

# Climate Change Disclosure in Egyptian firms and its Key-Determinants Following the Implementation of Financial Regulatory Authority Decree No.108

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## Abstract

This study measures the extent of climate change disclosure by publicly traded firms on the Egyptian stock exchange, a leading Arab and African emerging market. This is following the issuance of Decree No. 108 of 2021 by the Egyptian Financial Regulatory Authority (FRA), in accordance with the recommendations of the Task Force on Climate-Related Financial Disclosures (TCFD). The study further scrutinises the main drivers of such disclosure to evaluate the extent to which TCFD recommendations are effective in emerging markets and whether applying them on a mandatory basis matters. Via content analysis, the annual reports of 33 publicly traded firms were scrutinised during the period from 2021 to 2022. The analysis examines governance, strategy, risk management, and metrics and targets as the main areas of focus, with the objective of computing the cumulative climate change disclosure (CCD) scores. Ordinary least squares regression is employed in determining the factors that drive the extent of disclosure. The regression analysis underlines that belonging to high carbon impact industries, foreign-ownership, foreign-directors, board-size, and listing on S&P/EGX ESG index as key determinants that have a significant and positive impact on the level of CCD. However, it is observed that the presence of independent board members has a significant negative impact on the level of

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disclosure. The results are consistent with the notions of the integrative theoretical foundation proposed (stakeholder, shareholder, legitimacy and human capital theories). The study findings have significant implications for policymakers, regulators, international bodies, investors, accounting standards setters, and corporations that assess the strategic significance of climate change disclosure levels and their determinants. Further, the study findings contribute to the development of policies and regulations that promote green investments.

**Keywords:** Climate change disclosure, TCFD, SDGs, Content Analysis, IFRS S2, Decree No.108, S&P/EGX ESG.

## 1. Introduction

The momentous economic implications of climate change (CC) have recently raised the concern of international bodies, governments, the IFRS Foundation, and the global business community. It represents the current increases in average temperature worldwide, sea level rise, and surprising irregular severe weather events (Khalifaoui et al., 2022). Climate-related financial risks are not limited to physical risks; they also involve transition risks that reflect the financial loss resulting from assets-revaluation due to an unanticipated change in policies and regulations (Monasterolo and De Angelis, 2020). This implies that climate-related risks may result in direct damage to firm assets, changes in regulations, and even changes in social norms that affect corporate image and reputation (Khalifaoui et al., 2022).

Mitigating climate change and adaptation labour is a common requirement for sustainable development on national and international levels (Bhaduri et al., 2016, Biermann et al., 2017), hence its significance for international investors and decision-makers. It has the potential to significantly affect corporate financial risk, investor portfolio pricing, corporate sustainability, capital market performance, and overall global financial stability (Monasterolo and De Angelis, 2020, Chua et al., 2022, Lin and Wu, 2023, Pham et al., 2023, Wu and Wan, 2023). This explains the current efforts exerted to issue the International Financial Reporting Standard on Climate-Related Disclosures (IFRS S2: Climate-Related Disclosures), to commence being effective in 2024. This proposed financial reporting standard requires corporate disclosures on climate-related risks and opportunities that are likely to affect corporate cash flows, financing, or the cost of capital in the short, medium, or long runs (ISSB, 2023).

Since the issuance of the Task Force on Climate Related Financial Disclosures (TCFD) recommendations in 2017 (TCFD, 2023), regulators, investors, corporate boards, and other stakeholders have recognised the need to incorporate climate change implications into corporate reports (O'Dwyer and Unerman, 2020, Chua et al., 2022, Cosma et al., 2022, Braasch and Velte, 2023).

TCFD provides guidelines regarding governance, strategy, risk management, and metrics and targets that should be released to provide useful information concerning the consequences of corporate activities on climate and the environment. Hence, this practice encourages firms to adopt CC management systems to control and mitigate climate-related risks. They specify that firms should provide quantitative and qualitative information on the climate impacts of their activities and the internal processes and procedures applied. Such disclosures should be relevant, specific, complete, balanced, understandable, consistent, comparable, reliable, objective, timely, and verifiable (Monasterolo, 2020). Accordingly, as part of the current efforts to support sustainable economic development, capital market regulators in many countries have started to adopt TCFD recommendations to encourage environmentally responsible financial markets.

