The Influence of Gender Diversity, Institutional Ownership, Board of Commissioners Meetings, and Leverage on Carbon Emission Disclosure

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Abstract. This research aims to provide empirical evidence about the impact of leverage, institutional ownership, board of commissioner meetings, and gender diversity on the disclosure of carbon emissions. The degree of each company's carbon emission disclosure is measured using a checklist created based on the information request sheet the carbon emission disclosure project (CDP) gave. Quantitative research is the category under which this kind of study falls. Panel data regression analysis is the method used in this study, while Eviews 12 is used for data processing. Quantitative data from yearly reports on www.idx.co.id are the data type used. Companies in the energy industry category that were listed between 2021 and 2023 on the Indonesia Stock Exchange are included in the research population. Through the purposive sampling method, 144 analysis units were obtained to determine the research sample. The study's findings indicate that the institutional ownership variable positively impacts the disclosure of carbon emissions. Meanwhile, disclosure of carbon emissions is not affected by board of commissioner meetings, gender diversity characteristics, or leverage.

Keywords: Gender Diversity, Institutional Ownership, Gender Diversity, Board of Commissioners Meeting, Leverage

1 Introduction

The traditional view of a company's purpose focuses on the single bottom line, which is limited to the company's profitability only. However, the development of the times and the increasing awareness of social and environmental issues have changed how companies view their goals and responsibilities to stakeholders. The triple bottom line concept, introduced by John Elkington in 1998, is becoming increasingly relevant in modern business. The concept of a triple bottom line integrating three critical aspects in the economy, society, and environment as an effort to achieve a sustainable business,

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so that companies must strive to be able to generate profits (profit), prospering its employees and the surrounding community (people), as well as protecting the surrounding environment (planet) [1], [2], [3].

The change in the company's orientation is caused by pressure from many parties so that the company can respond to the issue of global climate change, which is so extreme due to the increasing number of greenhouse gas emissions from the industrial activities of world companies [4], [5]. The latest report on global average temperature information released by the World Meteorological Organization (WMO) in early 2023, entitled State of the Climate 2022, states that 2015-2022 is the eighth year with the hottest earth temperature due to greenhouse gas emissions. 2022 was the hottest year globally, and the record temperature increase reached 1.15 degrees Celsius higher than the temperature throughout the pre-industrial period (1850-1900) [6].

Carbon emissions are a series of gases that bring carbon to the atmosphere [7], [8] arising from human activities in the form of burning fossils. Since the industrial revolution began, burning carbon-based fuels has rapidly increased the concentration of carbon dioxide in the atmosphere, increasing the rate of global warming that causes climate change [9], [10]. Thus, it can be understood that carbon emissions contribute greatly to greenhouse gas emissions and cause climate change.

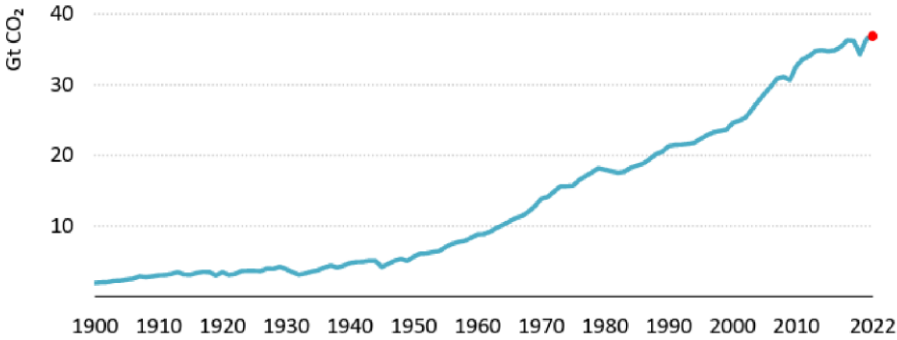

Fig 1. Carbon Dioxide (CO2) Emissions from Energy Combustion and Global Industrial Activities 1900-2022 (International Energy Agency, 2023)

According to data from the International Energy Agency (IEA) in Figure 1, carbon dioxide (CO2) emissions from energy burning and global industrial activities tend to increase yearly. The COVID-19 pandemic caused the most significant reduction in carbon emissions of up to 5% due to massive restrictions on community activities, including industries, which reduced energy demand. While the peak occurred in 2022, global carbon emissions from energy combustion and industrial activities reached 36.8 gigatons, the highest figure in history [11]. The IEA stated that the primary source of increased emissions in 2022 came from burning coal and petroleum.

Based on the Energy Institute's "Statistical Review of World Energy 2023" report (2023), Indonesia ranks 7th as the country with the highest contributor to carbon emissions. During the 2012-2022 period, the CO2 released by Indonesia into the atmosphere increased by 3.3%. Figure 2 shows the carbon dioxide emissions produced by Indonesia

from various sources during the 2012-2022 time frame created by GoodStats. GoodStats summarizes the data in Figure 1.2 based on the Energy Institute's "Statistical Review of World Energy 2023" report (2023).

