Deciphering the Drivers of Climate transparency in Malaysia: TCFD Perspective

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ABSTRACT

The pressure to address climate change by stakeholders pushes business players to pledge their climate commitment via reporting and disclosure. This mechanism signals the firm's climate adaptation and mitigation efforts, projecting their environmental performance. The study aims to investigate the drivers of climate transparency among publicly listed firms in Malaysia, with a focus on the perspectives of financial strength and corporate governance. Climate transparency is assessed based on the Task Force on Climate-related Financial Disclosures (TCFD) framework, in parallel with Malaysia's regulatory requirements. By adopting a panel data analysis, the study found that leverage, firm size, and the adoption of innovation are significant drivers of climate transparency among firms in Malaysia. However, no significant relationship was found for profitability, sales growth, board independence, and CEO duality. The study provides valuable insights to help market players prepare for a compliance strategy as climate change reporting becomes mandatory in Malaysia in 2025 under the National Sustainability Reporting Framework.

Keywords: Climate change reporting, Disclosure, ISSB, Malaysia and TCFD

INTRODUCTION

Environmental risks have dominated the long-term risks in terms of their likelihood of occurrence and severity, as reported by the Global Risk Reports issued by the World Economic Forum (Cavaciuti-Wishart et al., 2024; Elsner et al., 2025a, 2025b; Franco, 2020; Franco et al., 2021, 2022; Heading & Zahidi, 2023). The findings capture the views of over 1,500 global experts, including governments, industry players, non-governmental organisations (NGOs), and academics, which show that these multi-stakeholders have collectively acknowledged that a sustainability roadmap is no longer optional but an obligation for all. The heightened concerns over climate-related issues among multi-stakeholders may be due to the worldwide reported catastrophes that have caused fatalities and property damage, in addition to disrupting national systems. The restoration process would require a significant amount of effort and funding, especially for the marginalised community, despite their relatively small contribution to climate change (Sultana, 2022). The attention and pressure from stakeholders mean that business players cannot afford to ignore the calls for climate mitigation and adaptation. Failure to respond to stakeholders' demands may cause firms to suffer strategic drift, negatively impacting their business sustainability in the market.

Meanwhile, on July 28, 2022, the United Nations (UN) declared that access to a clean, healthy, and sustainable environment is a universal human right (UNEP, 2022). The global move is also demonstrated by the global financial standard setters' pursuit of climate-related information disclosures as part of the global financial standards to be adopted by market players. Specifically, the International Financial Reporting Standard Board (IFRS), being the global accounting standard setter, has developed climate-related disclosure standards, known as IFRS S1 General Requirements for Disclosure of Sustainability-related Disclosures (IFRS S1) and IFRS S2 Climate-related Disclosures (IFRS S2) under the jurisdiction of the International Sustainability Standard Board

(ISSB). The move aims to enable firms to report consistent climate-related information and uniform metrics, facilitating informed decision-making by investors (IFRS, 2023). For Malaysia, the introduction of the ISSB Standards has been mandated by regulatory authorities under the National Sustainability Reporting Framework. Still, implementation is expected to begin in 2025, with full adoption anticipated in 2030 (SCM, 2024). Before the introduction of the ISSB Standards, the climate-related information disclosure in compliance with the Task Force on Climate-Related Financial Disclosure (TCFD) framework was introduced to the listed firms on Bursa Malaysia on September 26, 2022 (BM, 2022). Nonetheless, as the requirement is to be implemented by the end of the 2025 financial year, the disclosure remains voluntary during the interim period.

Following that, the current study was initiated to investigate the drivers of climate transparency within a voluntary disclosure context in the emerging market setting, with a particular focus on Malaysia. The investigation focuses on firm-level characteristics, encompassing aspects of financial strength and corporate governance (Darus et al., 2019; Desai, 2022; Wahyuningrum et al., 2024). The study contributes to the body of knowledge by providing empirical evidence from an emerging market context, where the preparation of climate change reporting remains voluntary. In addition, the findings provide valuable insights to business players in preparing for the mandatory climate change reporting requirements in the country.

