan direksi, latar belakang pendidikan dewan direksi, dan rapat dewan pada kinerja keberlanjutan sektor energi di Bursa Efek Indonesia periode 2021-2023. Teknik analisis yang dipergunakan adalah analisis regresi linear berganda. Sampel penelitian ini terdiri atas 26 perusahaan sektor energi dengan total 78 data observasi yang ditentukan melalui teknik purposive sampling. Hasil penelitian menemukan bahwa latar belakang pendidikan dewan direksi dan rapat dewan berpengaruh positif pada kinerja keberlanjutan. Hasil penelitian ini mendukung teori pemangku kepentingan sebagai teori yang melandasi hubungan antara karakteristik dewan terhadap kinerja keberlanjutan.

Kata Kunci: *Kinerja Keberlanjutan, Karakteristik Dewan, Teori Pemangku Kepentingan*

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INTRODUCTION

The corporate performance paradigm has shifted toward the Triple Bottom Line—Profit, People, and Planet (Damayanty et al., 2022). This shift implies that a firm is no longer evaluated solely on its financial performance but also on how effectively it manages its environmental and social responsibilities (Eriyanti & Fitri, 2022). Accordingly, performance assessment now encompasses both financial and non-financial (sustainability) dimensions.

Sustainability reporting is one of the primary mechanisms for communicating and assessing sustainability performance. Such reports disclose information on environmental, social, and governance (ESG) dimensions, thereby enhancing corporate transparency and accountability (Sutadji et al., 2024). In Indonesia, sustainability reports are mandatory for all listed issuers under the Financial Services Authority Circular Letter No. 16/SEOJK.04/2021 on the Form and Content of Annual Reports of Issuers or Public Companies (Otoritas Jasa Keuangan, 2021). Sustainability reporting is expected to support better internal and external decision-making and strengthen corporate transparency (Eriyanti & Fitri, 2022).

By December 2024, 882 listed companies—approximately 94% of firms on the Indonesia Stock Exchange—had published sustainability reports for the 2023 reporting year (Bursa Efek Indonesia, 2025). However, the growth in the number of reports has not been matched by an equivalent improvement in Indonesia's sustainability performance. According to the 2024 Environmental Performance Index, Indonesia ranks 163rd out of 180 countries (Environmental Performance Index, 2024). The 2022 Climate Report also notes that climate-related disclosure in Indonesia is 44%, lagging behind Thailand (57%), Singapore (48%), and Malaysia (48%). Similarly, the 2024 Sustainable Development Report places Indonesia 78th out of 193 countries, below Thailand (45th) and Singapore (65th) (Sustainable Development Report, 2024).

Companies are key drivers of both economic growth and achievement of the Sustainable Development Goals (Naciti, 2019). The energy sector, in particular, has significant environmental, economic, and social implications. Together with other sectors, it contributed 50.6% of Indonesia's total emissions in 2022, a figure projected to increase through 2030 (Low Carbon Development Indonesia, 2024). The energy transition is also expected to result in substantial labour displacement, with an estimated 30,000 mining workers potentially losing their jobs between 2020 and 2040, especially in coal-dependent regions (Institute for Essential Services Reform, 2024).

The Katadata Corporate Sustainability Index 2023 reports that the energy sector achieved a sustainability score of 49.13 out of 100 (Sandjadirja & Rahmawati, 2024), lower than the plantation sector (56.86) and the mining sector (50.22). This suggests that the energy sector's ESG performance remains suboptimal, with considerable scope for improvement.

Sustainability performance is influenced by various internal governance factors, particularly board characteristics. The board of directors plays a central role in ensuring corporate sustainability across economic, environmental, and social dimensions (Chai & Suparman, 2022). Larger boards may bring greater diversity in expertise, experience, problem-solving capacity, reputation, and

external networks (Githaiga & Kosgei, 2023), which can support stronger sustainability oversight. Some studies report that larger boards are associated with higher sustainability performance (Werastuti, 2022), whereas others find the opposite, suggesting that larger boards may reduce sustainability performance, possibly due to coordination inefficiencies (Githaiga & Kosgei, 2023).

