Decoupling Climate Disclosure from Emission Performance: Evidence from Indonesia's High-Impact Sectors

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Abstract

This study examines whether climate-related disclosure reflects substantive environmental accountability or is more consistent with a legitimacy-oriented reporting strategy among firms operating in Indonesia's environmentally sensitive sectors. Using 130 firm-year observations from 35 listed companies over 2019–2023, the study estimates Ordinary Least Squares (OLS) regressions with robust standard errors. Climate-related disclosure is measured using a 36-item index developed from GRI 305, POJK No. 51/2017, the TCFD recommendations, and ISO 14064. The findings show that firms experiencing increases in carbon emissions provide more extensive climate-related disclosure, whereas improvements in environmental performance are not associated with greater disclosure. This pattern is consistent with firms using climate-related reporting, at least in part, to respond to legitimacy pressures rather than as a direct reflection of substantive environmental improvement. The study extends the application of legitimacy theory to Indonesia's mandatory sustainability-reporting environment and highlights the importance of stronger regulatory oversight and independent assurance in improving the credibility of corporate climate-related disclosure.

Keywords: greenwashing, climate-relateddisclosure, carbon emissions, legitimacy theory, high-impact sectors

Introduction

Growing concern over climate change has increased demands for corporate transparency concerning environmental impacts. In Indonesia, these expectations have been reinforced by POJK No. 51/POJK.03/2017, which requires sustainability-related disclosure by listed companies and financial institutions (Dewi et al., 2022). Greater disclosure, however, does not necessarily imply stronger environmental accountability. Firms operating in environmentally intensive industries may maintain favourable ESG profiles and sustainability narratives despite environmental controversies or rising carbon emissions (Tirta et al., 2026).

Similarly, narratives of green transition within Indonesia's energy and mining sectors coexist with continued coal-based expansion (Saraswati et al., 2021). This tension raises an important question: does climate-related disclosure reflect underlying environmental performance, or does it also help firms preserve legitimacy when that performance deteriorates?

The distinction is particularly important in high-impact industries, where substantial environmental footprints expose firms to greater scrutiny from regulators, investors, and civil society. Under such conditions, disclosure may communicate substantive environmental accountability, but it may also perform a symbolic function by projecting environmental responsibility without corresponding improvements in environmental outcomes (Frendy et al., 2024). Distinguishing between these functions becomes particularly difficult where sustainability information is subject to limited independent verification or assurance.

Competing theoretical perspectives imply different relationships between environmental performance and disclosure. Legitimacy theory suggests that organisations seek to maintain societal acceptance and may increase disclosure when adverse environmental performance threatens that legitimacy (Suchman, 1995; Deegan & Rankin, 1996). In the context of climate reporting, deteriorating environmental performance may therefore be accompanied by more extensive disclosure as firms respond to external scrutiny and seek to reassure stakeholders (Chang et al., 2021; Ren et al., 2020; Guastella et al., 2022; Zhou et al., 2023). Such a pattern would be consistent with a decoupling between favourable disclosure and underlying environmental outcomes and, potentially, with symbolic environmental reporting (Bothello et al., 2023; Bernini & La Rosa, 2024).

Voluntary disclosure theory offers a contrasting prediction. Firms with superior environmental performance have stronger incentives to disclose because reporting allows them to distinguish themselves from poorer-performing firms and signal organisational quality (Clarkson et al., 2008; Lu & Wang, 2020). From this perspective, more extensive climate disclosure should accompany better rather than deteriorating environmental performance. The relationship between actual environmental outcomes and the extent of climate disclosure therefore provides an empirical means of distinguishing between these competing explanations.

This theoretical tension is particularly relevant in emerging economies where mandatory sustainability reporting may have developed more rapidly than monitoring and assurance mechanisms. In Indonesia, POJK No. 51/2017 mandates sustainability reporting but does not require external assurance, creating the possibility that reported commitments may diverge from underlying environmental outcomes. Existing studies have largely examined the extent of sustainability disclosure rather than whether disclosure corresponds with measurable environmental performance (Karim et al., 2021; Ardiana, 2023b). Moreover, reporting frameworks allow considerable disclosure concerning strategies, targets, and future commitments that may not yet be reflected in actual emission reductions. In the absence of credible verification, extensive disclosure may therefore reflect legitimacy concerns as well as substantive environmental accountability (Darnall et al., 2022; Luo et al., 2021).