Figure 2 shows that although Indonesia's carbon emissions once decreased in 2020, the total carbon emissions increased the following year and increased drastically in 2022. Total carbon emissions in Indonesia 2022 from flaring processes, industrial processes, methane gas, and energy increased by 27.73% and reached 839.6 million tons of CO2. Emissions generated from the energy sector have the most influential contribution of up to 82.4% of Indonesia's total carbon emissions in 2022. Carbon emissions from the energy sector come from emissions from the combustion of oil, gas, and coal.

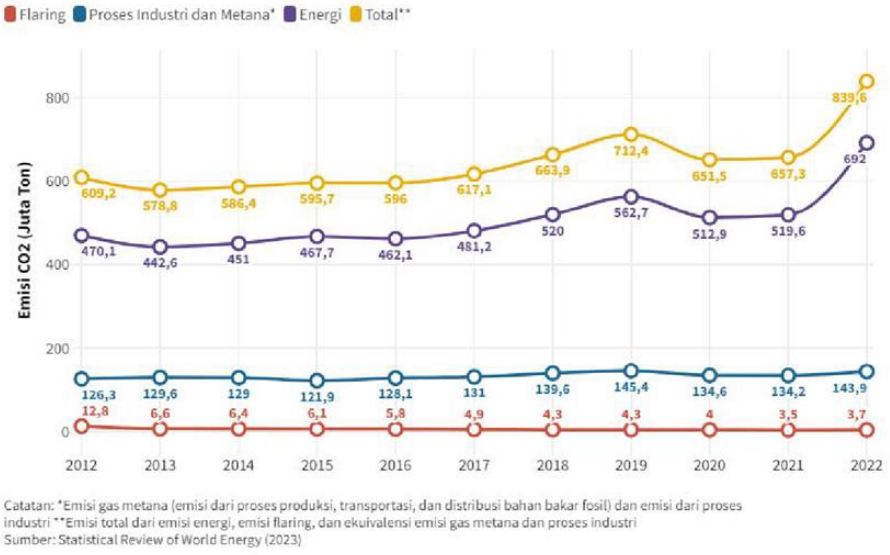

Fig 2. Indonesia's Carbon Dioxide (CO2) Emissions from Various Sectors 2012-2022 (GoodStats, 2023)

One of the companies in Indonesia that contributes carbon emissions from its activities is PT Medco E&P Indonesia in East Aceh, a subsidiary of PT Medco Energi Internasional Tbk. On April 9, 2021, several residents experienced mass poisoning due to breathing air contaminated with gas. Medco E&P Indonesia's VP of Relations & Security said that the poison was caused by smoke from the flaring (gas combustion) activities of the AS-11 well [12]. Then, as viewed in Figure 1.2, flaring is a contributor to carbon emissions. In addition, the Director of the Indonesian Forum for the Environment (Walhi) Aceh stated that the unpleasant smell has been troubling residents for four years, even recently, on September 24, 2023, dozens of people were rushed to the hospital again for breathing air mixed with gas at a location not far from PT Medco E&P (Kompas.com, 2023). The impact felt by residents at first was only a foul smell that made residents nauseous, vomited, and dizzy until some fainted and repeatedly had to be rushed to the hospital. However, now it is getting worse, not only air pollution but

also starting to impact the decline in healthy water quality, which begins to change its taste and content [13].

To overcome the world's concerns about environmental problems, especially related to carbon emissions, an international amendment called the Kyoto Protocol made by the United Nations Framework Convention on Climate Change (UNFCCC) has been agreed. Indonesia ratified the first period of the Kyoto Protocol on June 28, 2004, through Law Number 17 of 2004. The Kyoto Protocol implies that carbon counting is a way for companies to recognize, measure, record, present, and disclose carbon emissions [14]. In addition, Indonesia has also made several efforts to reduce carbon emissions by 29% using its efforts and 41% with international assistance by 2030 as an implementation of the Paris Agreement outlined in Law Number 16 of 2016.

According to Presidential Decree Number 61 of 2011, business players must also participate in initiatives to lower greenhouse gas emissions (Article 4). Carbon emission declaration from businesses as business actors demonstrates efforts to reduce greenhouse gas emissions, including carbon emissions [15], [16], [17]. Nonetheless, the existing legislation does not require businesses to notify the public of their carbon emissions. According to [18], disclosing carbon emissions will compel businesses to reveal their performance and incentivize them to implement environmentally friendly measures. This will contribute to a better knowledge of carbon emissions and climate change.

Carbon emission disclosure is a form of corporate contribution to the global warming problem and is usually reported in annual or sustainability reports. [19], [20]. Carbon emission disclosure can be an added point and a competitive advantage that companies have over companies that do not disclose carbon emissions so that it can encourage sustainable company growth, reduce pressure from stakeholders, and make it easier for financial report users to evaluate risks, assess performance, and make investment and operational decisions [21], [22].