Gender diversity is a key component of board diversity that can enhance disclosure practices, including sustainability reporting (Ali & Firmansyah, 2023). The presence of women on boards may enrich deliberations and broaden perspectives in decision-making (Aprilya & Kesaulya, 2023). Empirical evidence from Lewa et al. (2024) and Githaiga & Kosgei (2023) indicates that board gender diversity can improve sustainability performance. Conversely, Safitri & Septiani (2022) find that greater gender diversity may reduce sustainability performance, suggesting the need to consider contextual factors such as board culture and decision processes.

Board educational background may also shape strategic choices, including a firm's stance toward sustainability (Umaroe & Hamidah, 2023). A board whose members possess relevant educational qualifications may be better equipped to understand complex ESG issues and integrate them into corporate strategy. Studies by Aprilya & Kesaulya (2023)nd Puspitasari et al. (2023) report that higher educational qualifications at the board level are associated with improved sustainability reporting. In contrast, Werastuti (2022) finds that board educational background can be associated with lower sustainability performance, again highlighting mixed evidence in the literature.

Board meeting frequency reflects the intensity of board oversight and monitoring. Board meetings provide a forum for discussing strategic issues, including those related to sustainability, and can encourage greater transparency and accountability in corporate activities (Ikpor et al., 2024; Nguyen et al., 2021). Lewa et al. (2024) and Murtiasri et al. (2023) document that more frequent board meetings are associated with stronger sustainability performance. However, (Chiputra et al., 2023) report no significant effect of board meetings on sustainability disclosure, suggesting that meeting quality may matter more than frequency alone.

Taken together, prior studies yield inconsistent findings regarding the influence of board size, gender diversity, educational background, and meeting frequency on sustainability performance. These inconsistencies point to a research gap and motivate further investigation. The present study examines the effect of board characteristics—board size, board gender diversity, board educational background, and board meetings—on the sustainability performance of energy sector companies in Indonesia over the 2021–2023 period. This study differs from prior work in its focus on the energy sector, the observation window, and its measurement of board meetings, which is based on the ratio of actual board attendance to the minimum required number of board meetings. The findings are expected to inform internal governance evaluations and encourage boards to adopt more sustainability-oriented practices.

Stakeholder theory posits that firms do not operate solely for their own benefit but must also create value for a broad set of stakeholders (Freeman, 1984).

Accordingly, companies require stakeholder support to sustain their operations. Sustainable firms are those that can accommodate diverse stakeholder interests by improving stakeholder engagement and involving key stakeholders in the preparation and use of sustainability reports (Dewi et al., 2023). In this context, board characteristics become an important governance mechanism through which firms respond to stakeholder expectations regarding sustainability.