LITERATURE REVIEW

Previous studies have employed a similar keyword search to explore the study realm, including terms such as climate change, carbon, global warming, account*, report*, and disclosure* (Borghei, 2021; Gulluscio et al., 2020; He et al., 2022; Wang, 2023). Despite the different terms used in previous literature, they all lead to the same purpose of counteracting climate change by disclosing climate-related information. Previous studies have examined the internal and external forces that influence a firm's propensity for climate information disclosure as part of its strategic climate response (Borghei, 2021). The firm's corporate governance and financial attributes were extensively discussed as part of the internal motivation (Abdalla et al., 2024; Darus et al., 2019; Giannarakis et al., 2018) and regulatory landscape, as well as stakeholder pressure, as part of the external factor (Falkner, 2016; Polizzi & Scannella, 2023). In support of this stance, He et al. (2022) found that the plethora of literature in influential accounting journals, as reported by the Australian Business Deans Council (ABDC) between 2005 and 2018, also concentrated on the motivation for carbon disclosure. Based on previous literature, He et al. (2022) proposed a framework for determining the determinants of carbon disclosure, focusing on the firm's internal factors, including corporate governance, financial resource constraints, and accounting information systems.

Firm size is one of the most discussed drivers for climate transparency. Besides possessing the capacity to undertake climate initiatives, the visibility of large firms among stakeholders exposes them to stronger scrutiny, which in turn motivates them to be more proactive in climate disclosure (Luo et al., 2013). Mixed findings are reported for profitability. Profitable firms are generally motivated by a signalling mechanism to show the firm's business sustainability in relation to its available resources (Ben-Amar & McIlkenny, 2015). However, others find that profitability does not drive climate transparency (Dharma et al., 2024). The same mixed findings are reported for leverage. Highly leveraged firms may disclose more information to reduce the information asymmetry between capital funders and firms, or be subject to a capital covenant. However, in contrast, some studies find that highly leveraged firms may face financial constraints in committing to climate action (Bae Choi et al., 2013). Meanwhile, for firms experiencing stronger growth, they may tend to allocate their funds and resources to revenue expansion plans rather than climate-related matters, contributing to their adverse relationship (Mou & Ma, 2023). Lastly, as environmental quality involves capital investments (Caglar et al., 2024), firms adopting innovation tend to disclose more climate-related information as part of their strategic differentiation and pursuit of social legitimacy. Meanwhile, as part of the aspect of corporate governance, board independence enhances monitoring effectiveness by taking proactive action on heightened concerns over the importance of providing climate-related information (Ben-Amar & McIlkenny, 2015).

In assessing the information disclosed, few guidelines are available in the markets. Nevertheless, the newly developed Task Force on Climate-related Financial Disclosure (TCFD) framework has been progressively adopted by G7 and G20 countries, including the European Union, Australia, Singapore, and New Zealand (Dey, 2024). The inclination towards the TCFD framework was reported by Achenbach (2021) based on

interviews conducted with TCFD supporters. The study reported that the respondent highlighted the ability of stakeholders to grasp the information well, while also acknowledging that the disclosed information extends beyond the retrospective application (Achenbach, 2021). Hence, the adoption of the TCFD framework extends beyond compliance purposes, as it enables a firm to respond effectively to climate risks and opportunities. In addition, the TCFD framework has served as the foundation for the development of ISSB Standards, thereby strengthening their position among market players as a compliance mechanism.

METHODOLOGY

Sample and Data Collection

The sample of the study consists of publicly listed companies (PLCs) on Bursa Malaysia from all industries, except the financial sector, from 2020 to 2023. The exception for the financial sector was made due to its unique and highly regulated nature (Jin et al., 2025), which may impact the generalizability of the final results. The ten largest PLCs, based on their market capitalisation, from each sectoral industry were selected due to the implementation of regulatory requirements in Malaysia that require the preparation of climate-related information disclosure depending on their market capitalisation (SCM, 2024). Based on the disclosure requirement, firms with a market capitalisation of RM2 billion and above will start disclosing climate information as Group 1, followed by others in the following year (SCM, 2024). Hence, by focusing on the top-capitalised firms, one can obtain richer information disclosure pertaining to climate-related information. In addition, previous studies have highlighted the focus on large firms in sustainability studies due to their significant impact on the ecological element (Yusoff et al., 2018). The distributions of firms based on the sectoral index by Bursa Malaysia are presented in Table 1.

Table 1 Distribution of Industries Classification Based on Bursa Malaysia

No	Industry	Number of firms
1	Property	10
2	Construction	10
3	Energy	10
4	Plantation	10
5	Industrial products and services (IPS)	10
6	Utilities	10
7	Transportation and logistics	10
8	Consumer products and services (CPS)	10
9	Telecommunication and media	10
10	Utilities	10
11	Technology	10
	Total of firms	110