In Indonesia, the disclosure of carbon emissions has grown significantly. The state of affairs in Indonesia is becoming more concerning as the country's annual carbon emissions keep rising. Disclosure of carbon emissions is necessary for an organization to become climate change responsive because of business operations and to understand that an accountability mindset is required. Based on earlier studies, Table 1 shows Indonesian enterprises' average carbon emission declaration.

Table 1. Average Carbon Emission Disclosure in Indonesia

No	Researchers	Sample	Unit of Analysis	Average Exposure
1.	Prasetya and Yulianto (2018) [23]	Non-financial companies	126	35%
2.	Setiawan and Iswati (2019) [24]	Plantation companies	45	21%
3.	Yusuf (2021) [25]	Companies listed in the Corporate Governance Perception Index	40	32,70%

4.	Pratama (2021) [27]	Non-financial companies	340	25,14%
5.	Meiryani et al. (2023) [28]	LQ45 Company	135	20,50%
6.	Yuliana and Wedari (2023) [29]	High Profile Company	70	17,26%

Table 1.1 indicates that Indonesia's average transparency regarding carbon emissions is relatively low. This indicates that although the intensity of carbon emissions on a national and worldwide scale keeps rising annually, disclosure of carbon emissions could be ideal. Companies in Indonesia who care about the environment typically report their carbon emissions since this is a response to environmental pressure [30]. The company's demand for more environmental awareness reflects Indonesia's low disclosure of carbon emissions.

Therefore, it is necessary to research factors that can increase carbon emission disclosure due to the gap phenomenon, where Indonesia's average carbon emission disclosure is relatively low. This gap occurs because only a few companies disclose carbon emissions even though they have impacted the environment. In addition, this low level of carbon emission disclosure is due to the nature of voluntary disclosure, and there is a consideration between the costs incurred and the benefits that will be obtained.

Carbon emissions disclosure emerged as a useful communication tool to ensure accountability and transparency [31]. Therefore, carbon emission disclosure can be done to reduce information asymmetry between internal and external parties of the company. This is because disclosing carbon emissions can help external parties in the decision-making process after knowing the impact caused by the company's activities.

This problem of information asymmetry is in line with the theory of agency. Agency theory describes the relationship between the company's management acting as an agent and the shareholders acting as principals. This theory underlines the potential conflict of interest that can cause information asymmetry problems because agents are considered to have more information about the company's operations than principals. Management is expected to disclose more information to reduce the problem of information asymmetry with the principal [32]. One of the information management can reveal is the disclosure of carbon emissions.

Based on previous studies conducted by [29], [33], [34], [35], [36], [37], [38], [39]. It is known that the results of these studies are still inconsistent. A research gap from previous research has given rise to a gap that provides opportunities to research carbon emission disclosure. The independent variables selected based on agency theory are the influence of gender diversity, institutional ownership, board of commissioner meetings, and Leverage. The novelty of this study lies in the independent variable Gender Diversity. According to [40], This variable was chosen because few studies have tested gender diversity in the council on carbon emissions disclosures. Indonesia adheres to the council system, a two-tier system that separates the functions of executors (directors) and supervisors (commissioners). Existing research is still dominated by a sample of companies' One-Tier Board System because little research has been done on the gender diversity of the Board of Commissioners regarding carbon emission disclosure; this

study helps to promote gender diversity in the Two-Tier Board System. Since women are generally regarded as being more concerned about the environment than men are, and because this can encourage businesses to disclose carbon emissions, the gender diversity of the board of commissioners is thought to be able to optimize supervision of management policies. Diverse gender representation on the board of commissioners may persuade businesses to reveal their carbon emissions [41].

The second novelty is in the institutional ownership variable in terms of its measurement. Previous research on the measurement of institutional ownership used institutional stock ownership from domestic and foreign countries. However, this study will only examine institutional ownership from domestic companies. The domestic company in question is operating in Indonesia.

2 Literature Review and Hypotheses

2.1 Agency Theory

Agency Theory introduced by [42], It is the relationship between two interested parties, the principal and the agent. A principal is a person who invests capital in a company. Meanwhile, an agent is the person who manages the company's business on behalf of the principal. These two parties are in the same company but have different goals and interests. Principals focus on increasing profits, while agents concentrate on improving the business. These differences in interests give rise to conflicts called agency problems.

One of the causes of agency problems is information asymmetry. Information asymmetry is the gap between the amount of information owned by management and market participants [43]. The management manages the company and knows all the information related to the business, while the shareholders depend on the management to get the information. This difference in the distribution of information can sometimes cause the information received by shareholders to be different from that known by the manager, thus creating information asymmetry between the two. Information asymmetry will be higher if the quality of information is low and the stakeholders need to be more informed about the business. [44].