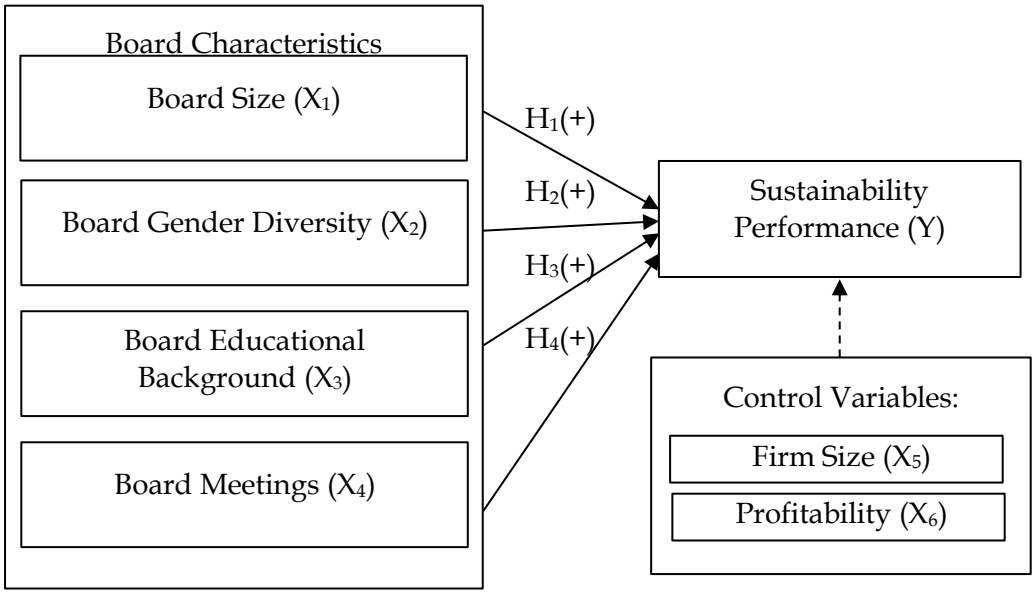

Figure 1. Conceptual Framework

Source: Research Data, 2025

Board size refers to the number of individuals serving on a company's board of directors (Anyigbah et al., 2023). From a stakeholder theory perspective, a larger board can more effectively accommodate the needs and expectations of diverse stakeholders through broader representation in deliberation and decision-making. A greater number of board members increases the likelihood that the board will possess a wider range of expertise, capabilities, and problem-solving skills, thereby enhancing its ability to oversee complex strategic and sustainability issues Nguyen, (2020).

Previous studies show that board size can enhance sustainability performance (Kwarteng et al., 2023; Lewa et al., 2024; Werastuti, 2022). Based on this evidence, the following hypothesis is proposed.

H_1: Board Size has a positive effect on Sustainability Performance.

Diversity reflects the attributes that distinguish one individual from another. Gender represents socially constructed roles, behaviours, and perspectives associated with being male or female (Yuliandhari et al., 2022). Consistent with stakeholder theory, the presence of women on the board of directors is expected to introduce more diverse and socially attuned perspectives, particularly regarding environmental and social issues. Board gender diversity is therefore widely viewed as an important governance mechanism that can influence board decision-making and leadership effectiveness in relation to corporate social and environmental responsibility (Kwarteng et al., 2023).

Empirical studies by Lewa et al. (2024) and Githaiga & Kosgei (2023) find that board gender diversity positively affects sustainability reporting. Other research similarly reports that gender-diverse boards can improve social, environmental, and governance performance (Atalay et al., 2025; Nguyen et al., 2021). In line with this prior literature, the following hypothesis is formulated.

H_2: Board Gender Diversity has a positive effect on Sustainability Performance.

Board educational background refers to the formal education history of board members, including both level and field of study. Educational diversity at the board level is important because it encourages a variety of perspectives, analytical skills, decision-making approaches, and evaluations of social and corporate practices (Khan et al., 2019). From a stakeholder theory perspective, a board whose members possess expertise in multiple disciplines is better positioned to understand and address the economic, social, and environmental issues that matter to different stakeholder groups, thereby improving sustainability performance. As corporate leaders, directors are expected to translate their knowledge and educational backgrounds into strategic choices that support the firm's long-term survival and sustainability (Kwarteng et al., 2023).

Prior research indicates that board educational background can enhance sustainability reporting and performance (Aprilya & Kesaulya, 2023; Puspitasari et al., 2023). Studies by Kwarteng et al. (2023) and Steelyana W & Raharjo (2024) likewise show that more advanced or diverse educational backgrounds at the board level are associated with better sustainability disclosure. Based on this evidence, the following hypothesis is proposed.

H_3: Board Educational Background has a positive effect on Sustainability Performance.

Board meetings are formal gatherings of the board of directors held periodically during the year. They reflect the intensity of board activity and the time devoted to oversight and strategic monitoring (Ikpor et al., 2024). From a stakeholder theory standpoint, regular and effective board meetings constitute a key mechanism for supervising management and making informed decisions that support sustainability, thereby responding to stakeholder expectations. An adequate frequency of board meetings is necessary to ensure that strategic issues—including those related to sustainability performance—are discussed and acted upon in a timely manner. Anyigbah et al. (2023) find that board meetings can improve CSR reporting, and Khalaf (2024) similarly reports that board meeting frequency positively influences sustainability reporting.

