The effect of accrual-based and real-based earnings management on carbon emission disclosure

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Abstract

Amid increasing global attention to sustainability, carbon emission disclosure (CED) has emerged as a critical mechanism for enhancing corporate accountability. Yet, the reliability of CED can be undermined by earnings management practices that mask firms' true performance. This study examines the influence of accrual-based and real-based earnings management that have the proxies as abnormal cash flows, production costs, and discretionary expenses on CED. Using panel data from energy, basic materials, transportation, and agriculture firms listed on the Indonesia Stock Exchange (IDX) over the 2019–2023 period, the results reveal heterogeneous effects: abnormal cash flows and overproduction significantly reduce the extent of CED, whereas lower discretionary expenses are associated with greater disclosure. These findings advance the literature by illustrating how distinct earnings management strategies differentially shape corporate environmental transparency. Despite inherent limitations in measurement and market scope, the study contributes to sustainability reporting research in emerging markets and offers practical insights for regulators and stakeholders aiming to strengthen the credibility of environmental disclosures.

Keywords: *carbon emission disclosure; accrual-based earnings management; real-based earnings management; greenhouse gas emission*

Abstrak

Seiring meningkatnya perhatian terhadap isu lingkungan global, pengungkapan emisi karbon (CED) menjadi instrumen penting bagi perusahaan untuk menunjukkan akuntabilitas. Namun, CED dapat dipengaruhi oleh manajemen laba yang menyamarkan kondisi keuangan. Penelitian ini menganalisis pengaruh manajemen laba berbasis akrual dan riil yang diukur melalui arus kas abnormal, biaya produksi, dan beban diskresioner terhadap CED, dengan independensi dewan sebagai variabel moderasi. Menggunakan data perusahaan sektor energi, bahan baku, transportasi, dan pertanian di BEI periode 2019–2023, hasil penelitian menunjukkan bahwa manajemen laba melalui arus kas dan overproduction berdampak negatif, sedangkan pengurangan beban diskresioner berdampak positif terhadap CED. Independensi dewan tidak memoderasi pengaruh tersebut secara signifikan, menandakan perannya yang terbatas. Terlepas dari keterbatasan lingkup pasar, sifat pengungkapan sukarela, dan penggunaan satu variable tata kelola, penelitian ini memberikan wawasan penting bagi peningkatan kualitas pelaporan lingkungan di negara berkembang.

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Kata kunci: *pengungkapan emisi karbon; manajemen laba berbasis akrual; manajemen laba berbasis aktivitas riil; emisi gas rumah kaca*

INTRODUCTION

The intensification of climate-related litigation reflects growing scrutiny of corporate responsibility for environmental degradation. For example, in 2023 residents of Pari Island sued Holcim Ltd in the Zug Court, Switzerland, alleging that the company's operations contributed to coastal erosion, saltwater intrusion, and ecosystem damage that threatened community livelihoods (Nurfaizah, 2023). Such cases highlight the increasing expectation that firms demonstrate accountability for their carbon emissions through transparent reporting. Carbon emission disclosure (CED) has thus emerged as a central mechanism of corporate legitimacy, consistent with the Triple Bottom Line principle of balancing profit, people, and planet (Farha et al., 2022).

Globally, voluntary carbon reporting has expanded rapidly. The carbon disclosure project (2023) recorded over 23,000 disclosing firms in 2023, a 24 percent increase from the previous year and a 140 percent increase since 2020. In Indonesia, identified as the ninth-largest carbon emitter worldwide (International Energy Agency, 2022), the government has pledged carbon neutrality by 2060 and introduced the carbon economic value framework under presidential regulation No. 98/2021. Similarly, the PROPER environmental performance program reported cumulative reductions of 299.6 million tons of CO_2-equivalent emissions through more than one thousand eco-innovation initiatives (PROPER, 2023). Nevertheless, prior research shows that disclosures are often compliance-driven or symbolic, raising concerns about their credibility and alignment with stakeholder expectations (Nilasakti et al., 2024).

While CED is designed to enhance transparency and reduce risks of reputational loss, litigation, and declining demand (Berthelot & Robert, 2011), it may also impose additional costs, depress firm value (Coburn et al., 2011), and provide opportunities for opportunistic behaviour. Earnings management (EM), defined as the use of accounting discretion or operational decisions to influence reported outcomes (Kamaludin & Wiardi, 2022), plays a critical role in this dynamic. EM may artificially improve reported earnings but weaken the informativeness of financial statements, eroding stakeholder trust (Helda et al., 2022; Susanto, 2017). Managers may therefore strategically employ environmental disclosure as a tool to counterbalance skepticism, preserve legitimacy, and mitigate monitoring pressures (Hoi et al., 2013; Prior et al., 2008).