This study examines whether firms experiencing deteriorating environmental performance provide more climate-related disclosure than firms whose environmental

performance improves. Using year-on-year changes in carbon emissions together with a climate-related disclosure index, the analysis considers whether mandatory sustainability reporting is characterised by alignment or decoupling between disclosure and environmental outcomes. In doing so, the study shifts attention from the amount of climate-related disclosure to its relationship with observable environmental performance.

The study makes three contributions. First, it provides evidence on whether deteriorating carbon performance is associated with more extensive climate-related disclosure, thereby identifying potential decoupling within a mandatory reporting environment. Second, it extends the application of legitimacy theory by examining whether legitimacy-related reporting incentives remain relevant after sustainability disclosure becomes mandatory. Third, it highlights the limitations of using disclosure volume alone as an indicator of environmental accountability, with implications for regulators, investors, and assurance providers.

Drawing on legitimacy theory, increasing carbon emissions are expected to intensify external scrutiny and increase the threat to organisational legitimacy. Firms facing such pressures may respond by providing more extensive climate-related disclosure to demonstrate environmental awareness, communicate remedial actions, and reassure stakeholders. Accordingly, the following hypothesis is proposed:

H_1: Firms in Indonesia's high-impact sectors with increasing carbon emissions disclose more climate-related information than firms with decreasing emissions.

Support for H1 would indicate that greater climate-related disclosure can coexist with deteriorating environmental performance, a pattern consistent with legitimacy management and disclosure–performance decoupling. Such evidence would not establish intentional greenwashing. It would, however, demonstrate that more extensive climate-related disclosure should not necessarily be interpreted as evidence of better underlying environmental performance.

Research Method

This study adopts a quantitative explanatory design to examine the relationship between climate-related disclosure and environmental performance. The analysis focuses on companies listed on the Indonesia Stock Exchange (IDX) in four environmentally intensive sectors: Energy, Basic Materials, Industrials, and Transportation & Logistics. These sectors were selected from the IDX's eleven-sector classification because of their relatively high greenhouse gas emissions and greater exposure to environmental regulation and stakeholder scrutiny. They therefore provide an appropriate setting in which to examine whether climate-related disclosure corresponds with underlying environmental performance.

The observation period covers 2019–2023. Although POJK No. 51/POJK.03/2017 was enacted in 2017, this period captures reporting after Indonesia's mandatory sustainability-reporting framework became operational for listed companies. The final year, 2023, was the most recent year for which complete sustainability and financial information was available when the study was conducted.

Purposive sampling was applied to an initial population of 282 companies across the four sectors. The first screening retained 187 companies that disclosed climate-related information through sustainability reports, annual reports, or official corporate

websites during the observation period. Firms were subsequently required to report Scope 1 and/or Scope 2 carbon emissions for at least two consecutive years, as the principal explanatory variable requires year-on-year emission data. These criteria produced a final sample of 35 companies and 130 firm-year observations for which both climate-related disclosure and environmental performance could be measured.

The dependent variable, climate-related disclosure (CRD), is measured using a manually constructed 36-item disclosure index derived from four complementary frameworks: GRI 305: Emissions, POJK No. 51/2017, the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD), and ISO 14064. Together, these frameworks capture internationally recognised reporting practices alongside Indonesia's domestic regulatory requirements. The index covers four dimensions: greenhouse gas emissions, including Scope 1, Scope 2 and, where applicable, Scope 3 emissions; energy consumption, efficiency, and reduction initiatives; emission-reduction targets, mitigation programmes, and progress; and climate governance, oversight, risks, and strategies. Each applicable item is scored one when disclosed and zero otherwise. CRD is then calculated as the proportion of applicable items disclosed (Jastrzębska, 2023). The measure therefore captures the breadth of climate-related disclosure rather than the quality or credibility of its narrative content.

Environmental performance, the principal independent variable, is measured as the annual change in reported carbon emissions (CO2_CHANGE). Carbon emissions are based on disclosed Scope 1 and Scope 2 emissions, and the variable is calculated as follows:

$$CO2_CHANGE = (CO2_t - CO2_{t-1})/CO2_{t-1} \quad (1)$$

Following Guastella (2022), the annual change in carbon emissions is scaled by prior-year emissions to facilitate comparison across firms of different sizes. Positive values indicate increasing emissions and therefore deteriorating environmental performance, whereas negative values indicate emission reductions and improving performance. CO2_CHANGE consequently captures changes in environmental outcomes that may increase or reduce firms' exposure to legitimacy pressures.