Several studies document that board meetings positively affect sustainability performance (Kwarteng et al., 2023; Lewa et al., 2024; Puspitasari & Kasri, 2023). Murtiasri et al. (2023) also show that board meetings have a positive impact on economic and environmental performance, while Almaqtari et al. (2023) and Ikpor et al. (2024) report that more frequent board meetings are associated with improved sustainability disclosure. On this basis, the following hypothesis is developed.

H_4: Board Meetings have a positive effect on Sustainability Performance.

RESEARCH METHOD

This study employs an associative quantitative approach to examine the relationships among multiple variables. The data comprise secondary sources, specifically sustainability reports and annual reports obtained from the Indonesia Stock Exchange website (www.idx.co.id) and the official websites of the sampled companies. The population consists of firms in the energy sector listed on the Indonesia Stock Exchange during the 2021–2023 period. The sample was selected using purposive sampling, with criteria requiring companies to have published annual and sustainability reports consecutively and to provide complete data for all variables over the 2021–2023 period. Based on these criteria, 26 companies met the requirements, yielding 78 firm-year observations.

Sustainability performance is assessed using three dimensions: social, economic, and environmental sustainability. These dimensions are operationalised using disclosure items aligned with the GRI Standards 2021, specifically 69 out of 85 indicators deemed relevant to the energy sector, with reference to the coal and oil and gas sector guidelines. Sustainability performance is measured through content analysis, assigning scores from 0 to 2 for each indicator. A score of 0 is assigned when an indicator is not disclosed, 1 when it is disclosed in a limited or incomplete manner, and 2 when it is disclosed comprehensively and in a material way (Puspitasari & Kasri, 2023). The overall sustainability performance score is then calculated using the following formula.

$$SP = \frac{\sum X}{n} \quad \text{..... (1)}$$

Where:

SP : *Sustainability Performance*

x : Number of indicators disclosed in the sustainability report

n : Number of GRI Standard 2021 economic, social, and environmental topic indicators relevant to the energy sector (69 indicators)

Board size is defined as the amount of total top management in a company (Werastuti, 2022a). A larger board size indicates greater diversity of expertise, which supports sustainable performance. According to Almaqtari et al. (2023), Githaiga & Kosgei (2023) and Lewa et al. (2024), board size can be measured using the following formula.

$$BSIZE = \text{Number of all board members} \quad \text{..... (2)}$$

Board gender diversity is defined as gender diversity on board of directors, between male and female board members. This variable is assessed utilizing the Blau Index. Board gender diversity is classified into two classifications, namely male and female. The measurement of gender diversity adopts research (Khan et al., 2019) dan (Widvannanda et al., 2024) with the following formula.

$$Blau\ Index = 1 - \sum_{i=1}^{n} Pi^2 \quad \text{..... (3)}$$

Where:

n : Number of members in each category

i : Types of categories, namely male (1) and female (2)

Pi : Proportion of members in each category

$$(Pi = \frac{\text{Number of Members in Each Category}}{\text{Total Board of Directors}})$$

Board educational background is the learning history that the directors have undergone. The measurement of board educational background uses the Blau Index. Board educational background is classified into 5 categories, namely

accounting, business and related fields, engineering, science, and other disciplines. This proxy of board educational background adopts research (Khan et al., 2019) and (Widvannanda et al., 2024) with following formula.

$Blau\ Index = 1 - \sum_{i=1}^{n} Pi^2$ ..... (4)

Where:

n : Number of members in each category

i : Types of categories, namely accounting (1), business and related fields (2), engineering (3), science (4), and other disciplines (5)

Pi : Proportion of members in each category

$(Pi = \frac{\text{Number of Members in Each Category}}{\text{Total Board of Directors}})$

Board meetings are regular gatherings possessed by the board of directors and commissioners. Citing to Peraturan Otoritas Jasa Keuangan (POJK) Number 33/POJK.04/2014 about Board of Directors and Board of Commissioners of Issuers or Public Company state that board meetings should be conducted no less than 21 times. Referring to Almaqtari et al. (2023), board meetings can be proxied by comparing amount of board members present and total board meetings. Therefore, this study modifies that measurement by comparing amount of board members present and minimum amount of board meeting in compliance with POJK Number 33/POJK.04/2014 about Board of Directors and Board of Commissioners of Issuers or Public Company. This measurement of board meetings is conducted using formula below.