Despite the growing emphasis on sustainability, carbon emission disclosure in emerging economies such as Indonesia remains largely voluntary, leading to substantial variation in reporting quality and credibility (Nilasakti et al., 2024). In this context, earnings management can significantly distort the integrity of sustainability reporting, as managers may exploit disclosure practices to legitimize firm activities rather than to enhance transparency. Moreover, the absence of standardized reporting frameworks comparable to those widely adopted in developed markets further exacerbates these challenges, leaving stakeholders with limited assurance regarding the reliability of CED (Liu et al., 2023). These conditions underscore the importance of examining how different earnings management practices interact with voluntary disclosure systems in Indonesia's capital market, where firms face increasing pressure to balance financial performance with environmental accountability.

Extant evidence suggests that EM, whether accrual-based or real activity-based, tends to diminish the credibility of non-financial reporting, including CED (Astari et al., 2020; Khuong et al., 2023; Liu et al., 2023). Yet, real earnings management (REM) is heterogeneous in nature. Abnormal operating cash flows and production costs are often associated with reduced

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disclosure, whereas lower discretionary expenses may correspond to higher disclosure, potentially reflecting symbolic greenwashing (Rahayu et al., 2021). Nonetheless, much of the literature treats REM as a uniform construct, neglecting these nuanced effects. This gap limits understanding of how specific types of EM influence environmental transparency, particularly in emerging economies where disclosure remains largely voluntary.

Accordingly, this study seeks to examine the relationship between earnings management and carbon emission disclosure (CED), focusing on both accrual-based and real activities manipulation. Real earnings management is analysed through three common proxies: abnormal cash flows, abnormal production costs, and abnormal discretionary expenses. Furthermore, this study investigates whether such practices constrain or promote transparency in environmental reporting. By integrating these perspectives, the research provides a comprehensive assessment of how different earnings management strategies may influence corporate disclosure of carbon emissions.

LITERATURE REVIEW

Corporate reporting is not merely a technical exercise of conveying financial and non-financial information; it is also shaped by underlying theoretical perspectives that explain managerial behaviour and stakeholder expectations. In the context of environmental disclosure, particularly CED, theories of the firm provide valuable insights into why companies voluntarily disclose, how such disclosures are perceived, and whether they genuinely enhance transparency or merely serve symbolic purposes. Among the most relevant perspectives are agency theory and stakeholder theory, which together illuminate the dual nature of disclosure as both an accountability mechanism and a potential tool for opportunistic impression management.

Agency theory explains the principal–agent relationship in which shareholders (principals) delegate decision-making authority to managers (agents) who control corporate resources (Jensen & Meckling, 1976). Divergent interests and information asymmetry create the potential for agency problems, as managers may act in self-interest rather than in alignment with shareholder wealth. A common outcome of such conflicts is earnings management (EM), where managers manipulate accounting figures or operational choices to achieve targeted outcomes (Healy & Wahlen, 1998).

Through the agency lens, EM undermines the informativeness of financial reports, erodes investor trust, and increases monitoring costs. The problem is amplified in contexts with weak governance structures, such as concentrated ownership or ineffective boards, which limit shareholders' ability to constrain managerial discretion (Garcia-Sanchez et al., 2020). In such settings, non-financial reporting, including CED, may also become susceptible to opportunistic use. Managers can strategically increase disclosure to offset the negative perception of manipulated earnings, thereby reducing scrutiny and preserving legitimacy (Hoi et al., 2013; Prior et al., 2008). Rather than serving as a genuine accountability mechanism, disclosure may thus be deployed as an impression management strategy.

Stakeholder theory broadens the scope of corporate accountability by positing that firms are responsible not only to shareholders but to a wide array of stakeholders, including employees, consumers, regulators, communities, and the natural environment (Freeman & McVea, 2001). Within this framework, CED becomes a key mechanism to communicate environmental responsibility, address stakeholder concerns, and sustain long-term legitimacy. Transparent disclosure helps reduce reputational risks, safeguard market demand, and mitigate litigation threats (Berthelot & Robert, 2011).

However, stakeholder theory also recognizes the risk of symbolic disclosure. Under growing societal pressure for sustainability, firms may disclose extensively but superficially, producing

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reports that emphasize form over substance. This practice often referred to as greenwashing, signals compliance without necessarily reflecting genuine improvements in environmental performance (Liu et al., 2023). Such tendencies are particularly evident in emerging markets like Indonesia, where voluntary disclosure regimes and weak enforcement contribute to significant variability in disclosure quality. Thus, while stakeholder theory frames disclosure as a means of accountability, in practice it may be strategically exploited to secure legitimacy.