Information asymmetry conflicts can be minimized by reporting and disclosing the company as a form of transparency of activities carried out by management to interested parties outside the company. This is done to prevent deviations made by management that are in their best interests. Agency theory offers a framework that links corporate governance mechanisms to carbon emission disclosures. Companies can make decisions to make carbon emission disclosures that are part of voluntary disclosures (Voluntary Disclosure). Agency theory views carbon emissions reporting as a solution to reduce information asymmetry between agents and principals [45]. Carbon emission disclosure can create transparency over the activities carried out by the company so that the distribution of information between agents and principals will be balanced, which can ultimately overcome information asymmetry conflicts.

Gender diversity is gender diversity in the board's composition, which this study refers to as the board of commissioners. The Board of Commissioners supervises and

advises the Board of Directors. The role of women on the board of commissioners can increase oversight of the company's activities. To understand the effect women have on the board, it is essential to consider the number of women. A higher proportion of female board of commissioners will be able to increase the board's effectiveness, and a female board of commissioners will provide better participation. The role of women is expected to increase supervision of corporate responsibility, especially related to environmental strategy and disclosure.

According to agency theory, information asymmetry arises naturally because managers have more information than principals or shareholders. Information asymmetry triggers the existence of agency problems. The board of commissioners, which has a variety of genders, acts as a better control because the range of views and opinions is more comprehensive. In other words, gender diversity can minimize agency conflicts. The role of women on the board of commissioners will apply emphasis on supervising agents to avoid information asymmetry conflicts in disclosing more information to shareholders. One form of information disclosure is carbon emission disclosure. Carbon emission disclosure is essential because by looking at global conditions, namely the peak in 2022, carbon emissions due to energy burning and industrial activities reached 36.8 gigatons, the highest figure in history [46], so that the disclosure of carbon emissions can minimize stakeholder errors in decision-making.

Results of previous research by [41], [47] found a positive relationship between gender diversity and carbon emission disclosure. This means that a female board of commissioners can provide added value to a company because women are considered to care about the environment and pay more attention to voluntary carbon emission disclosure. Therefore, the proposed research hypothesis is:

H1: Gender diversity has a positive effect on carbon emissions disclosure

Institutional ownership is the ownership of company shares owned by an institution [48]. Institutional ownership is the percentage of shares owned by the institution that can be used to supervise and control the company's performance. So, decisions regarding company policies will be based on the company's interests for the good and sustainability of the company.

The existence of institutional ownership becomes attractive if it is associated with agency theory. Agency theory is the relationship between management and shareholders, described as the relationship between agents and principals. The relationship between shareholders and the company's management is vulnerable to conflicts of interest or agency problems. According to agency theory, the more significant the proportion of institutional ownership in a company, the higher the level of supervision of agents [42]. Supervision is carried out to prevent agents from behaving deviantly to avoid problems of agency.

Management responds to the level of tightening supervision carried out by institutional investors to disclose information to stakeholders voluntarily. This is an effort to minimize information asymmetry related to company activity information. One of them is disclosing information related to carbon emissions. [46] stated that the disclosure of carbon emissions is essential because by looking at global conditions, namely the peak in 2022, carbon emissions due to energy burning and industrial activities reached 36.8

gigatons, the highest figure in history. The disclosure of carbon emissions is a means of communication with stakeholders to smooth the decision-making process. Thus, this agency problem can be minimized. [49] The disclosure of carbon emissions is essential because by looking at global conditions, namely the peak in 2022, carbon emissions due to energy burning and industrial activities reached 36.8 gigatons, the highest figure in history. The disclosure of carbon emissions is a means of communication with stakeholders to smooth the decision-making process. Thus, this agency problem can be minimized.

Research conducted by [50] proves that institutional ownership positively affects carbon emission disclosure. The higher the institutional ownership, the higher the carbon emission disclosure. Therefore, the hypothesis proposed is:

H2: Institutional ownership has a positive effect on carbon emission disclosure.

According to Law No. 40 of 2007 Article 1 paragraph 6, the board of commissioners has the task of carrying out supervisory functions in general and specifically by the articles of association and providing input to the board of directors. In addition, the board of commissioners also supervises activities that show the company's concern for the environment [51]. The duties of the board of commissioners can run effectively, one of which is by holding frequent meetings of the board of commissioners as a means of communication between members of the board of commissioners. Research conducted by [52] found that the more often the Board of Commissioners held meetings, the more influential the supervisory function of the management became. This is because the more frequency of board of commissioner meetings, the more information is received, the faster it is to monitor management activities, and the more proactive it is in formulating strategies to overcome problems due to the company's activities.

