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The Effect of Environmental Performance and CEO Gender on Carbon Emission Disclosure with Leverage as a Moderating Variable

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Abstract

Purpose – *This study aims to obtain empirical evidence on the influence of environmental performance and CEO gender on carbon emission disclosure, with leverage as a moderating variable.*

Design/methodology/approach – *This study uses quantitative research. The sample in this study consists of 66 companies in the basic materials sector listed on the Indonesia Stock Exchange from 2022 - 2024. The analysis technique used to test the hypothesis is multiple regression analysis using Eviews 9 software.*

Findings – *The results of this study found that Environmental Performance has a negative and statistically insignificant effect on Carbon Emission Disclosure, while CEO Gender has a negative and statistically insignificant effect on Carbon Emission Disclosure, and Leverage has a negative and statistically insignificant effect on Carbon Emission Disclosure. Furthermore, Environmental Performance does not strengthen the effect of Leverage on Carbon Emission Disclosure, while CEO Gender strengthens the effect of Leverage on Carbon Emission Disclosure.*

Research limitations/implications – *This study discusses Carbon Emission Disclosure and other factors such as Environmental Performance, CEO Gender, and Leverage, focusing on the basic materials sector. These results highlight the importance of executive characteristics under financial constraints and imply that voluntary environmental disclosure in Indonesia remains weak without stronger regulatory enforcement. They contribute to the environmental accounting literature by providing empirical evidence on the interaction between financial pressure and top management characteristics. They also offer policy implications for strengthening the mandatory carbon disclosure framework in emission-intensive sectors.*

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INTRODUCTION

Basic materials Sector is a company that provides products and or services in the form of basic materials used by other industries to produce final goods whose main activities of companies in this sector are generally in the form of mining, processing and distribution of basic materials which include chemical goods, construction materials, containers & packaging, metals & minerals and forestry & paper (Kayo, 2023). Sectors Basic Materials continues to experience positive growth every year. This condition has a positive impact on the economy but has the potential to pollute the environment. This is because the Basic Materials utilizing fossil-derived resources such as coal or petroleum in its operational processes. The use of fossil fuels produces carbon gas emissions or greenhouse emissions that will have an impact on climate change.

Advantages Basic Materials compared to other sectors, it lies in the role of providing energy supply and other mineral resources as much-needed resources. Companies engaged in the sector Basic Materials generally carry out production activities continuously and continuously without stopping. This is natural considering that Indonesia is blessed with an abundance of natural resources, so it provides many advantages to produce higher value output. In Indonesia, the sector plays a strategic role in supporting downstream industries such as manufacturing, construction, and energy, while also making a significant contribution to national greenhouse gas emissions. As a result, companies operating in this sector are facing increasing pressure from regulators, investors, and the public to increase transparency regarding their environmental impacts, particularly carbon emissions (Kayo, 2023).

Companies in the Basic Materials Sector have a greater awareness of the importance of transparency in sustainability reporting. Operational activities that directly impact the environment encourage companies in the sector to be more proactive in disclosing carbon emissions. In addition, pressure from regulators, investors, and the public is increasingly motivating the Basic Materials sector to apply Environmental, Social, and Governance (ESG) principles more seriously. Therefore, this sector is a relevant and strategic object to research the disclosure of carbon emissions and the factors that influence them.

Meanwhile there is a scandal carbon emission disclosure that has happened in Basic Materials Sector such as the cement industry which has the potential to cause air pollution, so it is necessary to make efforts to control emissions from the industry. Quoted from Kompas.com (Ramli & Jatmiko, 2021), PT Semen Indonesia (Persero) Tbk. develops products Green Concrete, namely an environmentally friendly concrete development program. In addition to meeting the needs of the market, the Director of Marketing and Supply Chain SIG said that the product was developed to support the government's efforts to reduce greenhouse gas (GHG) emissions by 26% by 2020 and 29% by 2030. In addition, in the first quarter of 2021, PT Semen Indonesia (Persero) Tbk. recorded profit attributable to owners of the parent entity of IDR 450 billion or grew by 0.87 percent.

Authorities have made efforts to reduce carbon emissions by establishing several policies listed in Law Number 6 of 1994 concerning United Nations Framework for Climate Change (UNFCCC) which then adopted the Kyoto Protocol contained in Law Number 17 of 2004, Presidential Regulation Number 61 of 2011 concerning the Planning, Implementation, Monitoring, and Evaluation of Greenhouse Gas Emission Reductions which became a reference for all sectors in Indonesia, including companies. The basis of this is the National Greenhouse Gas Inventory which is listed in Presidential Regulation Number 71 of 2011 and Law Number

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16 of 2016 concerning Paris Agreement In 2015, which targets a reduction in carbon emissions by 29% to 41% by 2030 (Septriyawati & Anisah, 2019). In connection with these regulations, companies need to disclose carbon emissions.