Climate change disclosure (CCD) can be referred to as the way firms report the CC risks and opportunities associated with business activities to stakeholders. The increased pressures on business-firms to improve their environmental performance and their need to report on that improved the stakeholders' awareness of its implications (Xue et al., 2020). Improved environmental practices are proven to have a positive spill-over impact on corporate performance (Gatimbu et al., 2018, Hang et al., 2019). Based on Amel-Zadeh (2021) global survey, investors contemplate climate risk as financially material and incorporate regulatory and litigation risks. In a similar vein, applying to the Chinese electric power sector, Sun et al. (2023) provide evidence that CC risks have a significant positive influence on corporate financial-performance. Chua et al. (2022), and Lv and Li (2023) report a significant climate-policy impact on Chinese stock market volatility. Likewise, Lin and Wu (2023) highlight the positive link between climate risk disclosure by Chinese listed firms and mitigating stock-price crash risk.

Applying to the US context, Pham et al. (2023) claim that investors consider climate risks and green investments following the Paris Agreement, and Khalfaoui et al. (2022) prove that the spill-over linkage of CCD is strongly influenced by market conditions and that investors address the lack of CCD as the main barrier to evaluating the CC effects. However, Braasch and Velte (2023), applying to German DAX30 firms, suggest corporate symbolic use of climate reporting to improve their image and gain legitimacy. Additionally, some researchers report mispricing of climate risks by financial markets (Andersson et al., 2016, Khan et al., 2016). Hence, there is a need for more research in this emerging field of disclosure to explore the quality of CCD practices and their main drivers, especially at the level of less-developed markets that are struggling to globalise their economies.

The Arab Republic of Egypt (A.R.E.) is susceptible to numerous sustainability-related challenges, particularly those that have CC implications that are currently of global importance (Yassen et al., 2020). Accordingly, Egypt, as one of the participants in the Paris Climate Agreement in 2015, has exerted numerous efforts to improve its ranking in the climate change performance index; submitted its nationally determined contribution for the first time in 2022; hosted COP27; and began a strategic partnership with the European Union in climate finance and adaptation (CCPI, 2023). Additionally, as an active member of the Sustainable Exchange Initiative, the Egyptian Financial Regulatory Authority (FRA) has taken several steps to support the release of CCD by listed firms on the EGX. As a pivotal action to attract international financial institutions and support environmentally friendly investments, the FRA issued Decree No. 108 in 2021. This decree requires listed firms with an issued capital or net ownership rights of at least 500 million Egyptian pounds, to provide CCD to show the financial impact of climate change as suggested by the TCFD, and to attach such disclosures to their annual reports, with such requirements becoming mandatory for the fiscal year ending December 2022(SSEI, 2021).

Given that Egypt has been at the forefront of issuing environment-protection laws since 1994, with the Egyptian Environmental Affairs Agency (EEAA) being responsible for monitoring and enforcing environmental regulations, and as Egypt has been the first to initiate ESG index in the region since 2010, it is expected that, there is some degree of awareness of corporate environmental responsibility among firms and different groups of stakeholders within the Egyptian context. This implies that listed firms will provide CCD, as such disclosures are likely to be valued by capital market participants and other stakeholder groups. While the nations are working together to reach a low carbon global economy and to mitigate climate-change effects, the played role by the A.R.E. as a leading transitional economy in African and Arab worlds is of precise significance in spreading awareness of the necessity to materialize the actions needed to mitigate CC risks into national regulations.

Given the scarcity of available empirical research(Liao et al., 2015, Amran et al., 2016, Ben-Amar et al., 2017, Ooi et al., 2019, Cosma et al., 2022, Braasch and Velte, 2023), this study fills the gap in the literature by being one of the first attempts to investigate the extent and nature of CCD in the annual reports of publicly-listed firms on the EGX, following the implementation of Decree No. 108. Additionally, the study investigates the main determinants influencing CCD quality.

In line with Deegan (2011) claim that there is no one theory that can competently explain corporate environmental accounting, building on insights from stakeholders, shareholders, legitimacy, and human capital theories to investigate the CCD and its key-drivers, this study proposes an innovative

theoretical base with an inclusive interpretation of possible relationships. This integrative framework provides additional insights, specifically when scrutinising emerging markets.

Targeting emerging economies with limited funds to finance advanced technologies, less-developed economic advancement, weak enforcement of laws, and where the cognition of CC effects by investors and firms is still developing compared to developed markets (Mangena et al., 2012, Jamali and Karam, 2018), adds to the need for carrying out this study.