Climate Transparency

In collecting the data for climate transparency, a content analysis was conducted on the annual reports of PLCs in Malaysia, including the Sustainability Report and Integrated Report from 2020 to 2023, with a focus on the Sustainability Section. This aligns with the disclosure requirements set by Bursa Malaysia, which specify the preparation of sustainability information to be included in a designated section. The information should be clearly and vividly disclosed, in addition to being separated from the chairman's statement (BM, 2015, 2022). To assess climate transparency, an index developed by Hussin et al. (2025) was used to evaluate the quality of climate-related information disclosure by PLCs in Malaysia. The index was developed in accordance with the Task Force on Climate-Related Financial Disclosure (TCFD) framework. As Bursa Malaysia has adopted the TCFD as part of its disclosure requirements for climate change reporting via its disclosure requirement in 2022 (BM, 2022), the index is suitable and appropriate to be used for a study conducted in Malaysia. Consistent with the TCFD framework, the disclosure of climate-related information was assessed from four (4) pillars, comprising governance, strategy, risk management and metrics and targets. The climate transparency is

mathematically expressed in the following equation : $CT_{it} = \frac{\sum_{i=1}^{n} X_{i,j,t}}{N_j}$

Where, CT_{it} = Climate change reporting score for firm i at year t

X_{ijt} = Total weightage scores for all pillars of climate change reporting for firm i at year t

N_j = Maximum score for overall climate change reporting

Meanwhile, Table 2 specifies the measurement for independent and control variables used by the study:

Table 2 Measurement Of Independent and Control Variables

Variables	Measurement
Profitability (PROF)	Net income divided by total assets (Ali et al., 2022)
Sales Growth (GRW)	Current year's revenues divided by the revenues from the previous year (Shaikh, 2022)
Leverage (LEV)	Total debts divided by total capital (Hassan & Romilly, 2018)
Size (SIZE)	Natural logarithm of total assets (Ali et al., 2022)
Innovation (INNOV)	A dichotomous scale of 0 or 1. A score of 0 with the non-adoption of SDG 9 and 1 for the adoption of SDG 9 (Mavuri et al., 2019)
Board Composition (BOARD)	Total independent directors divided by the total number of board of directors (Jia & Bradbury, 2021)
CEO Duality (CEOD)	A dichotomous scale of 0 or 1. A score of 0 with a separate person and 1 for the same person acting as chairman and CEO (Yu, 2023)

Data Analysis

Following the previous discussion, the current study proposes the following estimation equation:

$$CT_{it} = \alpha + \beta_1 PROF_{it} + \beta_2 GRW_{it} + \beta_3 LEV_{it} + \beta_4 SIZE_{it} + \beta_5 INNOV_{it} + \beta_6 BOARD_{it} + \beta_6 CEOD_{it} + \varepsilon_{it}$$

Panel data analysis was conducted using Stata 17 to investigate the drivers of climate transparency among PLCs in Malaysia, given its robustness in handling unobserved heterogeneity and reducing multicollinearity among variables (Wooldridge, 2002). In addition to the pooled ordinary least squares (POLS) model, the fixed effect (FE) and random effect (RE) models are presented. Two diagnostic tests were conducted in selecting the most appropriate model, which are the Breusch Pagan LM and the Hausman test. Additionally, heteroskedasticity and autocorrelation checks were also undertaken for a more robust final estimation. Upon the selection, the standard error was clustered as part of the robust variance analysis to ensure reliable results (Gutierrez & Drukker).

FINDINGS AND DISCUSSION

Descriptive Analysis

Table 3 summarises the descriptive statistics of the variables used in the current study. The climate transparency (CT) among PLCs in Malaysia between 2020 and 2023, as measured by the climate change reporting score, indicates a mean value of 39.57. This score is higher than that reported in the previous study conducted by Darus et al. (2019) and Abdalla et al. (2024), with average disclosure scores of 22.81 and 17.70, respectively. The minimum value of CT at 0.00 shows that there are firms that do not disclose any climate-related information in their annual report. The introduction of climate-related information disclosure in 2022, through the amendment of listing requirements by Bursa Malaysia, may help explain the low adoption rate among PLCs in Malaysia. In addition, the implementation of the listing requirements is a phased approach based on the market capitalisation. Meanwhile, the mean profitability (PROF) of the sample firms is 6.92, ranging between -44.36 and 84.04. The sales growth rate (GRW) among Malaysian firms ranges from 0.06 to

97.65, with a mean value of 1.81. The leverage (LEV) of the sample firms indicates that some firms obtain all their funding through capital contributions, with a minimum value of 0.00. However, the average of 32.95 suggests that, generally, firms in Malaysia are not highly leveraged. The average size (SIZE) of the sample firms is 15.45, measured by the log of total assets, which ranges between 11.09 and 83.33. As part of the corporate governance element, the mean value of 53.16 for board composition (BOARD) indicates that, generally, Malaysian firms have more independent directors on their boards. The results also revealed that the majority of the Malaysian firms have a separate person acting as the chairman and CEO of the company. The variable of innovation (INNOV) indicates that 48 per cent of the firms are adopting SDG 9: Industry, Innovation, and Infrastructure.