Taken together, agency and stakeholder theories provide complementary explanations for the dynamics of EM and CED. In emerging economies such as Indonesia, the interaction of these perspectives becomes particularly salient. Weak governance mechanisms, high ownership concentration, and the absence of standardized reporting frameworks provide fertile ground for managerial opportunism (Nilasakti et al., 2024). At the same time, rising stakeholder expectations and government initiatives toward carbon neutrality increase pressure on firms to demonstrate accountability through disclosure. This dual environment makes CED simultaneously a tool for genuine transparency and a potential instrument of strategic impression management.

Earnings management and carbon emission disclosure

Earnings management (EM) has been widely recognized as a managerial practice that reflects the tension between opportunism and accountability within corporate decision-making (Dechow et al., 1995; Healy & Wahlen, 1998). It is broadly defined as the deliberate intervention in financial reporting to achieve desired outcomes, either to mislead stakeholders or to influence contractual arrangements (Susanto, 2017). Managers frequently engage in EM to smooth income, avoid losses, or meet earnings benchmarks, thereby presenting a more favourable view of firm performance (Helda et al., 2022; Roychowdhury, 2006).

Two dominant forms of EM are identified in the literature. Accrual-based earnings management (AEM) manipulates accounting estimates such as provisions, depreciation, or revenue recognition, while real earnings management (REM) alters underlying operational activities including sales, production, and discretionary spending. Although AEM is relatively easier to detect due to regulatory oversight and advances in auditing, REM is more subtle and potentially more damaging to long-term firm value, as it distorts actual business operations and reduces future cash flows.

These practices are not limited to shaping financial outcomes; they also extend to the domain of non-financial disclosure, particularly environmental reporting. Managers concerned about the potential exposure of opportunistic earnings behaviour may strategically adjust disclosure practices to maintain legitimacy and manage stakeholder perceptions. In this sense, EM and CED are intertwined as complementary instruments of impression management: while EM affects the credibility of financial information, CED serves as a signalling mechanism through which firms attempt to balance or conceal reputational risks arising from opportunistic reporting.

Carbon emission disclosure (CED) has emerged as a vital component of corporate transparency, especially as climate change intensifies global scrutiny on corporate responsibility (Choi et al., 2013). However, disclosure decisions are not purely a matter of regulatory compliance; they are also subject to managerial discretion. From an agency theory perspective, managers may suppress or manipulate disclosure to conceal opportunistic earnings practices, thereby avoiding reputational or regulatory consequences (Khuong et al., 2023; Prior et al., 2008). In contrast, stakeholder theory suggests that firms may strategically use CED to signal legitimacy and satisfy external demands, even when disclosure does not fully reflect substantive environmental performance (Astari et al., 2020; Cho et al., 2015). This duality highlights how EM and CED interact as complementary tools in impression management.

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Evidence indicates that firms engaging in AEM are more likely to disclose less information on carbon emissions, as environmental transparency could expose inconsistencies between manipulated financial results and actual firm performance (Ali et al., 2021; Khuong et al., 2023). For instance, aggressive accrual adjustments such as revenue acceleration or expense deferrals enable managers to meet financial targets without altering operations, but this often coincides with reduced voluntary disclosures that could undermine the credibility of manipulated earnings. Therefore, it is expected that higher AEM levels are associated with lower CED.

The relationship between REM and CED is more complex. First, manipulation of operating cash flows, for example, through accelerating sales with deep discounts or delaying payments, tends to reduce disclosure, since firms may prefer to limit non-financial transparency that could raise questions about operational sustainability (Kim, 2012; Liu et al., 2023). Second, REM via overproduction reduces cost per unit and temporarily inflates margins but usually generates surplus inventory and higher energy consumption, thereby increasing emissions. To obscure these inefficiencies, managers may strategically reduce CED (Liu et al., 2023). These patterns align with agency theory, which predicts that managers prioritize short-term profitability at the expense of transparency.

In contrast, REM through discretionary expense reduction may produce different outcomes. Cutting costs in R&D, advertising, or CSR projects helps managers boost short-term earnings, but it can simultaneously draw criticism regarding the firm's long-term commitment to sustainability. To counterbalance this perception, firms may paradoxically increase carbon disclosures as a symbolic gesture to maintain legitimacy and meet stakeholder expectations (Garcia-Sanchez et al., 2020; Rahayu et al., 2021). This behaviour is consistent with stakeholder theory, as firms use disclosure strategically as an impression management tool, rather than as a reflection of substantive environmental performance.