The results reveal that, on average, Egyptian firms have reported 48.8% of the CCD index required by the Financial Regulatory Authority. Moreover, a significant enhancement is observed in the level of disclosure for the year 2022, highlighting the pivotal role of issuing Decree No.108 in enhancing CCD. Regression analysis indicates a positive significant relationship between board size, foreign ownership, foreign directors, and the level of CCD. Moreover, firms operating in carbon intensive industries and firms listed on S&P/EGX ESG provide a significantly higher level of disclosure. Nevertheless, it is noted that independent board members have a noteworthy negative influence on the CCD level. These findings support the notions of the theoretical foundation employed.

As there is a growing movement towards green investment, the study results may help policymakers in determining the barriers to acceptable compliance with CCD recommended by the TCFD and in developing the national CCD regulatory framework. The results can help policymakers decide the necessary actions to mitigate CC hazards to sustain their economic stability and meet national development goals. Identifying CCD determinants helps professional bodies close the reporting gap at country and firm levels. Results are expected to be of importance for investors in setting up their investment strategies and for other stakeholders in making better assessments of the current and future corporate potential.

The remainder of this study is structured as follows: Section 2 indicates its theoretical underpinning, and prior literature and formulates the hypotheses. Research methodology is interpreted in Section 3. Finally, study findings and a conclusion with avenues for future research are discussed in sections 4 and 5, respectively.

## **2. Theoretical background and hypotheses development**

### ***2.1. Theoretical background***

#### ***2.1.1. Stakeholders' theory***

According to this theory, management responsibility is not limited to shareholders but extends to considering the interests of other groups or individuals affected by or affected by corporate activities (Wang et al., 2016, Velte et al., 2020, Al

Amosh et al., 2022). Hence, this highlights how powerful the role of stakeholders is in maintaining nonfinancial aspects of corporate performance and, hence, in supporting corporate sustainability (Herold, 2018, Kaur and Lodhia, 2018). In a similar vein, it is claimed that shareholders' satisfaction is not the main priority of businesses (Jones et al., 2018). According to Chen et al. (2023) considering the environment helps in reducing corporate risks through strengthening its competitive advantage and enhancing its product image, thereby gaining higher support from stakeholders. Accordingly, CCD should be taken seriously by listed firms to avoid negative reactions from stakeholders that can threaten corporate sustainability. However, even with CCD being released by firms, stakeholders may not consider it in their decisions due to the complexity of CC, which may make it difficult to assess the time and form of its related risks (Ge and Lin, 2021, Lin and Wu, 2023).

### ***2.1.2. Shareholders' theory***

According to this theory, corporate management's main priority is to satisfy the information needs of shareholders in order to mitigate agency costs resulting from information asymmetry (Nguyen and Nguyen, 2020, Xue et al., 2020, Al Amosh et al., 2022, Hazaea et al., 2022, Lin and Wu, 2023). This information includes information relating to corporate environmental performance, keeping in mind that any disclosures should primarily serve the value creation objective to best meet shareholders' interests (Al Amosh et al., 2022). To decrease agency costs, corporate management should provide useful information regarding the climate effects resulting from corporate activities, how CC risks impact corporate operational and financial performance and hence corporate sustainability, and how CC risks and opportunities are incorporated into the corporate risk management process (Chua et al., 2022). If corporate performance fails to respond to the development in investors' acuity to CC-related risks, this reflects that CCD is still not a main driver for corporate valuation decisions (Zhang, 2022). However, according to Lin and Wu (2023), improved disclosures can effectively mitigate information asymmetry by improving the assessment of possible risks, thereby providing a sort of early warning. Consequently, corporate management is expected to provide CCD to diminish the information gap and enable shareholders to better value the consequences of corporate risks that are climate-related on the firm's performance, thereby mitigating the management-shareholder information gap and decreasing agency costs. This is likely to be further supported with corporate governance monitoring tools.

### **2.1.3. Legitimacy theory**

Legitimacy theory has been a significant source of inspiration for several studies focusing on environmental disclosure (Chelli et al., 2014, Chauvey et al., 2015). Legitimacy theory explains the rationale behind managers' disclosure of information to promote the interests of an organisation. According to Patten (1992), the social contract is a crucial concept within legitimacy theory. Shocker Allan and Prakash (1974) mention that firms are operating within a social contract, either explicitly or implicitly, where their survival and expansion depend on providing societal outcomes and distributing benefits (economic, social, or political) to the groups granting power to them. Deegan (2002) points out that managers may have various motivations for disclosing information regarding the environmental performance of their firm. One motivation could be the need to establish legitimacy for specific aspects of a firm's activities. Thus, this theory assumes that firms belong to carbon-sensitive industries strategically respond to social and political pressures by disclosing information about their corporate climate practices. These firms face considerable pressure to legitimise their actions by providing extensive climate disclosures (Deegan, 2002, Braasch and Velte, 2023).