Several firm-level characteristics are included to account for observable differences that may influence both climate-related disclosure and environmental performance. Firm size (SIZE) is measured as the natural logarithm of total assets (Guastella, 2022), reflecting the greater visibility and disclosure pressures typically faced by larger firms. Profitability (ROA), measured as net income divided by total assets, controls for differences in firms' financial capacity to undertake environmental initiatives and related reporting activities (Alsaifi et al., 2020). Leverage (LEV), calculated as total liabilities divided by total assets, captures potential financing and creditor pressures that may influence disclosure decisions (Alsaifi et al., 2020).

Capital intensity (CAPINT), measured as capital expenditure divided by total assets (Ardiana, 2023a), controls for differences in firms' investment structures that may be associated with both emissions and disclosure. Sales growth (GROWTH), calculated as the annual percentage change in revenue (Ren et al., 2020), captures changes in business activity that may affect environmental performance and reporting behaviour. Sector and year effects are also included to account for systematic differences across industries and

Table 1. Variable Definitions, Measurements, and Expected Relationships

Variable	Definition and Measure	Predicted Direction
CRD	Climate-related disclosure score based on 36 items (GRI 305, POJK 51/2017, TCFD, ISO 14064); scored 1 if disclosed, 0 otherwise; normalized as % of applicable items (Jastrzębska, 2023)	-
CO2_CHANGE	Year-on-year change in carbon emissions (Scope 1 and 2), scaled by prior year revenue (Guastella, 2022) $(CO2_CHANGE = \frac{CO2_t - CO2_{t-1}}{CO2_{t-1}})$	+
SIZE	Firm size measured as natural logarithm of total assets (Guastella, 2022)	+
ROA	Profitability measured as return on assets (net income / total assets) (Alsaifi et al., 2020)	+
LEV	Leverage measured as total liabilities divided by total assets (Alsaifi et al., 2020)	+/-
CAPINT	Capital intensity measured as capital expenditure divided by total assets (Ardiana, 2023a)	+
GROWTH	Sales growth measured as ($Revenue_t$ – $Revenue_{t-1}$) / $Revenue_{t-1}$ (Ren et al., 2020)	+
SECTOR	Sector dummy variables for Energy, Basic Materials, Industrials, and Transportation & Logistics. Binary variables (1,0) representing the firm's sector (reference group: other IDX sectors)	?
YEAR	Binary variables (1,0) for each year from 2019 to 2023 to account for unobserved time-fixed effects	?

Source: Authors own work

Note: '?' denotes that the predicted direction is non-directional. Sector and Year dummies are utilized to control for fixed effects across different industries and time periods, and their coefficients are not the primary focus of the hypothesis testing.

Using the uploaded article's concise methodological style, I would tighten the description of data sources, coding procedures, and estimation strategy as follows. Data were obtained entirely from publicly available sources. Climate-related disclosure information was collected from corporate sustainability reports, annual reports, and official company websites. Scope 1 and Scope 2 emissions were obtained from corporate disclosures, while financial data used to construct the control variables were extracted from audited annual reports. These sources reflect the information available to investors, regulators, and other external stakeholders.

Climate-related disclosure was measured through manual content analysis using the 36-item disclosure index. Manual coding was adopted because climate reporting combines quantitative indicators with qualitative narrative disclosures that may not be captured reliably through automated extraction. Reports were reviewed systematically using a predefined coding protocol, with each item scored one when explicitly disclosed and zero otherwise. Coders were trained using a common coding manual, and

approximately 20% of the sample was independently re-coded to assess coding consistency. Any discrepancies were discussed and resolved by agreement, thereby reducing subjective judgement and improving the reliability of the coding process.