Disclosure of carbon emissions is still voluntary so that not all companies disclose this information in their reports and there are no regulations that regulate the obligation of companies to be responsible and report their carbon emissions, especially to the public (Pramuditya & Budiasih, 2020). Regarding the disclosure of carbon emissions that are still voluntary, there is a case of a company that does not fully disclose information about carbon emissions, namely PT Bukit Asam Tbk in 2016-2017. PTBA is a state-owned company in the coal subsector located in South Sumatra Province. PT Bukit Asam Tbk conducts environmental disclosure with results in 2016 and 2017 only conducting environmental disclosure of 62% and low quality (Syahputra et al., 2019).

Carbon Emission Disclosure Influenced by factors Environmental Performance (Retnowati & Cahyani Putri, 2024), CEO gender (Isyiana & Inawati, 2025), and Leverage (Suhardi, 2025). Then there are several other factors that affect Carbon Emission Disclosure such as Green Investment (Dani & Harto, 2022), Profitability (N. Wulandari et al., 2025), Media Exposure (N. H. Putri et al., 2025), Audit Committee (Angelina & Handoko, 2023), Carbon Performance (Priliana & Ermaya, 2023), Company Size (Padila et al., 2025), and Institutional Ownership (D. Wulandari & Sasongko, 2024).

Factors that can affect Carbon Emission Disclosure i.e. Environmental Performance, according to (Meiryani et al., 2023) Environmental Performance is a measure of a company's performance in preserving the environment and creating a good environment. Transparent disclosure information will be fulfilled by businesses that invest in environmental performance management because it is reliable for stakeholders. Companies with good environmental performance will provide information on their environmental performance in the form of carbon emission disclosures. This is consistent with research conducted by (Dani & Harto, 2022; Priliana & Ermaya, 2023) states that Environmental Performance has a positive effect on Carbon Emission Disclosure. However, it is inversely proportional to the research by (Retnowati & Cahyani Putri, 2024) states that Environmental Performance negative effects on Carbon Emission Disclosure.

Research findings conducted by (Harjito & Sutopo, 2024) states that Carbon Emission Disclosure arise because it is influenced by leadership roles involving gender, the power that is possessed CEO Women are more dominant in performing earnings management practices than companies with the power they have CEO men. In addition, compensation and reputation for tenure can also be a practical factor Earnings Management influenced by CEO. Companies with diverse boards of directors Gender and the national is expected to successfully implement carbon emission reduction practices and communicate its activities to stakeholders. This is consistent with research conducted by (Harjito & Sutopo, 2024; Meiryani et al., 2023) states that CEO Gender has a positive effect on Carbon Emission Disclosure. However, it is inversely proportional to the research by (Isyiana & Inawati, 2025) states that CEO Gender negative effects on Carbon Emission Disclosure.

Furthermore, Leverage can be a factor that affects the Carbon Emission Disclosure, Leverage It provides an overview of a company's ability to finance the company's operating activities as well as the company's debt-dependent assets. The larger this ratio, the more the

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company also has a lot of debt in financing its assets. Companies with large debts will be careful to disclose and reduce carbon emissions, which includes various costs in preventive measures carbon emission (Claudia & Halik, 2023). This is consistent with research conducted by (Claudia & Halik, 2023; Firdausa et al., 2022; Padila et al., 2025) states that Leverage has a positive effect on Carbon Emission Disclosure. However, it is inversely proportional to the research by (S. D. A. Putri & Amin, 2022; Suhardi, 2025) states that Leverage negative effects on Carbon Emission Disclosure.

Leverage is important to study because its existence can affect the strength and direction of the relationship between independent variables such as environmental performance and CEO gender to carbon emission disclosure. Specifically, leverage as a moderation variable describes the level of a company's dependence on external funding that can influence management's decisions in disclosing environmental information, including carbon emissions. Companies with high levels of leverage tend to be more cautious in their disclosures due to pressure from creditors demanding financial stability, while companies with low leverage may be more open to increasing environmental transparency. Therefore, leverage as a moderation variable can provide a deeper understanding of how a company's financial condition affects the relationship between industry characteristics, environmental performance, and CEO characteristics to the company's carbon emission disclosure rate.

Based on the phenomenon and differences in the results of previous research, the basic material sector listed on the Indonesia Stock Exchange for the period 2022–2024 was chosen as the object of this research. This study aims to analyze the influence of environmental performance and CEO gender on carbon emission disclosure, with leverage as a moderation variable, to make an empirical contribution to the development of environmental accounting literature and sustainability reporting practices in Indonesia, as well as provide critical insights on the limitations of voluntary disclosure regimes and contribute to policy debates on strengthening environmental transparency in Indonesia.