$BMEET = \frac{\text{Number of Board Members Present}}{\text{Minimum Number of Board Meetings}}$ ..... (5)

Firm size means a scale of company that can be reflected in the amount of assets, sales revenue, and market capitalization (Suharti et al., 2024). According to Kwarteng et al. (2023) and Lewa et al. (2024), firm size can be approximated using the following formula.

$FIRMSIZE = Ln\ (Total\ assets)$ ..... (6)

Profitability is intended to assess the extent to which a company earns profits. The ratio also illustrates the effectiveness of company management (Perbiyanti, 2023). According to Suharti et al. (2024) and Yuliandhari et al. (2022), profitability can be approximated using the following formula:

$ROA = \frac{\text{Net Income After Tax}}{\text{Total Assets}}$ ..... (7)

The data analysis techniques utilized were descriptive statistical analysis, classical assumption testing, multiple linear regression analysis, model feasibility testing, hypothesis testing, and coefficient of determination testing. Multiple linear regression analysis intends to identify the direction of the connection among two or more independent variables and control variables with dependent variables, either it is a positive or negative connection (Utama, 2016). The regression equation utilized is described as below.

$SP = \alpha + \beta_1 BSIZE + \beta_2 GENDER + \beta_3 EDU + \beta_4 BMEET + + \beta_5 FIRMSIZE + \beta_6 ROA + \varepsilon$ ..... (8)

Where:

SP : Sustainability Performance

α : Constanta

β : Regression Coefficient

BSIZE : Board Size
GENDER : Board Gender Diversity
EDU : Board Educational Background
BMEET : Board Meetings
FIRMSIZE : Firm Size
ROA : Return on Assets
ε : Error

RESULT AND DISCUSSION

Descriptive statistical analysis is an analysis that intends to offer a overview of research data. This analysis shows the minimum, maximum, mean, and standard deviation values. The results of each variable are shown in Table 1.

The sustainability performance (SP) variable obtained thiniest value of 0.14 and tallest value of 1.91. The average sustainability performance value was 1.121 and the standard deviation was 0.530. This displays average sustainability performance of companies in the energy sector is quite high.

Table 1. Descriptive Statistical Analysis Results

	N	*Minimum*	*Maximum*	*Mean*	*Std. Deviation*
SP	78	0.14	1.91	1.121	0.530
BSIZE	78	1.00	15.00	4.794	2.343
GENDER	78	0.00	0.50	0.159	0.198
EDU	78	0.00	0.78	0.557	0.183
BMEET	78	1.52	50.57	9.392	8.253
FIRMSIZE	78	13.00	28.00	20.897	3.740
ROA	78	-0.38	0.62	0.106	0.137
Valid N (*listwise*)	78				

Source: Research Data, 2025

The board size variable (BSIZE) has a minimum value of 1.00 and a maximum of 15.00, with a mean of 4.794 and a standard deviation of 2.343. This suggests that, on average, energy sector companies are overseen by approximately five board members. Board gender diversity (GENDER) ranges from 0.00 to 0.50, with an average of 0.159 and a standard deviation of 0.198, indicating that, on average, women account for about 16% of board members in the sampled firms. The board educational background variable (EDU) records values between 0.00 and 0.78, with a mean of 0.557 and a standard deviation of 0.183, implying that, on average, 56% of board members possess educational backgrounds consistent with the diversity criteria applied in this study.