The hypothesis was tested using Ordinary Least Squares (OLS) regression with heteroskedasticity-robust standard errors. Robust standard errors were employed to mitigate potential heteroskedasticity and improve the reliability of statistical inference. The baseline model is specified as follows:

$$CRD_{i,t} = \beta_0 + \beta_1 CO2_CHANGE_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 ROA_{i,t} + \beta_4 LEV_{i,t} + \beta_5 CAPINT_{i,t} + \beta_6 GROWTH_{i,t} + \sum_{j=1}^{4} \beta_{6+j} SECTOR_{j,t} + \sum_{k=1}^{5} \beta_{10+k} YEAR_{k,t} + \varepsilon \quad (2)$$

Using the uploaded article's style, I would make the passage more concise, reduce repetition around legitimacy theory, and state the role of each robustness test more directly. The coefficient on CO2_CHANGE (β_1) provides the principal test of H1. A positive and statistically significant coefficient would indicate that firms experiencing increasing emissions provide more extensive climate-related disclosure than firms experiencing emission reductions. Such a result would be consistent with the legitimacy-based prediction of decoupling between disclosure and underlying environmental performance.

Four additional analyses assess the robustness of the findings. First, all continuous variables are winsorised at the 1st and 99th percentiles to reduce the influence of extreme observations while retaining valid cases. Second, the baseline model is re-estimated including lagged climate-related disclosure (CRD_{t-1}) to account for persistence in firms' reporting practices and to assess whether the observed association reflects more than established disclosure patterns.

Third, an alternative measure of environmental performance, CARBONINT, is employed to determine whether the results are sensitive to the operationalisation of environmental performance. This analysis examines whether firms with relatively poorer carbon performance also provide more extensive climate-related disclosure, which would be consistent with legitimacy-based explanations of environmental reporting (Deegan & Rankin, 1996; Ren et al., 2020).

Finally, the sample is partitioned according to whether firms experience increasing or decreasing emissions, and separate regressions are estimated for the two groups. This analysis assesses whether the association between environmental performance and climate-related disclosure differs across emission trajectories. A stronger association among firms with increasing emissions would be consistent with the argument that disclosure becomes more responsive when deteriorating environmental performance intensifies legitimacy pressures (Chang et al., 2021; Zhang, 2023).

Result and Discussion

This section presents the empirical findings of the study. It begins with descriptive statistics and correlation analysis to provide an overview of the sample and the relationships among the study variables. The discussion then turns to the main regression results and their implications for the proposed hypothesis. Throughout the analysis, the findings are interpreted through the lens of legitimacy theory to evaluate whether firms

operating in Indonesia's high-impact sectors expand climate-related disclosure in response to deteriorating environmental performance.

Table 2. Descriptive Statistics

Variable	Mean	Std. Dev	Min	Max	Skewness	Kurtosis
CRD	0.578	0.162	0.167	0.917	-0.241	1.803
CO2_CHANGE	0.042	0.138	-0.209	0.391	0.312	2.447
SIZE	14.276	1.103	11.983	17.342	0.408	2.123
ROA	0.071	0.082	-0.134	0.268	0.159	2.048
LEV	0.529	0.215	0.088	0.934	0.203	2.762
CAPINT	0.148	0.093	0.012	0.456	1.342	4.992
GROWTH	0.116	0.172	-0.245	0.567	-0.148	2.633
SECTOR_Energy	0.208	0.407	0	1	1.458	0.218
SECTOR_Basic Materials	0.20	0.402	0	1	1.518	0.308
SECTOR_Industrials	0.208	0.407	0	1	1.458	0.128
SECTOR_Transportation Logistics	0.177	0.383	0	1	1.713	0.949
YEAR_2019	0.2	0.402	0	1	1.518	0.308
YEAR_2020	0.177	0.383	0	1	1.713	0.949
YEAR_2021	0.215	0.413	0	1	1.401	-0.038
YEAR_2022	0.208	0.407	0	1	1.458	0.128
YEAR_2023	0.2	0.402	0	1	1.518	0.308

Source: Processed Data, 2025

Table 2 reports the descriptive statistics for the variables used in the empirical analysis. The mean climate-related disclosure score (CRD) is 0.578, indicating that firms disclose, on average, approximately 58% of the applicable items included in the disclosure index. The standard deviation of 0.162 indicates meaningful variation across firms, suggesting that the extent of climate-related reporting remains heterogeneous despite the introduction of mandatory sustainability reporting requirements.