LITERATUR REVIEW

Legitimacy Theory

(Dowling & Pfeffer, 1975) created the theory of organizational legitimacy, focusing on the interaction between companies and society. According to this theory, society is considered a key element in the long-term development of a company. Companies strive to gain legitimacy and strengthen their relationships with the social environment in which they operate. If society does not accept the legitimacy of a company due to violations of previously established rules, the company is required to comply with these rules in order to maintain its legitimacy. Therefore, compliance with regulations is essential to maintain the smooth operation of the company.

Upper Echelon Theory

(Hambrick & Mason, 1984) created the Upper Echelon Theory to explain that the strategies adopted by companies are entirely determined by top management. Their role in company performance and the results achieved by the company are also determined by top management. This theory emphasizes that the characteristics and experiences of executives

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influence how they view situations, make strategic decisions, and take action within the organization (Bromiley & Rau, 2016).

Stakeholder Theory

(Freeman, 1984) created Stakeholder Theory to explain the relationship between organizations and various groups that have an interest in them. This theory states that employee contributions to the company can be influenced by company activities. The main objective of stakeholder theory is to assist management in increasing company value as a result of various activities and minimizing any negative consequences that may arise for stakeholders.

Environmental Performance

(Sudarmanto et al., 2024) states that Environmental Performance refers to a company's operational activities that incorporate elements of control and monitoring to ensure that the environment remains clean and sustainable. Environmental Performance refers to how effectively a company or organization manages and reduces the negative impact of its operations on the environment. This includes various measures, strategies, and practices adopted by companies to ensure that their business activities not only comply with applicable environmental regulations but also contribute positively to overall environmental sustainability (Aurora et al., 2024).

CEO Gender

(Suharnanik, 2023) states that gender is a social construct that encompasses roles, behaviors, identities, and expectations associated with a particular sex in a society. Each society has different norms and values in defining gender, but generally gender is used to divide humans into male or female, and to define different roles and expectations for each sex. The Chief Executive Officer (CEO) plays an important role in corporate governance and influences investor investment decisions. In general, men and women have different positions in decision-making related to social responsibility, especially regarding sustainability (Isyiana & Inawati, 2025).

Leverage

Leverage is a method of measuring balance sheet data integrity by analyzing financial risk to produce reliable information. This evaluation technique highlights the relationship between external and internal financing that plays a role in determining a company's financial resilience. The leverage ratio calculation is the basis for assessing bankruptcy risk and long-term investment feasibility. This means the amount of debt used by a company to fund its operations compared to its own capital (Safariah et al., 2025). In this study, leverage functions not only as a financial ratio but as a source of pressure that can strengthen or suppress managerial influence on welfare.

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Carbon Emission Disclosure

(Widarjo et al., 2024) states that carbon emission disclosure is a practice carried out by companies to record, assess, and report information regarding carbon emissions generated from all operational activities. In Indonesia, disclosure of carbon emissions by companies is still voluntary, where disclosure is still carried out on a voluntary basis. However, the issuance of Presidential Regulation No. 98 on the economic value of carbon is an important indicator of the government's increasing attention and commitment to environmental transparency and accountability. This policy demonstrates the government's awareness of the importance of carbon emissions reporting as part of national climate policy and sustainable development in the business world.

Hypotheses development

Environmental Performance reflects a company's responsibility in managing the impact of its operational activities on the environment. Companies with good environmental performance tend to be more proactive in disclosing carbon emission information as a form of accountability to stakeholders. Based on legitimacy theory, carbon emission disclosure is used by companies to gain social legitimacy by demonstrating compliance with applicable environmental values, norms, and regulations. This is in line with research showing that Environmental Performance has a positive effect on Carbon Emission Disclosure (Dani & Harto, 2022; Priliana & Ermaya, 2023). Based on the above explanation, the researchers formulated the following hypothesis:

H_1: Environmental Performance has a positive effect on Carbon Emission Disclosure.

CEOs play a strategic role in managing companies, including in decision-making related to environmental issues. One characteristic of CEOs that has an influence is gender. Gender diversity in company management can affect information disclosure, particularly related to carbon emissions. Based on Upper Echelon Theory, it shows that a company's board of directors plays an important role because it influences the choices and decisions made by the company. This theory considers gender to be an important construct to explore in the context of carbon emission disclosure. This is in line with research showing that CEO gender has a positive effect on carbon emission disclosure (Harjito & Sutopo, 2024; Meiryani et al., 2023). Based on the above explanation, the researchers formulated the following hypothesis:

H_2: CEO gender has a positive effect on carbon emission disclosure.