The board meeting variable (BMEET) has a minimum value of 1.52 and a maximum of 50.57, with an average of 9.392 and a standard deviation of 8.253. This indicates that, on average, boards in the energy sector achieved attendance equivalent to roughly 9 out of a minimum of 21 expected board meetings, or about 45% of the minimum threshold, which can be considered relatively low. Firm size (FIRMSIZE) ranges from 13.00 to 28.00, with a mean of 20.897 and a standard deviation of 3.740, indicating that the typical energy sector company in the sample falls within the large-firm category. The profitability variable (ROA) ranges from –0.38 to 0.62, with an average of 0.106 and a standard deviation of 0.137, suggesting

that, on average, energy sector companies generated profits equivalent to 10.6% of their total assets over the observation period.

Table 2. Results of Classical Assumption Tests

	N	*Asymp. Sig. (2-tailed)*	*Durbin-Watson*	*Sig.*	*Tolerance*	*VIF*
(*Constant*)	78	0.200	1.570	0.159		
BSIZE	78			0.911	0.746	1.340
GENDER	78			0.200	0.938	1.066
EDU	78			0.531	0.832	1.202
BMEET	78			0.172	0.786	1.272
FIRMSIZE	78			0.608	0.841	1.190
ROA	78			0.209	0.923	1.084

Source: Research Data, 2025

Based on Table 2, the research data is normally distributed and devoid of autocorrelation, heteroscedasticity, and multicollinearity. Thus, this research model is suitable for utilize in multiple linear regression testing. Referring to Table 3, the multiple linear regression equation derived from this research can be expressed in the following manner:

SP = 0,309+0,046BSIZE+0,111GENDER+0,665EDU+0,021BMEET-
0,003FIRMSIZE+0,749ROA ..... (9)

A constant value of 0.309 signifies that if board size, board gender diversity, board educational background, and board meeting, as well as company size and profitability, are 0 or constant, sustainability performance will raise by 0.309 units.

The regression coefficient for board size (BSIZE) is 0.046. This implies that, holding other variables constant, a one-unit increase in board size is associated with a 0.046-point increase in sustainability performance. The positive sign indicates a favourable relationship: larger boards tend to be aligned with higher sustainability performance.

Table 3. Multiple Linear Regression Analysis Results

	Unstandardized Coefficients		*Standardized Coefficients*		
Model	B	*Std. Error*	*Beta*	t	*Sig.*
(*Constant*)	0.309	0.404		0.765	0.447
BSIZE	0.046	0.024	0.201	1.894	0.062*
GENDER	0.111	0.253	0.042	0.439	0.662
EDU	0.665	0.291	0.230	2.286	0.025**
BMEET	0.021	0.007	0.323	3.123	0.003***
FIRMSIZE	-0.003	0.014	-0.023	-0.232	0.817
ROA	0.749	0.368	0.194	2.034	0.046**

*Description: * p-value <0,1; ** p value <0,05; *** p value <0,01*

Source: Research Data, 2025

The regression coefficient for board gender diversity (GENDER) is 0.111. Ceteris paribus, a one-unit increase in board gender diversity is expected to increase sustainability performance by 0.111 points. This positive coefficient suggests that firms with more gender-diverse boards tend to exhibit stronger sustainability performance.

For board educational background (EDU), the regression coefficient is 0.665. This means that, all else equal, a one-unit increase in the educational background measure is associated with a 0.665-point increase in sustainability performance. The positive coefficient indicates that boards with stronger or more relevant educational profiles are linked to higher sustainability performance.

The regression coefficient for board meetings (BMEET) is 0.021. Thus, holding other factors constant, a one-unit increase in the board meeting variable is associated with a 0.021-point increase in sustainability performance. This positive relationship implies that more active boards, as reflected in higher meeting intensity, tend to be associated with better sustainability outcomes.

By contrast, the regression coefficient for firm size (FIRMSIZE) is –0.003. This indicates that, ceteris paribus, a one-unit increase in firm size is associated with a -0.003-point decrease in sustainability performance. The negative sign suggests an inverse relationship: as firm size increases, sustainability performance tends to decline slightly.