Agency theory reveals that principals and agents can have different interests. This difference can cause several problems, such as information asymmetry, impacting agency costs. The Board of Commissioners meeting is a way to deal with this agency problem [53], [54], [55]. Information asymmetry occurs due to the difference in information known by agents and principals, so to overcome this problem, transparency of company information is needed. One form of information transparency in company activities is the disclosure of carbon emissions [56]. Carbon emission disclosure is important because, as a result of energy burning and industrial activities in 2022, carbon emissions reached 36.8 gigatons, which is the highest in history. The disclosure of carbon emissions is a means of communication to stakeholders so that the decision-making process does not experience errors. Thus, the board of commissioners meeting will increase oversight of the agent's performance to ensure the disclosure of information related to carbon emissions carried out by the company. Research conducted by [47], [51] found that the Board of Commissioners meeting positively affected carbon emission disclosure. This result means that the more frequently the Board of Commissioners meetings held, the better the function of the Board of Commissioners is in supervising the disclosure of carbon emission information in the annual and sustainability reports. Therefore, the hypothesis proposed is:

H3: The meeting of the board of commissioners has a positive effect on the disclosure of carbon emissions.

The company's funding sources come from the company's internal sources in the form of shareholder investment and from external sources in the form of creditor loans. This creditor loan can be carried out after the creditor sees the company's condition through financial statements, one of which is by looking at the company's leverage position [57]. Leverage is a ratio that describes the company's ability to pay all its obligations used to finance its activities. The leverage ratio shows the size of the company's debt. Companies with high leverage levels also have high financial risks, so companies must make adequate payments to creditors.

As the party that provides loans, creditors will look for more information related to the company. [58] state that companies with high leverage disclose more environmental information than those with low leverage. Therefore, companies with high leverage ratios prefer to disclose ecological responsibility, one of which is by disclosing carbon emissions. Carbon emission disclosure is necessary because, due to energy burning and industrial activities in 2022, carbon emissions reached 36.8 gigatons, the highest in history. The disclosure of carbon emissions is a means of communication to stakeholders so that creditors can see the company's seriousness regarding the environmental aspect related to the impact they cause from the carbon emissions produced. So, disclosing carbon emissions can minimize the information asymmetry between the company and creditors so that the company pays attention to its long-term sustainability. Agency theory shows that companies with high leverage are more at risk of high agency costs. High leverage indicates the high use of debt as a source of corporate funding.

According to agency theory, companies with higher levels of leverage will disclose more information about social and environmental responsibility so that companies will not be the focus of creditors [59], [60]. Carbon emission disclosure is a form of environmental responsibility to stakeholders, especially creditors. By increasing the amount of information disclosed, companies can reduce agency costs and possible conflicts of interest between owners and creditors [61]. The same is also stated by [62], who states that the amount of information the company discloses can reduce the agency's cost. Companies can use the information disclosed in the carbon emission disclosure to reduce the high cost of existing agencies and minimise errors in creditors' decision-making.

[63] stated that leverage can increase carbon emission disclosure due to strict scrutiny by creditors. As entities increasingly rely on creditor funding, they will make voluntary disclosures to meet creditor expectations. [64]. Research conducted by [39], [65] found that leverage positively affects carbon emission disclosure. Carbon emission disclosure is part of voluntary disclosure, so higher leverage can encourage companies to disclose carbon emissions. Therefore, the hypothesis formulated is as follows.

H4: Leverage has a positive effect on carbon emissions disclosure

3 Methods

This study falls within the quantitative research category since it uses processed numerical data and statistical analytic techniques. Secondary data from company annual

reports and sustainability reports was used in this investigation. The independent and dependent variables are the two variables used in this investigation. The disclosure of carbon emissions is the dependent variable in this research. Gender diversity, institutional ownership, the frequency of board of commissioner meetings, and leverage are the study's independent factors.

Regression analysis using panel data is the data processing method used in this investigation. Eviews software 12 is used for data processing. The panel data regression model equation must be specified before data processing begins. The next step is to estimate the optimal panel data model using the Chow, Hausman, and Lagrange multiplier tests for the Common Effect Model, Fixed Effect Model, and Random Effects Model. The traditional assumption test, which consists of the Multicollinearity, Heteroscedasticity, and Normality tests, will be conducted once the optimal model has been identified.

All companies in the energy sector listed on the Indonesia Stock Exchange between 2021 and 2023 comprise the study's population. The selection of energy sector firms as the focus of the study stems from the fact that Indonesia is the world's seventh-largest carbon emitter, with the energy sector accounting for the majority of carbon emissions in the country. The purpose of choosing 2021–2023 as the observation period is to learn about any recent changes in the disclosure of carbon emissions during that time. Sampling was carried out using the purposive sampling method. The following are the criteria that have been previously established in the sampling of this study:

Table 1. Sampling Criteria

No	Sample Criteria	2021	2022	2023
1	Energy sector companies listed on the Indonesia Stock Exchange (IDX) in 2021-2023	71	76	83
2	Companies that do not disclose carbon emissions (at least one disclosure item) in their annual reports and/or sustainability reports consistently during 2021-2023	(17)	(22)	(29)
3	Energy sector companies that do not present complete data related to the data needed in the study during 2021-2023	(9)	(6)	(3)
	Number of samples	45	48	51
	Number of units of analysis (3 years)		144	

The author briefly explains the operationalization of variables, measurements, and references used for this study in the following Table 2.