Leverage is a measure used to compare a company's total debt to its total assets. Capital obtained through debt can be optimally utilized by the company to develop its operational activities. Leverage provides an overview of a company's ability to finance its operational activities and assets that depend on debt. The higher this ratio, the more debt the company has in financing its assets. Companies with large debts will be careful to disclose and reduce carbon emissions, which include various costs in carbon emission prevention measures. This is in line with research showing that Leverage has a positive effect on carbon emission disclosure (Nugraha, 2024). Based on the above explanation, the researchers formulated the following hypothesis:

H_3: Leverage has a positive effect on carbon emission disclosure.

Environmental performance reflects the measurable results of a company's

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environmental management system in controlling environmental impacts based on environmental policies, targets, and objectives. Good environmental performance demonstrates a company's commitment to sustainability and compliance with applicable social norms and regulations. Based on legitimacy theory, companies are required to gain and maintain public legitimacy through environmental disclosure, including carbon emissions disclosure. Companies with superior environmental performance tend to be more motivated to disclose environmental information as a form of accountability and an effort to maintain their reputation. Leverage plays a role as a factor influencing disclosure decisions. Leverage reflects the degree of a company's dependence on debt-based financing. High leverage increases financial risk which often forces managers to be more cautious in allocating funds for in-depth environmental reporting. Companies with high levels of debt face pressure from creditors and stakeholders to maintain transparency and legitimacy, including in carbon emissions disclosure. Previous studies show that leverage has a positive effect on Carbon Emission Disclosure (Claudia & Halik, 2023; Solekhah & Wahyudi, 2022). Based on the above explanation, the researchers formulated the following hypothesis:

H_4: Leverage strengthens the influence of Environmental Performance on Carbon Emission Disclosure.

As the head of a company, the CEO plays a crucial role in formulating corporate policies. These individual characteristics and personalities are influenced by experience and innate traits, including gender. The CEO plays a strategic role in determining the direction of corporate policies, including those related to social and environmental issues. Based on Upper Echelon Theory, top leadership characteristics, such as gender, influence corporate decision-making and strategy. Based on risk aversion, female CEOs tend to be more sensitive to financial pressure (leverage) and will increase transparency as a strategy to maintain creditor trust. This characteristic is driven by companies' desire to improve transparency and the quality of carbon emissions disclosures. Leverage, as a financial factor, plays a role in strengthening this relationship. Highly leveraged companies face greater reputational risks and pressures, thus requiring more careful risk management. Financial pressure encourages companies to increase environmental transparency. Previous studies show that leverage has a positive effect on Carbon Emission Disclosure (Firdausa et al., 2022; Padila et al., 2025). Based on the above explanation, the researchers formulated the following hypothesis:

H_5: Leverage strengthens the influence of CEO Gender on Carbon Emission Disclosure.

RESEARCH METHOD

This study aims to analyze the relationship between independent variables, namely Environmental Performance and CEO Gender, with the dependent variable Carbon Disclosure, and the moderating variable Leverage. This study uses panel data regression testing. There are three models that can be used to estimate model parameters with panel data, namely the Common Effect Model (CEM), Fixed Effect Model (FEM-Covariance Model), and Random Effect Model (REM). Model selection tests are used to determine the best model among the three regression models, namely the Common Effect Model, Fixed Effect Model, and Random Effect Model. The tests used include the Chow test and Lagrange Multiplier test. To test the hypothesis, this study uses the coefficient of determination test and the t-test.

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Table 1. Variable measuring instruments and sources of measurement

No	Type	Variable	Measurement	Source
1	Independent Variables	Environmental Performance	$GRI\ 300 = \frac{n}{k}$ Description: n: number of items disclosed by the company k: number of items required by GRI 300	(Retnowati & Cahyani Putri, 2024)
2		CEO Gender	Dummy Variable, with the following criteria: Score 1: if the CEO is female Score 0: if the CEO is male	(Isyiana & Inawati, 2025)
3	Dependent Variable	Carbon Emission Disclosure	$\text{CED} = \frac{\Sigma di}{M}\ x\ 100\%$ Description: CED = Carbon Emission Disclosure Σdi = Total overall score 1 obtained by the company M = Maximum total items that can be disclosed	(Almuaromah & Wahyono, 2022)
5	Moderating Variable	Leverage	$\text{DAR} = \frac{\text{Total Liabilitas}}{\text{Total Asset}}\ x\ 100\%$	(Suhardi, 2025)

Source: Data processed by the author (2025)

Based on the established criteria, 66 companies out of 114 companies in the industrial sector were eligible for this study over a period of 3 years and the number of observations was obtained as many as 198 data observations. The technique used in this study was non-probability sampling. Non-probability sampling is a sampling method that basically uses certain considerations used by researchers. The type of non-probability sampling used was purposive sampling. Purposive sampling is a sampling method that selects sample members from a population determined subjectively by the researcher.