Finally, the regression coefficient for profitability (ROA) is 0.749. This implies that, holding other variables constant, a one-unit increase in profitability is associated with a 0.749-point increase in sustainability performance. The positive coefficient indicates that more profitable firms tend to exhibit higher levels of sustainability performance.

A regression model is deemed valid when its significance level is lower than 0.05. As indicated in Table 4, the significance value at 0.000 is below 0.05. This is indicates that the regression model is appropriate to application.

Table 4. Model Feasibility Test Results (F Test)

Model	*Sum of Squares*	df	*Mean Square*	F	*Sig.*
Regression	8,693	6	1,449	7,939	0,000
Residual	12,958	71	0,183		
Total	21,651	77			

Source: Research Data, 2025

Referring to Table 5, the adjusted R-squared (R^2) value is 0.351 (35.1%). This indicates that 35.1% of the variation in sustainability performance is explained jointly by board size, board gender diversity, board educational background, board meetings, firm size, and profitability, while the remaining 64.9% is attributable to other factors not included in the regression model.

Table 5. Results of the Coefficient of Determination Test (R^2)

R	*R Square*	*Adjusted R Square*	*Std. Error of the Estimate*
0,634	0,402	0,351	0,427

Source: Research Data, 2025

Hypothesis testing was conducted to assess the effect of each independent variable on sustainability performance, as reported in Table 5. The first hypothesis (H1) posits that board size has a positive effect on sustainability performance. The significance value for board size is 0.062, which exceeds the 0.05 threshold, with a t-value of 1.894. Thus, board size does not have a statistically significant effect on sustainability performance, and H1 is rejected. The mean board size is 4.794,

indicating that the average energy sector firm has approximately five directors. This figure complies with POJK No. 33 of 2014 concerning the Board of Directors and Board of Commissioners of Issuers or Public Companies, which requires at least two directors. However, the findings suggest that simply increasing the number of board members does not necessarily enhance sustainability performance. This is consistent with Kalbuana et al. (2022) and Puspitasari & Kasri (2023), who report no significant effect of board size on sustainability reporting and performance. These results do not align with the stakeholder theory view that a larger board is better able to accommodate stakeholder interests through broader participation in decision-making. In practice, the number of directors and commissioners may have heterogeneous implications for decisions related to CSR and sustainability disclosure (Lestiananda et al., 2023).

The second hypothesis (H2) states that board gender diversity has a positive effect on sustainability performance. The significance value for board gender diversity is 0.662, greater than 0.05, with a t-value of 0.439. Accordingly, board gender diversity does not have a significant effect on sustainability performance, and H2 is rejected. The mean value of board gender diversity is 0.159, suggesting that, on average, women constitute about 16% of board members in energy sector firms; the remainder are men. Despite this representation, the results indicate that gender diversity does not translate into higher sustainability performance. These findings are consistent with Yuliandhari et al. (2022), Almaqtari et al. (2023) and Fakir & Jusoh (2020), who also find no significant impact of board gender diversity on sustainability reporting and performance. This outcome contrasts with the stakeholder theory argument that female directors bring broader and more nuanced perspectives on social and environmental issues. One possible explanation lies in cultural factors: Indonesian business culture still tends to be influenced by a patrilineal system in which men hold dominant decision-making roles, while women may defer to male colleagues (Muslih & Klarisa, 2019), limiting the potential influence of female board members.

The third hypothesis (H3) proposes that board educational background has a positive effect on sustainability performance. The significance value for board educational background is 0.025, which is below 0.05, and the t-value is 2.286. This indicates that board educational background has a positive and significant effect on sustainability performance, and H3 is accepted. The mean value of 0.557 shows that, on average, 56% of directors have diverse educational backgrounds across different fields. This diversity appears to support improvements in sustainability performance. The finding is consistent with Kwarteng et al., (2023) also Steelyana W & Raharjo (2024), who report that board educational background positively influences sustainability reporting. As corporate leaders, directors are expected to ensure the company's long-term viability by translating their knowledge and educational experience into strategies that support sustainable performance (Kwarteng et al., 2023). This result aligns with stakeholder theory, which suggests that directors with varied disciplinary backgrounds are better able to understand and address the economic, social, and environmental issues relevant to different stakeholder groups, thereby enhancing sustainability performance.