Table 2. Operational Variables

Variable	Definition	Measurement	Source
Carbon Emission Disclosure	Carbon emission disclosure is a disclosure that presents information related to the amount of carbon emissions produced, plans and targets for reducing carbon emissions, as well as	PEK = (number of items disclosed / total maximum score) x 100	[66], [67]

	risks and opportunities in relation to climate change.		
Gender Diversity	Gender diversity is gender diversity in the composition of the board where this study refers to the board of commissioners.	Gender = number of women on the board of commissioners / total board of commissioners	Ummah and Setiawan (2021) [41]
Institutional Ownership	Institutional ownership in this study refers to domestic institutional ownership, namely institutional stock ownership originating from Indonesia.	KI = number of shares owned by domestic institutions/number of outstanding shares	Angelina and Handoko (2023) [50]
Board of Commissioners Meeting	Board of Commissioners Meeting is the number of Board of Commissioners meetings in a year.	Meetings = total board of commissioner meetings	Y. M. Pratama (2021) [27]
Leverage	Leverage is a ratio that describes a company's ability to pay all of its obligations that are used to finance the company's activities.	DAR = total debt / total assets	Abdullah et al. (2020) [63]

This study used an analysis tool, namely a panel data regression model. This analysis measures the influence of more than one independent variable on the dependent variable. The calculation model is as follows:

$$\mathbf{CED = \alpha + \beta_1 GENDER\_2_{it} + \beta_2 KI\_LOKAL_{it} + \beta_3 RAPAT\_KOM_{it} + \beta_4 DAR_{it} + e_{it}} \quad (1)$$

Information:

CED	: Carbon Emissions Disclosure
α	: Constant
GENDER_2	: Gender Diversity
KI_LOKAL	: Institutional Ownership
RAPAT_KOM	: Board of Commissioners Meeting
DAR	: Leverage
β	: Regression Coefficient
i	: Company
t	: Time
e	: Error

4 Results and Discussion

The following are the test results in this study

4.1 Classical Assumption Test

Table 1. Multicollinearity Test Results

	GENDER_2	KI_LOKAL	RAPAT_KOM	DAR
GENDER_2	1.000000	0.095064	0.003473	-0.224625
KI_LOKAL	0.095064	1.000000	0.039985	-0.086821
RAPAT_KOM	0.003473	0.039985	1.000000	0.065838
DAR	-0.224625	-0.086821	0.065838	1.000000

Table 2. Heteroscedasticity Test Results

Variable	Prob.
C	0.0050
GENDER_2	0.1029
KI_LOKAL	0.6269
RAPAT_KOM	0.3379
DAR	0.6399

The results of the multicollinearity test in Table 1 between gender diversity, institutional ownership, board of commissioner meetings, and leverage have a correlation value below 0.8. The research data is accessible from the problem of multicollinearity. Then, the results of the heteroscedasticity test in Table 2, the variables of gender diversity, institutional ownership, board of commissioner meetings, and leverage, have a probability value of >0.05. It was concluded that the research sample data was accessible from heteroscedasticity problems.

4.2 Regression Analysis Test

After conducting the Chow test, Hausman test, and Lagrange multiplier test using Eviews software version 12.0, it was concluded that the Fixed Effect Model is the most appropriate regression panel data model for this study.

Table 3. Regression Test Results

Variable	Coefficient
C	0.301557
GENDER_2	0.057531
KI_LOKAL	0.002255
RAPAT_KOM	0.006334
DAR	-0.109133

Based on the results of the regression analysis, it can be known that the form of the research regression equation is as follows:

CED = 0.301557 + 0.057531 GENDER_2 + 0.002255 KI_LOKAL + 0.006334 RAPAT_KOM - 0.109133 DAR + ε

4.3 Multiple Coefficient of Determination Test

Table 4. Multiple Determination Coefficient Test Results

Adjusted R-squared
0.815082

The Adjusted R-squared value in this study is 0.815082. This figure shows that gender diversity, institutional ownership, board of commissioner meetings, and leverage account for 81.51 % of carbon emission disclosures. Other variables that were not examined in this study accounted for 18.49%.

4.4 Simultaneous Significance Test

Table 5. Simultaneous Significance Test Results

Prob. F-statistic
12.67250

The probability value of The F-statistic of 12.67250 is based on the results of the overall significance test of the regression equation. It can be concluded that gender diversity, Institutional ownership, Board of Commissioners Meetings, and Leverage as independent variables do not influence carbon emission disclosure. According to [68], If the F test turns out to be insignificant or means $b_1 = b_2 = b_3 = 0$, then it can be ascertained that the partial t-test is not significant. So, the F test indicates looking at the partial test rather than the often misunderstood simultaneous test.