Table 2. Sample Selection

Number of basic materials sector companies listed on the Indonesia Stock Exchange as of December 31, 2024		114 Companies
	Criteria	
Criteria 1	Companies in the basic materials sector that are not listed (unlisted) on the Indonesia Stock Exchange in 2022-2024	(6 Companies)
	Companies in the basic materials sector listed on the Indonesia Stock Exchange in 2022-2024	108 Companies

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Criteria 2	The company in the basic materials sector did not submit an Annual Report for the year 2022-2024 that can be used in this research	(27 Companies)
	The company in the basic materials sector has submitted an Annual Report for 2022-2024 which can be used in this research	87 Companies
Criteria 3	Companies in the basic materials sector did not submit a Sustainability Report for 2022-2024 that can be used in this study	(48 Companies)
	The company in the basic materials sector has submitted a Sustainability Report for 2022-2024 which can be used in this research	66 Companies
Company Sample		66 Companies

Total N is 66 x 3 years of research = 198 Data Observations

Source: Data processed (2025)

This study used secondary data, with the data sources used in this study obtained from the financial reports of industrial sector companies listed on the Indonesia Stock Exchange for the period 2022 - 2024, obtained from www.idx.co.id. In obtaining data for this study, two techniques were used, namely literature research and field research. 1) Literature Research, the researcher obtained data related to the issue being studied through previous research journals, books, and the internet related to the research theme. 2) Field Research, the type of data used in this study was secondary data. The research was conducted on basic materials sector companies listed on the Indonesia Stock Exchange for the period 2022 - 2024, whose financial data had been published and audited by public accountants and published in full on the Indonesia Stock Exchange.

RESULTS

Table 3. Descriptive Test Results

	EP	GENDER	CED	LEV
Mean	0.553131	0.398990	0.630303	0.433030
Median	0.560000	0.000000	0.610000	0.420000
Maximum	0.930000	1.000000	0.940000	1.430000
Minimum	0.070000	0.000000	0.330000	0.010000
Std. Dev.	0.190514	0.490932	0.130858	0.252647
Skewness	-0.235188	0.412547	0.086036	0.735432
Kurtosis	2.740286	1.170195	2.497285	3.878711
Jarque-Bera	2.381812	33.23897	2.329237	24.21848
Probability	0.303946	0.000000	0.312042	0.000006
Sum	109.5200	79.00000	124.8000	85.74000
Sum Sq. Dev.	7.150259	47.47980	3.373382	12.57458

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Observations	198	198	198	198

EP: Environmental Performance, GENDER: CEO Gender, CED: Carbon Emission Disclosure , LEV: Leverage
Source : Output Eviews9 (2025)

Selection of the Best Panel Data Model
Chow Test

The criteria for making Chow test decisions are as follows:

1. If the probability (Prob) on Cross Section F < 0.05 then a better model is Fixed effect.
2. If the probability (Prob) on Cross Section F > 0.05 then a better model is Common effect.

Table 4. Chow Test

Effects Test	Statistic	d.f.	Prob.
Cross-section F	1.151892	(65,127)	0.2477
Cross-section Chi-square	91.763422	65	0.0161

Source : Output Eviews9 (2025)

Based on the results of the Chow test using Eviews 9, the cross-section F probability value is 0.2477, which is greater than the significance level (α= 0.05). This means that the best model to use is the Common Effect Model (CEM). Data testing then continues to the Lagrange Multiplier Test.

Lagrange Multiplier Test

The decision-making criteria for the Lagrange Multiplier test are as follows:

1. If the Significance on Both < 0.05 then a better model is the Random effect.
2. If the Significance on Both > 0.05 then a better model is Common effect.

Table 5. Lagrange Multiplier

	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	0.003911 (0.9501)	0.952607 (0.3291)	0.956518 (0.3281)
Honda	-0.062535 --	-0.976016 --	-0.734366 --
King-Wu	-0.062535 --	-0.976016 --	-0.972143 --

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Standardized Honda	0.312202 (0.3774)	-0.697459 --	-6.849338 --
Standardized King-Wu	0.312202 (0.3774)	-0.697459 --	-3.594765 --
Gourierioux, et al.*	--	--	0.000000 (>= 0.10)

*Mixed chi-square asymptotic critical values:	
1%	7.289
5%	4.321
10%	2.952

Source : Output Eviews9 (2025)

Based on the results of the Lagrange multiplier test, the Breusch-Pagan probability value is 0.9501, which is greater than the significance level (α= 0.05). In this case, it means that the best model is the Common Effect Model (CEM).