Taken together, these insights suggest that EM is not only a mechanism for manipulating financial outcomes but also a determinant of environmental transparency. AEM generally suppresses disclosure to protect managerial opportunism, while REM exhibits heterogeneous effects depending on the mechanism employed: cash flow and production-related manipulation reduce transparency, whereas discretionary expense manipulation may increase symbolic disclosure. This nuanced view underscores the importance of disentangling specific EM practices when evaluating their implications for carbon reporting, particularly in voluntary disclosure environments such as Indonesia. Hence, the following hypotheses are presented:

H_1: Accrual-based earnings management has an effect on carbon emission disclosure.
H_2: Real-based earnings management from abnormal cash flow operations has an effect on carbon emission disclosure.
H_3: Real-based earnings management from abnormal production costs has an effect on carbon emission disclosure.
H_4: Real-based earnings management from abnormal discretionary expenses has an effect on carbon emission disclosure.

RESEARCH METHODOLOGY

This study adopts a quantitative research methodology, emphasizing the systematic, objective, and replicable collection and analysis of numerical data to identify measurable relationships among the examined variables. Quantitative methods enable researchers not only to determine the presence of specific attributes but also to assess the extent to which such attributes are exhibited across different entities (Hair et al., 2018). This aligns with the purpose

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of the present study, which seeks to investigate how accrual-based and real earnings management practices influence carbon emission disclosure (CED) among publicly listed firms.

The study relies on secondary data drawn from the Indonesia Stock Exchange (IDX) for the 2019–2023 period, utilizing both annual reports and sustainability reports as the sources. The unit of analysis is the organizational level, focusing on companies operating within the energy, basic materials, transportation, and agriculture sectors. These industries were deliberately selected because they are classified as the four priority sectors for emission reduction by the Ministry of National Development Planning (BAPPENAS), as stipulated in Presidential Regulation No. 98 of 2021. This research uses SPSS 25 to test the hypothesis.

Dependent variable

Carbon emission disclosure (CED) is measured using a disclosure index adapted from Choi et al. (2013), which is based on the guidelines of the carbon disclosure project (CDP), an internationally recognized framework for voluntary climate-related reporting. Each disclosure item is scored using a binary system, where a value of 1 is assigned if the firm reports the item and 0 otherwise, with the final CED score calculated as the ratio of reported items to the maximum possible score. Higher scores indicating more comprehensive disclosure. The detailed checklist of disclosure items applied in this study is presented in Table 1.1.

Table 1. CED checklists

Category	Item	Description
Climate change: risk and opportunities	CC1	Explanation of potential climate-related risks, compliance-related, environmental, or broader organizational concerns and the corresponding mitigation measures planned by the company.
	CC2	Description of how climate change currently affects, the company's financial standing, operations, and related strategic opportunities.
GHG emission accounting	GHG1	Clarification of the approach or standards used in calculating greenhouse gas emissions (such as the GHG Protocol or ISO frameworks).
	GHG2	Statement regarding whether third-party verification of GHG emission figures is conducted, including the verifying party and the criteria used.
	GHG3	Reporting the total volume of GHG emissions, expressed in metric tons of carbon dioxide equivalent (CO_2e).
	GHG4	Disclosure of emissions categorized by Scope 1 and 2, and, if applicable, Scope 3 emissions.
	GHG5	Classification of GHG release by source category (e.g., coal, electricity, etc.).
	GHG6	Emission data presented by individual facilities or operational segments.
	GHG7	Comparative analysis of GHG emission levels over multiple reporting years.
Energy consumption accounting	EC1	Total energy usage reported in standard energy units such as terajoules or petajoules.
	EC2	Quantitative disclosure of energy obtained from low-carbon sources.

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	EC3	Energy usage classified by energy source, facility, or business division.
GHG reduction and cost	RC1	Outline of existing or planned strategies for lowering the release of GHG.
	RC2	Outline of intended emission mitigation levels along with the year by which they are to be achieved.
	RC3	Disclosure of emissions reduced to date under the plan, including the associated costs or savings.
	RC4	Inclusion of projected carbon-related costs within capital investment decisions.
Carbon emission accountability	ACC1	Identification of the board committee responsible for climate-related initiatives.
	ACC2	Explanation of the internal mechanisms employed by the board or management to oversee and assess advancements in climate initiatives.