4.5 Hypothesis Test Results

Table 6. Hypothesis Test Results

Variable	Prob.
C	0.0040
GENDER_2	0.2304
KI_LOKAL	0.0346
RAPAT_KOM	0.2977
DAR	0.3671

Based on Table 6, the probability value of gender diversity (X1) is 0.2304; it is concluded that gender diversity (X1) does not have a significant influence on carbon emission disclosure (Y). The probability value of institutional ownership (X2) is 0.0346; it is concluded that institutional ownership (X2) has a significant influence on carbon emission disclosure (Y). The probability value of the Board of Commissioners meeting (X3) is 0.2977; it is concluded that the Board of Commissioners meeting (X3) does not have a significant influence on carbon emission disclosure (Y). The probability value of leverage (X4) is 0.3671; it is concluded that leverage (X3) does not have a significant influence on carbon emission disclosure (Y).

4.6 Discussion

Gender diversity involving the number of women on the board of commissioners in this study states that gender diversity does not significantly influence carbon emission disclosure, which makes the first hypothesis rejected. This can be interpreted that the higher the gender diversity, the more it does not affect the increase in carbon emission disclosure. Thus, whether or not a woman is on the board of directors does not affect the disclosure of carbon emissions.

According to agency theory, information asymmetry arises naturally because managers have more information than principals or shareholders. Information asymmetry triggers agency problems. The board of commissioners, which has a variety of genders, acts as a better control because the range of views and opinions is wider. In other words, gender diversity can minimize agency conflicts. The role of women on the board of According to agency theory, information asymmetry arises naturally because managers have more information than principals or shareholders. Information asymmetry triggers agency problems. The board of commissioners, which has a variety of genders, acts as a better control because the range of views and opinions is more comprehensive. In other words, gender diversity can minimize agency conflicts. The role of women on the board of commissioners will apply emphasis on supervising agents to avoid information asymmetry conflicts in disclosing more information to shareholders. One form of information disclosure is carbon emission disclosure.

Table 7. Summary of Hypothesis Test Results

Hypothesis	t-Statistic	Prob.	Result
Gender diversity has a positive effect on carbon emission disclosure	1.207559	0.2304	H1 rejected
Institutional ownership has a positive effect on carbon emission disclosure.	2.145479	0.0346	H2 accepted
Board of Commissioners meetings have a positive effect on carbon emission disclosure	1.047481	0.2977	H1 rejected
Leverage has a positive effect on carbon emission disclosure	-0.906588	0.3671	H1 rejected

However, this result is different from the agency's theory, which assumes that the existence of a female board of commissioners can emphasize the process of supervising the agency in fulfilling the interests of stakeholders, especially related to environmental concerns in the form of carbon emission disclosure. This study did not get similar results to the survey of [47], [69], [70]. However, the results of this study are in line with the research [71], which denies the existence of the relationship between the board of directors and gender diversity in carbon emission disclosure. According to the explanation presented, the research conducted in Turkey and Australia stated that the diversity of female board of directors still needs to be higher. Based on the data that researchers have collected, the involvement of women commissioners in Indonesia in companies engaged in the energy sector still needs to be higher. This is reflected in this study, where the female board of commissioners is only 39% of the 144 company samples, so

the same opinion may also be due to conditions similar to those of the research conducted in Turkey and Australia.

This shows that Women on the board of commissioners still need more representation, affecting their ability to have a majority vote in board decisions. [72], [73]. According to [74], Women in male-dominated occupations often experience pressures that can reduce their tendency to be influential leaders due to gender stereotypes and biases. [31], [75] Prove that gender diversity affects CO2 emissions disclosure if there are two or more female board members. In Indonesia, gender diversity is still tiny in the board of commissioners. So, gender diversity cannot affect the disclosure of CO2 emissions.

In addition, in terms of intelligence, a man is considered more capable than a woman. It is believed that women's achievements are purely coincidental. Another explanation is that women are less vulnerable to financial risk than men, resulting in fewer women in certain positions. Furthermore, women working in the public and private sectors are suspected of affecting their performance [76], [77], [78], [79].

However, according to [71], The presence of female directors can have a significant impact when it can achieve "critical mass"; a minimum of two women in each company is needed to achieve this. This reason is in line with the theory of legitimacy, which states that a high heterogeneity of the board is needed to adequately protect the stakeholders' interests to contribute to increasing the legitimacy obtained from the community [80].

Institutional ownership in this study refers to domestic ownership. The results show that the second hypothesis (H2) is accepted, where the probability value is $0.0346 < 0.05$, with a beta value of 2.145479. So, statistically, institutional ownership positively affects carbon emission disclosure. The results of this study align with the agency theory, which states that institutional ownership can minimize the existence of information asymmetry conflicts between agents and stakeholders related to all activities and the impact of company activities, especially related to carbon emissions. With this institutional ownership, management is encouraged to be able to convey the impact produced by carbon emissions in the form of carbon emission disclosure.

The results of this study are in line with the research conducted by [81], [50] Institutional ownership positively affects carbon emission disclosure and corporate social responsibility practices. Thus, the greater the institutional ownership in the company, the more it will support it in implementing carbon emission disclosure and carrying out corporate social responsibility practices to realize corporate sustainability.