Multiple Regression Analysis

Table 6. Panel Data Regression Analysis

Variable	Prediction	Coefficient	T-Statistic	Prob.
C		0.627	11.924	0.000
EP	+	-0.022	-0.267	0.394
GENDER	+	-0.053	-1.409	0.080
LEV	+	-0.026	-0.245	0.403
LEV*EP -> CED	+	0.108	0.657	0.255
LEV* GENDER -> CED	+	0.133	1.725	0.04
R-Square				0.042
Adjusted R-Square				0.017
F-Statistic				1.714
Prob (F-statistic)				0.133

EP: Environmental Performance, GENDER: CEO Gender, CED: Carbon Emission Disclosure , LEV: Leverage
Source : Output Eviews9 (2025)

The results of panel data regression estimation using the Common Effect Model (CEM) show the results of testing with panel data regression, so from these results the following model equation is obtained:

CED = 0,62 – 0,022*EP - 0,053*GENDER – 0,026*LEV + 0,108*LEV*EP + 0,133*LEV*GENDER + ε

Coefficient of Determination Test

Table 7. Coefficient of Determination Test

R-squared	0.042743	Mean dependent var	0.630303
Adjusted R-squared	0.017814	S.D. dependent var	0.130858

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S.E. of regression	0.129687	Akaike info criterion	-1.217552
Sum squared resid	3.229193	Schwarz criterion	-1.117907
Log likelihood	126.5376	Hannan-Quinn criter.	-1.177219
F-statistic	1.714621	Durbin-Watson stat	1.994444
Prob(F-statistic)	0.133007		

Source : Output Eviews9 (2025)

R-Squared shows a value of 0.042743, which means that 4.2% of the Environmental Performance and CEO Gender variables can explain the Carbon Disclosure variable, as well as the interaction of Leverage as a moderating variable. This relatively low explanatory power suggests that carbon emission disclosure practices in Indonesia are influenced by many other factors beyond internal company characteristics, such as regulatory pressure, industry type, and media exposure.

Partial Test (T-Test)

Table 8. Partial Test (T-Test)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.627129	0.052593	11.92423	0.0000
EP	-0.022349	0.083481	-0.267707	0.7892
GENDER	-0.053207	0.037758	-1.409168	0.1604
LEV	-0.026706	0.108591	-0.245927	0.8060
LEV*EP	0.108537	0.165137	0.657259	0.5118
LEV*GENDER	0.133581	0.077405	1.725744	0.0860

EP: Environmental Performance, GENDER: CEO Gender, LEV: Leverage
Source : Output Eviews9 (2025)

The results of the test using the Common Effect Model (CEM) can be concluded as follows:

1. Environmental performance with a probability value of 0.7892/2 = 0.3946 > 0.05, can be interpreted that the Environmental performance has a negative effect and is statistically insignificant on Carbon emission disclosure.
2. CEO gender with a probability value of 0.1604/2 = 0.0802 > 0.05, can be interpreted that the CEO gender has a negative effect and is statistically insignificant on Carbon emission disclosure.
3. Leverage with a probability value of 0.8060/2 = 0.4030 > 0.05, can be interpreted that the Leverage has a negative effect and is statistically insignificant on Carbon emission disclosure.
4. The interaction between leverage and environmental performance with a probability value of 0.5118/2 = 0.2559 > 0.05 can be interpreted as leverage not strengthening the influence of environmental performance on carbon emission disclosure.
5. The interaction between leverage and CEO gender with a probability value of 0.0860/2 = 0.0430 < 0.05 can be interpreted as leverage strengthens the influence of CEO gender on carbon emission disclosure.

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DISCUSSIONS

Environmental performance on Carbon emission disclosure

Based on the partial test (t-test) using the Common Effect Model (CEM), the results show a coefficient of -0.022349 with a probability of 0.7892/2 = 0.3946, which is greater than the significance level α = 5% (0.05). From the statistical results, it can be concluded that the first hypothesis (H1) is rejected and it can be concluded that environmental performance has a negative effect and is statistically insignificant on carbon emission disclosure. From the coefficient and probability values above, it can be concluded that companies with better environmental performance do not necessarily disclose carbon emissions more extensively. This condition may be due to the voluntary nature of carbon emission disclosure, so that companies do not make environmental performance the main basis for determining the level of carbon emission transparency. In addition, companies that already have good environmental performance tend to consider carbon emission disclosure not as a strategic priority, but merely as a supplement to sustainability reports. The results of this study indicate that environmental performance has not been able to become a major driving factor in improving corporate carbon emission disclosure practices. Based on legitimacy theory, companies will essentially disclose environmental information to the extent necessary to obtain and maintain legitimacy from the public and stakeholders. Companies with good environmental performance tend to feel that they have met social expectations, so they do not have a strong incentive to increase carbon emissions disclosure more broadly.