Table 3 Descriptive Statistics of the Study's Variables

Variable	N	Mean	Standard Deviation	Minimum	Maximum
CT	434	39.57	17.98	0.00	97.22
PROF	428	6.92	10.32	-44.36	84.04
GRW	425	1.81	5.10	0.06	97.65
LEV	434	32.95	23.10	0.00	137.48
SIZE	434	15.45	1.44	11.09	83.33
BOARD	434	53.16	11.51	23.08	83.33
Variable	Non-INNOV		INNOV		
	Frequency	%	Frequency	%	N
	225	52	206	48	431
Variable	CEO duality		CEO separation		
	Frequency	%	Frequency	%	%
	34	8	400	92	434

Correlation Analysis and Multicollinearity

Table 4 presents the correlation matrix analysis of all variables in this study. Based on the results, the highest coefficient reported is 0.4818, which is below the cut-off of 0.7 (Hair et al., 2010). This is supported by the results presented in Table 5, which show that the variance inflation factor (VIF) values for all independent variables covered in the study are less than 5, indicating no multicollinearity problem arose in the dataset.

Table 4 Correlation Matrix

Variable	CT	PROF	GRW	LEV	SIZE	INNOV	BOARD	CEOD
CT	1							
PROF	0.0380	1						
GRW	0.0042	0.3610	1					
LEV	0.1105	-0.3650	-0.0604	1				
SIZE	0.3731	-0.3356	-0.1814	0.3844	1			
INNOV	0.4818	-0.0595	-0.0100	0.1823	0.3800	1		
BOARD	0.1562	-0.0771	-0.0504	0.0835	0.1003	0.0757	1	
CEOD	0.0995	-0.0133	0.0093	0.0852	0.0335	-0.0097	-0.0603	1

Table 5 Variance Inflation Factor (Vif) Values

Variable	VIF	1/VIF
SIZE	1.42	0.7067
PROF	1.36	0.7329
LEV	1.26	0.7951
INNOV	1.19	0.8430

GRW	1.18	0.8496
BOARD	1.02	0.9811
CEOD	1.02	0.9817
Mean VIF	1.21	

Regression Results

Table 5 presents the regression results for the drivers of climate transparency among PLCs in Malaysia from 2020 to 2023. As the baseline of the model estimation, represented by the POLS, most of the variables under study have a significant relationship with climate transparency, except for GRW and LEV, with an R^2 of 32.65 per cent. However, the Breusch-Pagan test for heteroskedasticity yielded a p-value of 0.0418. The p-value of less than 0.05 indicates that the model estimation provides sufficient evidence to reject the null hypothesis that the variance of the individual-specific effect is equal to zero. Hence, panel analysis was conducted for more robust regression results. Upon conducting the static panel analysis, the FEM estimation prevailed, with a Hausman's p-value of more than 0.05, specifically 0.0002. Hence, a robust estimation of FEM is relied on as the analysis's final results, which has clustered the standard error of each variable. Upon the adoption of the FEM, diagnostic tests for heteroscedasticity and autocorrelation were conducted, with both tests indicating a reported p-value of more than 0.05. It indicates that robust standard error estimations should be carried out to arrive at valid and final results by clustering the standard error (Hoechle, 2007).

Based on the results, leverage (LEV) has a significant negative relationship with the CT, with a coefficient of -0.1641. The negative relationship shows that highly leveraged firms tend to disclose less information on climate-related matters. The finding is consistent with Desai (2022) for studies conducted in India, using panel data analysis. Highly leveraged firms tend to prioritise servicing their financial obligations, which negatively influences the firm's initiative to undertake climate commitments. Environmental investment necessitates substantial capital contributions, and a longer timeframe is required for a viable return on investment (Palmer et al., 2001; Przychodzen & Przychodzen, 2015). Hence, highly leveraged firms must be able to wisely managed their financial resources for environmental investment, when simultaneously having financial obligation to Secondly, the firm's size also significantly influences the propensity of firms to disclose climate-related information, with a coefficient of 11.2309. Large firms tend to disclose more climate-related information, considering their significant environmental impact and the scrutiny they face from stakeholders (Haniffa & Cooke, 2005). To legitimise their business operations, the provision of such information serves as a mechanism to convince stakeholders of the efforts towards environmental sustainability. In addition, considering the regulatory landscape of disclosure requirements in Malaysia based on their market capitalisation (BM, 2015, 2022), a significant positive relationship is warranted. The regulatory push drives large firms to adopt climate change reporting more quickly to avoid a negative reputation or fines and penalties. Thirdly, the adoption of the innovation has a significant impact on the inclination of firms towards climate commitments, with a coefficient of 0.2709. The result is consistent with Kong et al. (2023), who found that technological innovation has a significant influence on ESG performance in Central and Southern Africa. Technological innovation enhances the capacity of firms to adopt sustainable practices (Kong et al., 2023), particularly in the context of environmental performance through improved resource productivity and competitiveness (Porter & Linde, 1995). Therefore, through innovation, the firm's climate performance improves, which indirectly enhances the quality of climate disclosure.