Based on the third hypothesis test results, the Board of Commissioners meeting variable had a significant value of $0.2977 > 0.05$ with a beta value of 1.047481. The third hypothesis predicts the positive relationship between the Board of Commissioner meeting and the disclosure of carbon emissions. However, the regression analysis results show a significance value of more than 0.05, so the third hypothesis is not accepted. Thus, it can be statistically concluded that the Board of Commissioners meeting does not affect carbon emission disclosure. The results of this statistic are interesting because, in this context, the Board of Commissioners meeting serves as an essential platform to discuss and establish policies and strategies related to carbon emission management, including improving environmental and sustainability issues. However, the Board of Commissioners' meetings have only sometimes significantly impacted carbon

emission disclosure. Although the Board of Commissioners meeting shows increased attention to environmental and sustainability issues, its impact on carbon emission disclosure is only sometimes significant.

A study by [82] suggests that the board of commissioners may commit to environmental responsibility, which is only sometimes followed by a significant increase in carbon emissions disclosures. Other research by [83] indicates that other factors, such as regulatory pressures, stakeholder demands, and corporate business strategies, play a more dominant role in determining the level of carbon emission disclosure. Furthermore, research by [84] although the Board of Commissioners often discusses environmental issues in meetings, this only sometimes translates into real action or changes in the company's carbon emissions reporting practices. This may be due to a need for more specialized expertise among board members in dealing with environmental issues or a higher priority on financial and operational issues [85].

Leverage is related to a ratio that describes a company's ability to pay all its obligations used to finance corporate activities as measured by DAR. It has results that have no influence and have a negative direction towards carbon emission disclosure, so it can be stated that the fourth hypothesis is not accepted. This is based on the results of hypothesis testing, which found that the leverage variable has a significant value of $0.3671 > 0.05$ with a beta value of -0.906588. Thus, it can be statistically concluded that leverage does not affect carbon emission disclosure.

A company's financial performance level is only sometimes a benchmark when considering carbon emission disclosure [86]. Companies with high debt levels want to get high profits but low in social responsibility disclosure, such as carbon emissions that have been generated, because they only care about profits without paying attention to the quality of the surrounding environment. The company's leverage does not affect the disclosure of carbon emissions. Some companies with high leverage do not disclose carbon emissions widely, and some with low leverage make extensive and complete carbon emission disclosures.

Based on research by Majid & Ghozali (2015) On the plantation, manufacturing, and mining companies listed on the IDX for the 2011-2013. Because voluntary disclosure can increase a company's operating costs, leveraged organizations exercise caution when making disclosures. The findings of this study contradict the agency theory, which claims that the greater the company's leverage, the greater the manager's effort in disclosing carbon emissions to minimize conflicts of interest due to information asymmetry.

This research aligns with that conducted by [84], which shows that while leverage can affect various aspects of a company's finances and operations, its impact on carbon emissions disclosure is not significant. The study reveals that companies with higher leverage do not consistently disclose their carbon emissions more or less transparently compared to companies with lower leverage.

Furthermore, the study by [87] it also supports these findings by stating that leverage is not a major determining factor in the rate of carbon emission disclosure. Instead, company size, industry type, and stakeholder pressure play a more significant role in

driving transparency in carbon emissions reporting. Companies may focus more on financial risk management related to leverage than environmental disclosures, including carbon emissions.

5. Conclusion

This study examined and investigated the influence of gender diversity, institutional ownership, board of commissioner meetings, and leverage on carbon emission disclosure. The sample used in this study is companies engaged in the energy sector listed on the Indonesia Stock Exchange (IDX) in the 2021–2023 period. The institutional ownership variable positively influences carbon emission disclosure because it shows significant results. High institutional ownership will further increase adequate supervision of management activities in managing the company and accountability to stakeholders, primarily related to environmental responsibility due to company activities, namely by disclosing carbon emissions, so that the second hypothesis is accepted.

For the variables of gender diversity, board of commissioners meetings, and leverage, no significant results were found on carbon emission disclosure, so the first, third, and fourth hypotheses were not accepted. Gender diversity does not influence carbon emissions disclosure because the number of women on the board of commissioners is still too small, so they have low representation, which affects their ability to have a majority vote in board decisions. Board of Commissioner meetings do not influence carbon emission disclosure because the board of commissioners may commit to environmental responsibility, which is carried out by holding frequent meetings and is only sometimes followed by a significant increase in carbon emission disclosure. Moreover, leverage does not influence carbon emission disclosure because the level of financial performance of a company is not always a benchmark when considering carbon emission disclosure.

This study has several limitations, namely related to research samples that focus on companies from Indonesia, so the samples used are relatively small, and some companies need to publish carbon emissions. From the weaknesses of this study, suggestions that can be given for future research are to expand the research population to show the consistency of companies in disclosing carbon emissions, both in Indonesia and other countries. In addition, it can also add new variables related to profit growth.

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