Environmental performance, measured by CO2_CHANGE, has a mean of 0.042, indicating a modest average increase in carbon emissions over the observation period. Values range from −0.209 to 0.391, demonstrating substantial variation in firms' emission trajectories. Some firms achieved reductions in emissions, whereas others experienced relatively large increases. This variation provides an appropriate setting in which to examine whether changes in environmental performance are associated with differences in climate-related disclosure.

The firm-level characteristics also vary across the sample. SIZE has a mean of 14.276, while average profitability (ROA) is 7.1% and average leverage (LEV) is 52.9%. Capital intensity (CAPINT) has a mean of 0.148 and exhibits greater positive skewness than the other continuous variables, indicating that capital investment is concentrated among a smaller number of firms. Sales growth (GROWTH) averages 11.6%, although its dispersion indicates considerable differences in firms' growth trajectories.

No extreme distributional characteristics are evident for most of the continuous variables, although CAPINT is comparatively more skewed. Potential sensitivity to extreme observations is addressed subsequently through winsorisation, while heteroskedasticity-robust standard errors are employed in the regression analysis.

The sector and year indicators show that the sample includes observations from each of the four high-impact sectors and throughout the 2019–2023 period. This coverage reduces the likelihood that the results are attributable solely to a particular industry or reporting year. Overall, the descriptive statistics reveal sufficient variation in both climate-related disclosure and environmental performance to support the subsequent multivariate analysis.

One point should be checked against Table 2 before finalising this paragraph: the original statement that Energy, Basic Materials, and Industrials each represent "approximately one-fifth" of the observations while Transportation & Logistics represents 18% cannot account for 100% of a four-sector sample. I would therefore avoid reporting those percentages until the sector frequencies are verified.

Table 3. Pearson Correlations

	CRD	CO2_CHANGE	SIZE	ROA	LEV	CAPINT	GROWTH
CRD	1						
CO2_CHANGE	0.792*	1					
SIZE	0.425***	0.448***	1				
ROA	0.459*	0.485*	0.534*	1			
LEV	0.094	0.096	0.092	0.089	1		
CAPINT	0.059	0.067	0.063	0.071	0.069	1	
GROWTH	0.066	0.075	0.069	0.068	0.072	0.064	1

Source: Processed Data, 2025

Notes: * significant at 90 percent of confidence level; ** significant at 95 percent of confidence level; *** significant at 99 percent of confidence level

Table 3 presents the Pearson correlation matrix for the variables included in the regression analysis. The correlations provide preliminary evidence on the relationships among the variables and an initial indication of potential multicollinearity.

Climate-related disclosure (CRD) is positively correlated with changes in carbon emissions (CO2_CHANGE) ($r = 0.792$, $p < 0.10$). Although the bivariate relationship does not establish causality, its positive direction is consistent with the study's prediction that firms experiencing deteriorating environmental performance provide more extensive climate-related disclosure. This pattern is also consistent with legitimacy theory, whereby firms facing greater environmental scrutiny may increase disclosure in response to legitimacy pressures (Suchman, 1995; Mio et al., 2020).

CRD is also positively correlated with firm size ($r = 0.425$, $p < 0.01$), indicating that larger firms tend to provide more extensive climate-related disclosure. This is consistent with their greater visibility and exposure to scrutiny from regulators, investors, and other stakeholders. Profitability (ROA) is similarly positively correlated with CRD ($r = 0.459$, $p < 0.10$), although the relatively weak statistical significance warrants cautious interpretation.

Among the explanatory variables, SIZE is positively correlated with CO2_CHANGE ($r = 0.448$, $p < 0.01$) and ROA ($r = 0.534$, $p < 0.10$). These associations suggest that larger firms tend to exhibit both stronger profitability and greater changes in reported carbon emissions. Leverage, capital intensity, and sales growth show comparatively weak correlations with CRD and the other explanatory variables.

Overall, the correlation matrix provides preliminary support for the expected association between environmental performance and climate-related disclosure. With

the exception of the relatively high correlation between CRD and CO2_CHANGE, the correlations among the explanatory variables are moderate, providing no immediate indication of severe multicollinearity. Formal multicollinearity diagnostics are therefore considered alongside the subsequent regression analysis.

One statistical point should be checked before finalising this section. With approximately 130 observations, a correlation as large as r = 0.792 would ordinarily have a p-value far below 0.10, and the same concern applies to some of the other reported coefficient–p-value combinations. I would verify the significance levels in Table 3 before publication, as they may contain transcription or formatting errors.