Table 6 Estimation Results of Pols, Fem and Rem for Climate Transparency and its Drivers

Dependent variable: CT	POLS	REM	FEM	FEM (Robust)
PROF	0.0975	0.0651	0.0459	0.0459
	(0.0296)***	(0.0300)**	(0.0346)	(0.0465)
GRW	0.0245	-0.0002	-0.0944	-0.0944
	(0.0610)	(0.0667)	(0.0839)	(0.0819)
LEV	-0.0083	-0.0432	-0.1641	-0.1641
	(0.0252)	(0.0343)	(0.0608)***	(0.0722)**

SIZE	2.022	2.5798	11.2309	11.2309
	(0.3435)***	(0.5097)***	(2.0127)***	(2.7620)***
INNOV	0.4199	0.3933	0.2709	0.2709
	(0.0538)***	(0.0548)***	(0.0668)***	(0.6514)***
BOARD	0.0060	0.0792	-0.1819	-0.1819
	(0.0022)***	(0.1241)	(0.1568)	(0.1221)
CEOD	0.2143	0.1588	0.1347	0.1347
	(0.0977)**	(0.1160)	(0.1511)***	(0.2668)
Constant	-2.825	-4.1249	-26.2322	-26.2322
	(0.9273)***	(1.4462)***	(5.503)***	(7.5206)***
Observations, N	373	373	373	373
No of groups		107	107	107
R-squared, R^2	0.3265	0.3243	0.2702	0.2156
F-test	25.24		13.70	9.32
	(0.0000)***		(0.0000)***	(0.0000)***
Wald chi2-test		117.89		
		(0.0000)***		
Poolability F-test			4.07	
			(0.0000)***	
Breusch-Pagan LM test		56.83		
		(0.0000)***		
Hausman test			27.94	
			(0.0002)***	
Heteroskedasticity	2.11		0.00073	
	(0.0418)**		(0.0000)***	
Serial Correlation			35.568	
			(0.0000)***	

Figures in parentheses are standard errors except for the F-test, Wald chi2-test, Poolability F-test, Breusch Pagan LM test, Hausman test, Heteroskedasticity and Serial Correlation tests, which are p-values.

***, ** and * indicate the respective 1%, 5% and 10% significance levels, respectively.

CONCLUSIONS

The provision of climate-related information to stakeholders, referred to as climate transparency in the current study, may serve as part of an environmental strategy in responding to stakeholders' pressure due to the catastrophic effects of climate change. The current study found a positive development in climate transparency among PLCs in Malaysia prior to the mandatory requirement for climate change reporting in the country, which will be implemented on a phased basis starting from 2025. The study found that the significant drivers of climate transparency in the emerging country of Malaysia are leverage, firm size, and the adoption of innovation. Highly leveraged firms are reluctant to allocate their resources to climate initiatives because financial obligations typically take precedence, explaining their significant negative relationship. Secondly, large firms tend to disclose more climate information to legitimise their business operations due to the significant environmental impact caused by their business activities. Lastly, firms that undertake innovation are climate-inclined, thereby enabling them to provide more climatic information to stakeholders. This empirical evidence offers valuable insights for business players as a readiness strategy for climate transparency, considering that substantial capital investment is needed for green endeavours. Meanwhile, the government has a crucial role to play in preparing a proactive environment in the country for green investment. Especially, as the government moves towards the mandatory requirement for climate change reporting, it must take proactive action to encourage firms to undertake climate initiatives through tax incentives, green financing, or

technology knowledge transfer.

For future research, the application of a dynamic panel model, such as the Generalised Method of Moments (GMM) method. GMM is a more robust panel data analysis method that considers the dynamic element in the model of the equation. The dynamic panel modelling will incorporate lagged dependent variables, as it assumes that last year's dependent variable affects the current year's dependent variable. With the application of GMM, the comparison between static panel and dynamic panel data analysis will provide more robust findings, which future studies may use to fill the gap.

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