Independent variable

Accrual-based earnings management (AEM)

AEM is measured using discretionary accruals estimated through the modified Jones model (Jones, 1991). In this approach, total accruals are first computed, after which the non-discretionary component is separated to obtain discretionary accruals as the primary proxy of earnings manipulation. Firms with higher discretionary accruals are considered to engage in greater earnings manipulation, while lower values indicate higher earnings quality (Dechow et al., 1995). The following equation is used.

$$TAC_{it} = NI_{it} - CFO_{it}$$

OLS regression is employed to measure the value of total accruals (TAC) as follows:

$$\frac{TAC_{it}}{A_{it-1}} = \beta 1 \frac{1}{A_{it-1}} + \beta 2 \frac{\Delta REV_{it}}{A_{it-1}} + \beta 3 \frac{PPE_{it}}{A_{it-1}} + \varepsilon$$

The computation of non-discretionary accruals (NDA) is performed by applying the formula provided:

$$NDA_{it} = \beta 1 \frac{1}{A_{it-1}} + \beta 2 \frac{\Delta REV_{it} - \Delta REC_{it}}{A_{it-1}} + \beta 3 \frac{PPE_{it}}{A_{it-1}} + \varepsilon$$

$$DA_{it} = \frac{TAC_{it}}{A_{it-1}} - \beta 1 \frac{1}{A_{it-1}} + \beta 2 \frac{\Delta REV_{it}}{A_{it-1}} + \beta 3 \frac{PPE_{it}}{A_{it-1}} + \varepsilon$$

Real-based earnings management (REM)

The measurement technique for REM adopts the model developed by Roychowdhury (2006) and Chen & Hung (2020).

REM from abnormal cash flow operation

Abnormal REM through cash flow operations is calculated from the model presented below:

$$\frac{CFO_{it}}{A_{it-1}} = \alpha_0 + \alpha_1 \left(\frac{1}{A_{it-1}}\right) + \beta_1 \left(\frac{S_{it}}{A_{it-1}}\right) + \beta_2 \left(\frac{\Delta S_{it}}{A_{it-1}}\right) + \varepsilon$$

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REM from abnormal production cost

Abnormal REM through production costs is measured from the model presented below:

$$\frac{COGS_{it}}{A_{it-1}} = \alpha_0 + \alpha_1\left(\frac{1}{A_{it-1}}\right) + \beta\left(\frac{S_{it}}{A_{it-1}}\right) + \varepsilon$$

$$\frac{\Delta INV_{it}}{A_{it-1}} = \alpha_0 + \alpha_1\left(\frac{1}{A_{it-1}}\right) + \beta_1\left(\frac{\Delta S_{it}}{A_{it-1}}\right) + \beta_2\left(\frac{\Delta S_{it-1}}{A_{it-1}}\right) + \varepsilon$$

$$\frac{PROD_{it}}{A_{it-1}} = \alpha_0 + \alpha_1\left(\frac{1}{A_{it-1}}\right) + \beta_1\left(\frac{S_{it}}{A_{it-1}}\right) + \beta_2\left(\frac{\Delta S_{it}}{A_{it-1}}\right) + \beta_3\left(\frac{\Delta S_{it-1}}{A_{it-1}}\right) + \varepsilon$$

REM from abnormal discretionary expenses

Abnormal REM through discretionary expenses is measured using model as follows:

$$\frac{DISEXP_{it}}{A_{it-1}} = \alpha_0 + \alpha_1\left(\frac{1}{A_{it-1}}\right) + \beta\left(\frac{S_{it}}{A_{it-1}}\right) + \varepsilon$$

The value of the residual is a way to measure abnormal value, which represent deviations from normal value and are assumed to reflect managerial manipulation.

Data analysis method

This study applies a structured quantitative analysis beginning with descriptive statistics to capture the distributional characteristics of variables, identify potential outliers, and provide an overview prior to further testing (Sugiyono, 2023). To ensure unbiased estimation, classical assumption tests are conducted. Normality is assessed using the Kolmogorov–Smirnov test, with residuals considered normal if the significance level exceeds 0.05. Multicollinearity is examined through tolerance and variance inflation factor (VIF), where tolerance values below 0.10 or VIF values above 10 indicate multicollinearity. Heteroscedasticity is tested using the Glejser method, with the model deemed free of heteroscedasticity if significance values exceed 0.05 (Ghozali, 2018).