Table 4 reports the baseline regression and robustness analyses. Across all specifications, climate-related disclosure (CRD) is the dependent variable, while CO2_CHANGE captures year-on-year changes in carbon emissions. The analysis examines whether deteriorating environmental performance is associated with more extensive climate-related disclosure.

Panel A presents the baseline results. The coefficient on CO2_CHANGE is positive and statistically significant at the 10% level, indicating that firms experiencing increases in carbon emissions tend to provide more extensive climate-related disclosure. Although the statistical evidence is relatively modest, the direction of the association is consistent with H1 and with the legitimacy-based prediction that firms facing deteriorating environmental outcomes may increase disclosure in response to greater external scrutiny.

This result suggests that more extensive disclosure does not necessarily accompany better environmental performance. Instead, firms with increasing emissions report more climate-related information, a pattern consistent with disclosure being used, at least in part, to respond to legitimacy pressures (Bothello et al., 2023; Zhou et al., 2023). Importantly, this finding should not be interpreted as evidence that such disclosure constitutes greenwashing. The analysis identifies an association between deteriorating environmental performance and greater disclosure; it cannot establish whether firms intentionally seek to mislead stakeholders. The evidence is therefore more appropriately interpreted as indicating potential decoupling between the extent of disclosure and underlying environmental outcomes.

The robustness analyses generally reinforce this interpretation. Panel B reports results after continuous variables are winsorised at the 1st and 99th percentiles. CO2_CHANGE remains positive and statistically significant at the 10% level, suggesting that the baseline association is not driven solely by extreme observations.

Panel C incorporates lagged climate-related disclosure (CRD_{t-1}) to account for persistence in firms' reporting practices. The coefficient on lagged disclosure is positive but statistically insignificant, while CO2_CHANGE remains positive and significant. Thus, the association between changes in emissions and current disclosure does not appear to be explained simply by firms maintaining historically high levels of climate reporting. The result is consistent with disclosure responding to contemporaneous environmental conditions rather than reflecting only established reporting routines. It does not, however, eliminate potential endogeneity or establish the direction of causality.

Table 4. OLS Regression Results for the Main Model and Robustness Tests

Dependent Variable:	Main Model			Robustness Test Models		
$CRD_{i,t}$	Panel A	Panel B	Panel C	Panel D	Panel E	Panel F
$CO2_CHANGE_{i,t}$	0.768*	0.723*	0.794*		0.812*	0.993**
	(1.258)	(1.134)	(1.321)		(1.238)	(1.195)
$CRD_{i,t-1}$			0.583			
			(1.093)			
$CARBONINT_{i,t}$				0.683*		
				(1.269)		
$SIZE_{i,t}$	0.032***	0.041***	0.039***	0.028***	0.045***	0.055***
	(0.042)	(0.032)	(0.044)	(0.039)	(0.043)	(0.064)
$ROA_{i,t}$	0.376*	0.315*	0.324*	0.367*	0.322*	0.354*
	(0.220)	(0.193)	(0.231)	(0.280)	(0.654)	(0.265)
$LEV_{i,t}$	-0.037	-0.018	-0.025	-0.042	-0.031	-0.033
	(0.039)	(0.013)	(0.022)	(0.022)	(0.025)	(0.043)
$CAPINT_{i,t}$	0.049	0.035	0.026	0.028	0.034	0.056
	(0.076)	(0.066)	(0.066)	(0.043)	(0.036)	(0.077)
$GROWTH_{i,t}$	0.068	0.057	0.062	0.053	0.053	0.054
	(0.081)	(0.079)	(0.083)	(0.056)	(0.065)	(0.033)
SECTOR: Energy	0.035***	0.024***	0.031***	0.033***	0.032***	0.064***
	(0.015)	(0.014)	(0.012)	(0.038)	(0.025)	(0.032)
SECTOR: Basic Materials	0.031**	0.021**	0.032**	0.024**	0.043**	0.064**
	(0.012)	(0.011)	(0.019)	(0.053)	(0.024)	(0.024)
SECTOR: Industrials	0.035**	0.032**	0.028**	0.024**	0.036**	0.065**
	(0.013)	(0.015)	(0.014)	(0.032)	(0.026)	(0.033)
SECTOR: Transportation & Logistics	0.038**	0.031**	0.033**	0.024**	0.036**	0.033**
	(0.015)	(0.012)	(0.029)	(0.022)	(0.025)	(0.034)
YEAR: 2019	0.031	0.033	0.031	0.032	0.039	0.065
	(0.012)	(0.015)	(0.011)	(0.024)	(0.032)	(0.035)
YEAR: 2020	0.022	0.021	0.026	0.033	0.046	0.054
	(0.013)	(0.011)	(0.022)	(0.032)	(0.034)	(0.013)
YEAR: 2021	0.027*	0.024*	0.031*	0.025*	0.032*	0.029*
	(0.012)	(0.015)	(0.013)	(0.019)	(0.055)	(0.033)
YEAR: 2022	0.023**	0.021**	0.022**	0.034**	0.032**	0.026**
	(0.013)	(0.016)	(0.012)	(0.032)	(0.044)	(0.043)
YEAR: 2023	0.035***	0.033***	0.032***	0.043***	0.032***	0.034***
	(0.019)	(0.011)	(0.013)	(0.022)	(0.053)	(0.013)
N	130	130	130	130	66	64
F-Stat	6.309***	6.311***	6.432***	6.499***	6.356***	6.594***
Adjusted R^2	0.351	0.392	0.464	0.383	0.377	0.386