These results are in line with the findings (Retnowati & Cahyani Putri, 2024) on basic materials manufacturing companies listed on the Indonesia Stock Exchange (IDX) during the 2018-2022 research period, which states that environmental performance has a negative effect on carbon emission disclosure. This is thought to be because many of the companies in the sample do not have ISO 14001 certification. This is because obtaining international standard environmental certification requires considerable costs, so companies tend to pay more attention to their financial performance than their environmental performance.

CEO gender on Carbon emission disclosure

Based on the partial test (t-test) using the Common Effect Model (CEM), the results show a coefficient of -0.053207 with a probability of 0.1604/2 = 0.0802, which is greater than the significance level α = 5% (0.05). From the statistical results, it can be concluded that the second hypothesis (H2) is rejected and that CEO gender has a negative effect and is statistically insignificant on carbon emission disclosure. From the coefficient and probability values above, it can be concluded that differences in leadership characteristics based on CEO gender have not been able to influence corporate strategic policies related to environmental transparency, particularly in carbon emission disclosure. This may be due to several factors, such as the CEO's limited authority in decision-making related to environmental issues, the dominance of economic interests and pressure from other stakeholders, or company policies that are more influenced by regulations and governance structures than the individual characteristics of the CEO. Although Upper Echelon Theory emphasizes the central role of top managers in determining the strategic direction of a company, these results show that not all characteristics

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of top management automatically have a significant impact on every type of strategic decision, particularly decisions related to compliance and environmental reporting.

These results are in line with the findings (Isyiana & Inawati, 2025) on companies listed in the IDX ESG Leaders from 2020 to 2023, which state that CEO gender has a negative effect on carbon emission disclosure. Variations in carbon emission disclosure are more influenced by institutional and operational factors within companies than by the demographic characteristics of top management. This causes the effect of CEO gender on carbon emission disclosure to be weak and insignificant.

Leverage on Carbon emission disclosure

Based on the partial test (t-test) using the Common Effect Model (CEM), the results show a coefficient of -0.026706 with a probability of 0.8060/2 = 0.4030, which is greater than the significance level α = 5% (0.05). From the statistical results, it can be concluded that the third hypothesis (H3) is rejected and it can be concluded that leverage has a negative effect and is statistically insignificant on carbon emission disclosure. From the coefficient and probability values above, it can be concluded that the company's decision to disclose carbon emission information is not determined by the company's funding structure, particularly the level of dependence on debt. Thus, carbon emission disclosure is likely to be influenced by factors other than leverage. According to legitimacy theory, companies disclose environmental information in an effort to obtain and maintain legitimacy from the public by adjusting their activities and information to social norms and expectations. However, the results of this study indicate that legitimacy pressure related to environmental issues has not been influenced by the company's leverage level. Companies with high leverage tend to prioritize fulfilling their financial obligations to creditors rather than voluntarily disclosing environmental information. Meanwhile, companies with low leverage do not necessarily increase carbon emissions disclosure if legitimacy pressure from the public, regulators, or other stakeholders is still relatively weak.

These results are in line with the findings (Adillah et al., 2025) on energy sector companies listed on the Indonesia Stock Exchange (IDX) from 2019 to 2023, which state that leverage has a negative effect on carbon emission disclosure. This means that the greater a company's fixed debt burden, the more likely it is to refrain from disclosing its carbon information, which is costly, and instead maximize funding for operational activities alone.

Leverage does not strengthen the influence of Environmental performance on Carbon emission disclosure

Based on the partial test (t-test) using the Common Effect Model (CEM), the results show a coefficient of 0.108537 with a probability of 0.5118/2 = 0.2559, which is greater than the significance level α = 5% (0.05). From the statistical results, it can be concluded that the fourth hypothesis (H4) is rejected and it can be concluded that leverage does not strengthen the influence of environmental performance on carbon emission disclosure. This indicates that even though companies have good environmental performance, this is not enough to encourage increased carbon emissions disclosure in highly leveraged companies. Highly leveraged companies tend to focus their attention on meeting financial obligations and

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financial stability, so environmental disclosure is not a top priority, especially when carbon emissions disclosure is still voluntary. Theoretically, these findings show inconsistency with legitimacy theory and stakeholder theory, which expect environmental performance to strengthen environmental transparency, especially in companies with high debt pressure. However, in practice, the interests of key stakeholders such as creditors and investors are still more oriented towards financial information than environmental information. Furthermore, based on agency theory, the management of highly leveraged companies is more focused on fulfilling debt contracts and short-term financial performance, so that environmental performance has not yet functioned effectively as a moderating variable.