Regression analysis is then employed to examine the relationship between EM and CED. The regression model is as follows:

$$CED = \beta_0 + \beta_1 AEM + \beta_2 REM_{CFO} + \beta_3 REM_{PROD} + \beta_4 REM_{DISEXP} + \varepsilon$$

Hypothesis testing

Hypothesis testing involves three stages. First, the coefficient of determination (R^2) evaluates the explanatory power of independent variables. Second, the F-test assesses whether independent variables jointly influence CED at a 5% significance level. The t-test examines the individual significance of each explanatory variable, where coefficients are considered significant if the p-value is below 0.05 or the t-statistic exceeds the critical value (Hair et al., 2018). The formula df = n – k – 1 is applied to calculate the degrees of freedom (df), where *n* indicating the sample size and *k* representing the number of predictors in the model.

RESULTS AND DISCUSSION

Descriptive statistics

Descriptive statistical testing serves to describe or provide an overview of the objects under study, encompassing the lowest and highest values, the average, and the standard deviation.

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Table 2. Descriptive statistics result

	N	Minimum	Maximum	Mean	Std. deviation
CED	180	,33	1,00	,7287	,16477
AEM	180	-,22	,54	-,0110	,09224
REM_CFO	180	-,20	,32	,0118	,09142
REM_PROD	180	-,23	,55	,0133	,08824
REM_DISEXP	180	-,09	,30	,0026	,03483
Valid N (listwise)	180				

The lowest value of carbon emission disclosure (CED) was 0.33, recorded by PT Indika Energy Tbk., while the highest was 1.00 for PT Perusahaan Gas Negara Tbk. The average CED level reached 72.87% with a standard deviation of 0.16477, indicating that most firms exhibit relatively high and consistent disclosure, though variations exist among companies with lower or higher levels.

AEM had a mean of -0.0110, suggesting that firms generally apply accrual adjustments conservatively. The range of -0.22 to 0.54 reflects the presence of both income-decreasing and income-increasing practices, while the standard deviation of 0.09224 indicates moderate variation across companies.

For REM, all three proxies show limited manipulation. REM_CFO averaged 0.0118 (SD = 0.09142) with values between -0.20 and 0.32, suggesting variability in operational cash flow adjustments. REM_PROD reported the highest mean of 0.0133 (SD = 0.08824) with a range of -0.23 to 0.55, reflecting differences in production activity strategies. Meanwhile, REM_DISEXP had the lowest mean of 0.0026 (SD = 0.03483) with a narrower range of -0.09 to 0.30, indicating that reducing discretionary expenses is the least prevalent and least varied form of earnings manipulation.

Normality test

To assess the normal distribution of residuals, a normality test is performed, ensuring that the regression model satisfies the fundamental assumptions required for statistical validity. This study draws on the One-Sample Kolmogorov-Smirnov test.

Table 3. Normality test result

Normality test	Result
Asymp. sig. (2-tailed)	0,200

The asymp. sig. (2-tailed) value of 0.200 (> 0.05) indicates that the regression residuals are normally distributed, thereby fulfilling the normality assumption for valid statistical inference.

Multicollinearity test

Multicollinearity serves to find out if the independent variables are strongly related to each other. Multicollinearity is assessed by examining the Tolerance and VIF values.

Table 4. Multicollinearity test result

	Collinearity statistics	
	Tolerance	VIF
AEM	,928	1,078
REM_CFO	,897	1,115
REM_PROD	,945	1,059
REM_DISEXP	,989	1,014
a. Dependent variable: CED		

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All variables show VIF values lower than 10 and tolerance values exceeds 0,10, suggesting that there is no substantial multicollinearity among the predictors. It confirms that each independent variable contributes uniquely to explaining variations in the dependent variable.

Heteroscedasticity test

The Glejser test is employed to evaluate whether residual variance is constant across predictor levels, as heteroscedasticity can bias standard errors and weaken the reliability of significance testing. It is ensuring that the regression model produces robust and valid inferences.

Table 5. Heteroscedasticity test result

	B	Std. Error	Beta	t	Sig.
(Constant)	,106	,007		16,029	,000
AEM	,121	,072	,129	1,671	,096
REM_CFO	,065	,074	,069	,874	,383
REM_PROD	,013	,075	,013	,168	,867
REM_DISEXP	,272	,186	,110	1,463	,145

a. Dependent variable: ABS_RES

All independent variables exhibit significance values above 0.05, indicating the absence of heteroscedasticity and confirming that the regression model is free from variance distortion issues.

Hypothesis testing

The regression analysis examines both AEM and REM, captured through irregularities in operational cash flows, production costs, and discretionary expenses in relation to CED as the dependent variable.