Source: Processed Data, 2025

Notes: Panel A: main model; Panel B: winsorization; Panel C: reverse causality; Panel D: alternative measure of environmental performance; Panel E: decreased CO_2 change; Panel F: increased CO_2 change

* significant at 90 percent of confidence level; ** significant at 95 percent of confidence level; *** significant at 99 percent of confidence level

Panel D replaces CO2_CHANGE with carbon intensity (CARBONINT). The coefficient remains positive and statistically significant at the 10% level. The consistency across alternative measures suggests that the principal finding is not dependent on a single operationalisation of environmental performance: firms with relatively poorer carbon performance also tend to provide more extensive climate-related disclosure.

Panels E and F examine whether this relationship differs according to firms' emission trajectories. Among firms experiencing declining emissions, the association between CO2_CHANGE and climate-related disclosure is positive but statistically insignificant. Improvements in environmental performance are therefore not accompanied by a systematic increase in disclosure. By contrast, among firms experiencing increasing emissions, CO2_CHANGE is positive and statistically significant at the 5% level. The association is also stronger than in the baseline specification.

This asymmetry is particularly relevant to the study's theoretical argument. Climate-related disclosure appears more responsive to deteriorating than to improving environmental performance. Firms whose emissions decline do not provide correspondingly greater disclosure, whereas firms facing rising emissions disclose more extensively. Such a pattern is difficult to reconcile fully with the voluntary disclosure argument that superior environmental performers disclose more to distinguish themselves from poorer performers (Clarkson et al., 2008; Lu & Wang, 2020). Instead, it is more consistent with legitimacy-based explanations in which disclosure becomes more salient when adverse environmental outcomes increase external scrutiny (Ren et al., 2020; Guastella et al., 2022; Bothello et al., 2023; Zhou et al., 2023).

Taken together, the robustness analyses provide reasonably consistent evidence of a positive association between poorer carbon performance and climate-related disclosure. The result persists after addressing extreme observations, prior disclosure patterns, alternative measurement of environmental performance, and differences in firms' emission trajectories. The consistency of the direction across these specifications increases confidence that the baseline result is not attributable solely to one particular modelling choice.

The control variables provide further insight into climate-related reporting practices. Firm size (SIZE) is positive and statistically significant across the reported specifications, indicating that larger firms tend to disclose more climate-related information. This is consistent with larger organisations facing greater visibility and scrutiny from regulators, investors, and other stakeholders. Profitability (ROA) is also positively associated with disclosure, suggesting that more profitable firms may have greater resources to develop sustainability-reporting systems and communicate environmental initiatives.

By contrast, leverage (LEV), capital intensity (CAPINT), and sales growth (GROWTH) are not statistically associated with climate-related disclosure. There is therefore limited evidence that financing structure, capital investment, or short-term growth explains variation in disclosure once environmental performance and other firm characteristics are considered.