These results are in line with the findings (S. D. A. Putri & Amin, 2022) on primary consumer goods companies (consumer non-cyclicals) listed on the Indonesia Stock Exchange from 2019 to 2021, indicating that leverage does not affect carbon emission disclosure. This indicates that the level of corporate debt is not a major factor in encouraging companies to disclose information related to carbon emissions.

Leverage strengthens the influence of CEO gender on Carbon emission disclosure

Based on the partial test (t-test) using the Common Effect Model (CEM), the results show a coefficient of 0.133581 with a probability of 0.0860/2 = 0.0430, smaller than the significance level α = 5% (0.05). From the statistical results, it can be concluded that the fifth hypothesis (H5) is accepted and it can be concluded that leverage strengthens the influence of CEO gender on carbon emissions disclosure. This indicates that the gender characteristics of CEOs play an important role in driving corporate responses to financial pressures and demands for transparency. CEOs with certain gender characteristics tend to have a more cautious leadership style, are oriented towards transparency, and are sensitive to sustainability issues, thereby encouraging increased carbon emissions disclosure in highly leveraged companies. These results support the upper echelons theory, which states that the demographic characteristics of top leaders influence corporate strategic decision-making. Furthermore, in line with stakeholder theory, the presence of CEOs with certain gender characteristics helps companies respond to stakeholder accountability demands through improved environmental disclosure quality.

These results are in line with the findings (Padila et al., 2025) on manufacturing companies listed on the Indonesia Stock Exchange (IDX) in 2020 to 2023, stating that leverage affects carbon emission disclosure. This reflects that companies with debt are required to pay more attention to carbon emission reporting, as it can build a positive image as an entity that cares about crucial environmental issues.

CONCLUSIONS

1. Environmental performance has a negative effect and is statistically insignificant on carbon emission disclosure. This means that a company's environmental performance level has not been able to consistently encourage increased carbon emission disclosure. Companies with better environmental performance do not always feel the need to disclose carbon emission information more widely, so disclosure has not become a top

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priority in corporate environmental reporting strategies.

2. CEO gender has a negative effect and is statistically insignificant on carbon emission disclosure. This means that CEO gender differences have not been proven to influence company policy on carbon emission disclosure. This shows that decisions related to carbon emission disclosure are more influenced by collective company policy than by the personal characteristics of the CEO, including gender differences.
3. Leverage has a negative effect and is statistically insignificant on carbon emission disclosure. This means that the level of a company's dependence on debt financing has no significant effect on the extent of carbon emission disclosure. These results indicate that market mechanisms or legitimacy pressures in Indonesia are not yet working effectively. Many companies boast good operational environmental performance (PROPER), but this doesn't necessarily translate into transparent carbon reporting due to weak sanctions.
4. Leverage does not strengthen the influence of environmental performance on carbon emission disclosure. This means that the financial condition of a company, as indicated by its leverage level, has not been able to encourage companies with good environmental performance to disclose carbon emissions more extensively. In other words, leverage does not act as a driving factor that strengthens the relationship between environmental performance and carbon emission disclosure.
5. Leverage strengthens the influence of CEO gender on carbon emission disclosure. This means that in companies with higher leverage levels, the gender of the CEO plays a more significant role in influencing carbon emission disclosure policies. It suggests that creditor pressure only effectively influences issuance transparency when led by CEOs with certain characteristics that are more responsive to financial reputational risk. Financial pressure from debt may encourage CEOs, particularly those with certain leadership characteristics, to increase transparency in an effort to maintain creditor and stakeholder trust.

1. Future research may consider other variables such as environmental governance, green accounting, media exposure, or environmental sensitivity. The addition of these variables is expected to provide a more comprehensive picture of the factors that influence carbon emission disclosure. In addition, other variables such as company size, profitability, corporate governance, or firm age may be added as moderators to strengthen and deepen the analysis results.
2. Future research is advised to use different measurements in measuring carbon emission disclosure, environmental performance, and leverage. For example, carbon emission disclosure can be measured using the latest GRI-based index or other international standards, environmental performance can be measured using PROPER, and leverage can be measured using alternative ratios such as debt to equity ratio or long-term debt ratio.
3. Further research should use a longer observation period in order to capture carbon emission disclosure trends more accurately and reflect the long-term sustainability of companies. In addition, expanding the number of companies sampled is also expected to improve the generalization of research results.
4. Future research could compare the basic materials sector with other sectors such as

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transportation and logistics, energy, or infrastructure to see whether the variables affecting carbon emission disclosure show different trends in each sector, both positively and negatively.

5. Regulators such as the Financial Services Authority (OJK) should create policies requiring disclosure of carbon emissions for high-risk sectors (such as basic materials) to increase transparency.

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