The fourth hypothesis (H4) states that board meetings have a positive effect

on sustainability performance. The significance value for board meetings is 0.003, which is below 0.05, and the t-value is 3.123. Thus, board meetings have a positive and significant effect on sustainability performance, and H4 is accepted. The average board meeting score is 9.392, indicating that, on average, boards attended the equivalent of 9 out of a minimum of 21 required meetings. Although this attendance rate is relatively low, it still appears sufficient to contribute to better sustainability outcomes. These results are in line with Kwarteng et al. (2023); Lewa et al. (2024); Puspitasari & Kasri (2023), who find that more frequent or effective board meetings are associated with stronger sustainability performance. They also support the stakeholder theory perspective that regular and meaningful board meetings are a key governance mechanism for monitoring management and making decisions that support sustainability and stakeholder interests. Board meetings reflect the effectiveness of the board's oversight function, as strategic issues affecting the firm's operations, including ESG matters, are typically discussed at these forums (Kwarteng et al., 2023).

The average firm size value is 20.897, indicating that the typical energy sector company in the sample falls within the large-firm category. However, firm size does not significantly affect sustainability performance. This is evidenced by the t-test result for firm size, which shows a significance value of 0.817, greater than 0.05. Thus, firm size has no statistically significant effect on sustainability performance. This finding is consistent with Katoppo & Nustini (2022) and Sitorus et al. (2024), who likewise report no significant relationship between firm size and sustainability performance or reporting.

Profitability, by contrast, shows a positive effect on sustainability performance. The significance value for profitability (ROA) is 0.015, which is below 0.05, indicating that profitability has a significant positive impact on sustainability performance. The average profitability of 0.106 suggests that energy sector companies generate profits equivalent to 10.6% of their total assets. The higher the profit earned, the more likely firms are to invest in and disclose sustainability initiatives to stakeholders. These findings are consistent with Suharti et al. (2024) and Yohana & Suhendah (2023), who document a positive relationship between profitability and sustainability reporting.

Overall, this study contributes to the understanding of governance-related determinants of corporate sustainability performance and offers empirical support for stakeholder theory in the context of board characteristics. Specifically, the evidence shows that board educational background and board meetings are positively associated with sustainability performance, supporting the stakeholder theory notion that knowledgeable and actively engaged boards are better positioned to address stakeholder needs and promote sustainability. Conversely, board size and board gender diversity do not exhibit significant effects, suggesting that the mere presence of more directors or female directors is insufficient to drive sustainability outcomes in the absence of supportive cultural and institutional conditions.

CONCLUSION

Board size was found to have no effect on sustainability performance, suggesting that the number of directors alone is insufficient to drive sustainability outcomes; rather, the board's strategic orientation and commitment to sustainability are

likely to be more decisive. Similarly, board gender diversity does not significantly influence sustainability performance, indicating that the presence of female directors has yet to translate into meaningful influence over decisions related to sustainability in the sampled firms.

By contrast, board educational background is positively associated with sustainability performance. This suggests that boards whose members possess more diverse or relevant educational profiles are better equipped to develop skills, exercise critical judgment, and evaluate social interests and corporate practices in ways that enhance sustainability outcomes. Board meetings also improve sustainability performance, as more active and engaged boards are better positioned to exercise effective oversight, thereby strengthening the accountability and transparency of sustainability-related activities and disclosures.

This study is subject to several limitations. First, board size and board gender diversity are not found to affect sustainability performance, which indicates that additional board-level characteristics may need to be considered. Future research could incorporate other governance attributes, such as board tenure, professional experience, and independence, to provide a more comprehensive understanding of the determinants of sustainability performance. Second, the study relies primarily on content analysis of sustainability disclosures. Subsequent research may benefit from adopting mixed-method approaches, for example by combining quantitative analysis with qualitative methods, such as interviews with board members or sustainability officers, to gain deeper insights into how board dynamics shape sustainability practices.

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