Table 6. Determination coefficient test (R^2)

R	R^2	Adjusted R^2	Std. error of the estimate
,553[a]	,305	,289	,13889

a. Predictors: (Constant), REM_DISEXP, REM_CFO, REM_PROD, AEM

The R^2 value shown 0,305, which means that 30,5% of differences in CED levels can be explained through AEM and REM. While the rest of 69,5% is explained by factors outside the scope of the model.

Table 7. F-test result

	Sum of squares	df	Mean square	F	Sig.
Regression	1,484	4	,371	19,229	,000[b]
Residual	3,376	175	,019		
Total	4,860	179			

a. Dependent variable: CED

b. Predictors: (Constant), REM_DISEXP, REM_CFO, REM_PROD, AEM

The regression model yields an F-statistic of 19.229 with a significance level of 0.000, exceeding the F-table value of 2.42 (df1 = 4, df2 = 175), indicating that all independent variables jointly exert a statistically significant effect on carbon emission disclosure (CED).

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Table 8. T-test result

	B unstand.	Std. Error	B stand.	t	Sig.
(Constant)	,727	,011		68,081	,000
AEM	-,935	,177	-,523	-8,000	,000
REM_CFO	-,486	,120	-,269	-4,049	,000
REM_PROD	-,386	,121	-,207	-3,187	,002
REM_DISEXP	,825	,300	,174	2,748	,007

b. Dependent variable: CED

The presentation of the regression model in this study is as follows:

CED = 0,727 – 0,935 AEM – 0,486 REM_CFO – 0,386 REM_PROD + 0,825 REM_DISEXP

Accrual-based earnings management on carbon emission disclosure

The t-test for AEM is -8,000 of 1,97361, with a coefficient of -0,935 and an alpha level of 0,000 ($p < 0,05$), indicating that AEM has a significant negative effect on CED. Firms employing AEM may limit voluntary environmental reporting to preserve favourable financial appearances and meet short-term performance goals. Given that accruals rely on internal estimates, they are less transparent, enabling managers to strategically control disclosure without immediate scrutiny.

The significant negative effect of AEM on CED can be understood through the strategic trade-off managers face between short-term financial objectives and long-term transparency obligations. By adjusting accruals, managers can manipulate reported earnings to meet market or internal targets while simultaneously constraining environmental disclosures, thereby mitigating scrutiny from stakeholders. This behaviour allows firms to maintain an appearance of financial stability and performance, even when sustainability practices may be compromised. The reliance on internal estimates in accruals further facilitates this selective reporting, as it is less observable to external parties, enabling managers to exercise discretion over which information is disclosed or withheld.

Khuong et al. (2023) argue that greater engagement of AEM is related to weaker environmental responsibility performance, as firms reduce disclosure to conceal opportunistic behaviour. Similar evidence is presented by Ehsan et al. (2021) and Ali et al. (2021) who showed that earnings-managing firms are less likely to provide credible non-financial environmental disclosures. This finding reinforces agency theory, which reflects managerial opportunism, where managers prioritize short-term financial appearances over transparency and sustainability, leading to reduced environmental disclosures.

Real-based earnings management from abnormal cash flow operations on carbon emission disclosure

The t-test for REM CFO is -4,049 of 1,97361, with a coefficient of -0,486 and an alpha level of 0,000 ($p < 0.05$), indicating that REM from abnormal CFO has a significant negative effect on CED. Firms manipulating operational cash flows may decrease transparency to maintain managerial discretion and control over reported performance. These practices can obscure the relationship between actual operations and environmental outcomes, reducing the credibility of corporate disclosures.

Firms employing REM often neglect environmental disclosure to avoid conflicting signals or regulatory backlash (Liu et al., 2023). REM strategies often go hand-in-hand with a deliberate reduction in transparency to preserve managerial discretion and avoid reputational consequences (Kim, 2012). From an agency perspective, managers act to optimize personal or short-term corporate objectives, sometimes at the expense of stakeholder interests. Stakeholder

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theory further explains that firms balance internal goals with external expectations, often limiting disclosure to prevent reputational damage or regulatory scrutiny.

Real-based earnings management from abnormal production costs on carbon emission disclosure

The t-test for REM_PROD is -3,187 of 1,97361, with a coefficient of -0,386 and an alpha level of 0,002 ($p < 0,05$), indicating that REM from abnormal production costs has a significant negative effect on CED. Firms overproducing to reduce unit costs often generate higher emissions and operational inefficiencies, which they may conceal by limiting disclosure. This suggests a strategic trade-off between financial optimization and environmental transparency.