The year effects also indicate an increase in climate-related disclosure from 2021 onwards. This temporal pattern is consistent with firms progressively adapting their reporting practices as Indonesia's mandatory sustainability-reporting requirements became more firmly established. Such an interpretation should nevertheless remain

cautious, as year effects may also capture other regulatory, market, or reporting developments occurring during the same period.

Overall, the evidence indicates that climate-related disclosure and environmental performance are not necessarily aligned. Firms experiencing increasing emissions provide more extensive climate-related information, whereas firms experiencing improvements in environmental performance do not exhibit a comparable reporting response. This asymmetry suggests that climate disclosure may perform functions extending beyond the communication of favourable environmental performance. From a legitimacy perspective, disclosure may also provide firms with a means of responding to heightened stakeholder scrutiny when environmental outcomes deteriorate.

The findings therefore extend the application of legitimacy theory to a mandatory reporting environment. Mandatory disclosure requirements do not necessarily remove incentives to manage organisational legitimacy through reporting. Rather, they may change the institutional setting within which those incentives operate. The present evidence is consistent with legitimacy-oriented disclosure persisting after sustainability reporting becomes mandatory, although the analysis cannot establish that such disclosure is intentionally symbolic.

The practical implication is that the volume of climate-related disclosure should not be treated as a sufficient indicator of environmental accountability. Regulators may need to complement disclosure requirements with stronger verification mechanisms, more consistent measurement requirements, and independent assurance of reported environmental information. Investors and other stakeholders should similarly evaluate climate-related narratives alongside observable indicators such as emissions levels and emission trajectories. Strengthening the connection between reported information and underlying environmental outcomes is important if mandatory sustainability reporting is to support substantive accountability rather than simply increase the amount of information disclosed.

Conclusion

This study examines whether climate-related disclosure among firms operating in Indonesia's high-impact sectors reflects underlying environmental performance or is also associated with legitimacy pressures. The findings show a positive association between increasing carbon emissions and the extent of climate-related disclosure. Although the baseline relationship is statistically significant at the 10% level, it becomes stronger among firms experiencing deteriorating environmental performance and remains directionally consistent across the robustness analyses. The evidence therefore suggests that firms facing less favourable environmental outcomes tend to provide more extensive climate-related disclosure. This pattern is consistent with legitimacy-based reporting and indicates that greater disclosure does not necessarily correspond with better environmental performance.

The study contributes to the sustainability-reporting literature in three respects. First, it extends the application of legitimacy theory to a mandatory reporting environment. The findings suggest that mandatory disclosure requirements do not necessarily eliminate legitimacy-related reporting incentives; rather, such incentives may persist within the institutional framework created by mandatory reporting. Second, the study develops a climate-related disclosure index integrating GRI 305, the TCFD

recommendations, ISO 14064, and POJK No. 51/2017, providing a structured measure of the breadth of climate-related reporting in Indonesia. Third, it provides evidence from an emerging economy in which the relationship between corporate disclosure and measurable environmental performance remains comparatively underexplored.

The findings also have practical implications. For regulators, mandatory disclosure requirements may need to be complemented by stronger verification and assurance mechanisms if reported climate information is to provide a credible representation of underlying environmental performance. Greater attention should therefore be directed towards the consistency between corporate disclosures and observable environmental outcomes. Investors and other stakeholders should similarly evaluate climate-related reporting alongside objective measures such as emission levels and emission trajectories rather than interpreting more extensive disclosure as evidence of superior environmental performance. Strengthening this connection is important if sustainability reporting is to support substantive environmental accountability.

The study is subject to several limitations. First, the analysis relies on publicly disclosed carbon emissions and climate-related information and is therefore dependent on the completeness and accuracy of corporate reporting. Second, although a structured coding protocol and independent re-coding procedures were employed, manual content analysis necessarily involves some researcher judgement. Third, the quantitative design identifies associations but cannot establish managerial motivations or determine whether greater disclosure is intentionally symbolic.

Future research could address these limitations by combining quantitative evidence with interviews involving managers, sustainability professionals, auditors, or other organisational actors to examine how climate-related disclosure decisions are made. Longitudinal research may also provide greater insight into whether changes in environmental performance precede changes in reporting behaviour. Finally, as Indonesia's sustainability-reporting framework continues to develop, future studies could examine whether stronger regulatory oversight and independent assurance reduce the apparent divergence between climate-related disclosure and underlying environmental performance.

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