Agency theory explains that managers, acting in self-interest, may prioritize short-term profit over full transparency, selectively disclosing information to avoid exposing inefficiencies or environmental impacts. Liu et al. (2023) confirmed that firms engaging in REM through production tend to reduce environmental disclosures to limit visibility into their operating practices. Similarly, stakeholder theory posits that firms may adjust disclosure to manage external perceptions and mitigate potential regulatory or reputational pressures.

This behaviour underscores the complexity of managerial decision-making in balancing operational efficiency with stakeholder accountability. Firms may perceive extensive carbon disclosure as potentially exposing inefficiencies or competitive vulnerabilities, leading to selective reporting. Consequently, the interplay between internal financial objectives and external pressures creates an environment where environmental transparency is strategically moderated, highlighting the nuanced role of REM in shaping sustainability communication.

Real-based earnings management from abnormal discretionary expenses on carbon emission disclosure

The t-test for REM_DISEXP is 2,748 of 1,97361, with a coefficient of 0,825 and an alpha level of 0,007 ($p < 0,05$), indicating that REM from abnormal discretionary expenses has a significant positive effect on CED. Firms reducing discretionary spending such as CSR, R&D, or marketing may use increased carbon disclosure symbolically, signalling responsibility to stakeholders while cutting actual sustainability efforts.

Stakeholder theory highlights that in the presence of diverse external pressures, firms strategically use voluntary disclosures to maintain legitimacy and minimize reputational risk. Firms may use such disclosures to maintain their legitimacy and minimize reputational risk, despite limited internal changes in actual sustainability practices (Cho et al., 2015). Managers may use disclosure as a strategic response to mitigate stakeholder scrutiny (Garcia-Sanchez et al., 2020). From an agency perspective, this reflects managerial behaviour that leverages disclosure to protect reputation and stakeholder confidence while prioritizing short-term financial objectives.

Positive result reflecting the distinctive nature of discretionary spending decisions. Unlike operational cash flows or production, reductions in discretionary expenses—such as CSR, marketing, or R&D—allow managers to strategically reallocate resources toward symbolic environmental reporting without impacting core financial performance. This behaviour suggests that firms may use voluntary carbon disclosures to maintain legitimacy and stakeholder confidence while minimizing actual expenditures, demonstrating a form of impression management rather than substantive operational commitment.

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CONCLUSION

This study demonstrates that accrual-based earnings management (AEM) significantly reduces carbon emission disclosure (CED), reflecting managerial opportunism where firms prioritize short-term financial performance over environmental transparency. Real earnings management (REM) exhibits heterogeneous effects: manipulation through abnormal cash flows and overproduction negatively impacts disclosure, suggesting that firms engaging in operational adjustments may strategically withhold environmental information to preserve financial appearances. Conversely, reductions in discretionary expenses positively relate to CED, indicating that firms may employ voluntary carbon disclosure as a signalling mechanism to maintain legitimacy and stakeholder trust despite internal cutbacks. Collectively, these findings underscore the complex interplay between financial reporting strategies and environmental transparency, highlighting those different forms of earnings management influence corporate disclosure behaviours in distinct ways, consistent with both agency and stakeholder theoretical perspectives. These results suggest that managerial decisions regarding financial reporting are not isolated from sustainability practices; instead, they reflect strategic considerations that balance internal objectives with external expectations. While AEM and REM through operational activities (CFO and production) prioritize short-term financial outcomes at the expense of transparency, discretionary expense adjustments illustrate how firms can simultaneously manage stakeholder perceptions and reputational risk. This highlights that carbon emission disclosure serves both as a governance tool and a strategic communication mechanism, mediating the effects of different earnings management practices. Overall, the study emphasizes that understanding CED requires examining the nuanced motivations behind diverse managerial behaviours, reinforcing the relevance of integrating agency and stakeholder perspectives in sustainability research. This study provides both theoretical and practical implications by demonstrating that various forms of earnings management distinctly influence carbon emission disclosure, indicating a strong link between financial reporting behaviour and a firm's sustainability orientation. From a practical standpoint, the findings underscore the need to enhance managerial competence beyond mere structural compliance, equipping managers to more effectively navigate the intersection of financial and environmental considerations. Moreover, the results highlight the importance of regulatory intervention through standardized and mandatory carbon reporting frameworks to strengthen accountability and promote transparent environmental disclosure practices.

LIMITATIONS

This study has several limitations, including the data used in this research only covers companies listed on the Indonesia Stock Exchange (IDX) within a determined period, which may restrict the applicability of the results to other nations or industries because of contextual and relevance disparities. Besides, the measurement of carbon emission disclosure (CED) relies on a content analysis approach based on an index, which is inherently subjective and dependent on the availability and quality of information voluntarily disclosed by companies.

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