### **2.1.4. Human capital theory**

According to this theory, education, skills, and experience affect the cognitive and productive abilities of human capital (Gull et al., 2018). Accordingly, each board member is expected to have a unique contribution to the board (Nguyen et al., 2020). Cognitive differences among board-members affect the exercise of a critical attitude, which enhances board efficiency (Hsu et al., 2019, Iwamoto and Suzuki, 2019, Esho and Verhoef, 2020). Applying to the UK context, Haque (2017) results suggest that board diversity can significantly improve corporate carbon performance in FTSE 350 nonfinancial firms. Foreign directors are expected to be aware of international environmental best practices, their execution, and monitoring, which best serve different stakeholders' groups' interests, as claimed by Mardini and Elleuch Lahyani (2022). Hence, the presence of foreign members on boards can improve monitoring of CCD practices by corporate board-members due to their diverse backgrounds in terms of education, qualification, and values.

## **2.2. Literature review and hypotheses development**

CCD is an emerging corporate reporting practice. However, despite the scarcity of research in this area, recent studies investigating compliance with TCFD recommendations are showing improvement in CCD practices over time though being at low levels (Giannarakis et al., 2017, Threlfall et al., 2020, Demaria and Rigot, 2021, Nisanci, 2021). This supports the need for this study that is likely to be the first to address compliance with TCFD recommendations and their determinants, applying to Egypt.

### ***2.2.1. Determinants of climate change disclosure***

CCD represents the channel through which businesses confirm their accountability towards developing a CC strategy to different stakeholder groups (Ooi et al., 2019). It helps improve corporate transparency concerning CC practices and their related current and future risks and opportunities (Ooi and Amran, 2018, Chua et al., 2022). Based on the results of Braasch and Velte (2023), applying to German-listed firms, there is still room for CCD practices improvements. Identifying the possible determinants of disclosure practices is essential for development of the extent, quality, and comprehensiveness of corporate-reports (Tauringana, 2021, Al Amosh et al., 2022). Accordingly, addressing the key-drivers of CCD enables mitigating the disclosure gap, particularly among firms listed on emerging stock exchanges, by detecting its major challenges and opportunities. Hence, this subsection aims to identify the possible key determinants of CCD in Egypt.

#### ***2.2.1.1. Disclosure Reform (Decree No. 108)***

The regulatory environment plays a pivotal role in promoting environmental-disclosure practices (Azizul Islam and Deegan, 2008). According to Monasterolo and De Angelis (2020), the Paris Agreement announcement resulted in a reduction in overall systematic-risk for low-carbon indexes applying to the US, EU, and other global stock markets. Applying to Egypt, prior research claims Egyptian legal and institutional frameworks are weak and ineffective (Farooque et al., 2022), which stands as a barrier to enhancing environmental disclosure practices. However, the issuance of Decree No.108, which requires listed firms to disclose CC related information, is likely to strengthen CCD in the Egyptian context. On one hand, this action is likely to force corporate management to release CC-related information. On the other hand, it is likely to improve investors' awareness of climate risks and their potential consequences for corporate performance. This is supported by Lin and Wu (2023), who argue that promoting CCD can successfully lessen asymmetry in management-investor climate risk perceptions, which prevents failures in case of releasing such information unexpectedly. Accordingly, mandating CCD will force management to take the necessary procedures to decrease the harmful climate effects of corporate activities, as this may reflect government commitment towards environmental issues. Hence, the level of CCD in the annual reports of publicly listed firms in Egypt is expected to experience a significant improvement in 2022 compared to 2021, as a consequence of the implementation of Decree No.108. Accordingly, hypothesis-1 is articulated as follows:

*H1: Decree No.108 has significantly improved corporate CCD.*



### **2.2.1.2. Industry Classification**

Businesses operating in different industries should not ignore the fact that CC is likely to influence the economic operations of climate-sensitive industries (e.g., agriculture, fishing, and forestry) as well as non-climate-sensitive ones such as insurance and financial services (Ghadge et al., 2020, Sun et al., 2023). Green economic activities are more likely to attain green growth (Ulucak, 2020, Hao et al., 2021). Hence, carbon performance is gaining escalating recognition from businesses for strategic purposes (Xue et al., 2020). Ben-Amar and McIlkenny (2015) mention that high carbon intensive industries have greater CC related risks, and thus exhibit a higher level of CCD compared to firms in low-carbon-intensive industries. Also, Hsu et al. (2023) and Pham et al. (2023), argue that carbon-intensive firms are subject to higher litigation risk, which can affect their performance. Therefore, environmentally alert investors prefer green stocks, and highly polluting firms are asked for higher returns (Hsu et al., 2023). According to Zhang (2022), the stock return is influenced by the firm classification as green or brown. This is further emphasised by Monasterolo (2020), who argues that Investors consider CC-related risks associated with different industries in their investment allocation decisions. This claim is also supported by the empirical results of Xue et al. (2020), that apply to the UK context and prove the influence of industry type due to the differences in investor attitude resulting from variations in industry environmental impact. The results of Braasch and Velte (2023) report a CCD gap between German carbon-sensitive firms and non-carbon-sensitive ones. According to Zhang (2022), green firms hedge climate risks. This is further justified by Pástor et al. (2021), who claim climate hazards to push governments to issue strict laws that favour green firms and also lead to increased demand for green products and services. Hence, investors highly value the stock of green firms due to its expected higher future cash flows (Zhang, 2022).

Although there is some evidence from prior research that carbon emission intensity negatively affects CCD, plenty of prior research support a positive effect (Braasch and Velte, 2023, Hahn et al., 2015, Velte et al., 2020). Accordingly, hypothesis-2 is articulated as follows:

H2: Firms operating in carbon intensive industries exhibit a greater level of CCD.

### **2.2.1.3. Foreign Ownership**

In broad terms, inadequate risk disclosure is identified as a key factor that influences foreign direct investment (Wahh et al., 2020). The existence of foreign stockholders supports corporate transparency and stakeholders' trust (Al Amosh et al., 2022, Al Amosh and Mansor, 2021). The review of prior environmental disclosure research reveals inconsistent results. Some researchers (Qa'dan and

Suwaidan, 2018, Saini and Singhania, 2019, Sharma et al., 2020) report a negative association. However, other researchers report a positive association (Guo and Zheng, 2021, Al Amosh et al., 2022). In a similar vein, with respect to CCD, the results of Zhang (2022) support the sensitivity of foreign investors to climate risks based on a sample from global stock markets. Applying to the Egyptian context, there is evidence that foreign ownership improves corporate non-financial disclosures compared to domestic one (Elfeky and Abdelaziz, 2022), however, there is no available evidence on the influence of foreign ownership on CCD. Accordingly, hypothesis 3 is articulated as follows:

H3: The percentage of foreign ownership has a significant positive influence on the level of CCD.

#### **2.2.1.4. Foreign directors on corporate boards**

The board of directors is a major governance mechanism that can play a crucial role in fairly providing a clear picture regarding CC implications at the firm level (Pattberg, 2017, Ooi et al., 2019, Cosma et al., 2022). This in turn helps in supporting corporate accountability, transparency, and hence sustainability. Good governance is important in securing value creation for the best interest of corporate shareholders and in balancing their interests with those of other stakeholders. The available research on the influence of corporate governance on CCD quality is relatively scarce (Liao et al., 2015, Ben-Amar et al., 2017, Ooi et al., 2019, Cosma et al., 2022, Mardini and Elleuch Lahyani, 2022). However, several available studies have specifically highlighted the proactive role of board diversity, particularly foreign directors sitting on board (Ben-Amar et al., 2017, Nguyen and Nguyen, 2020, Mardini and Elleuch Lahyani, 2022). Thanks to their miscellaneous skills, perceptions, and links (Ben-Amar et al., 2017, Baker et al., 2020, Song et al., 2020, Zaid et al., 2020, Khatib et al., 2021), foreign directors are likely to support corporate sustainability practices and CCD. Hence, the presence of foreign members on boards can enhance CCD due to the impact of their original foreign backgrounds on legislative and normative frameworks that most likely support a positive attitude towards climate change-related issues (Ooi et al., 2019). Hence, the presence of foreign directors could improve compliance with TCFD recommendations in form as well as appearance in firms operating in emerging economies, whereas CCD is likely to be an imported culture.

The influence of foreign directors on corporate CCD or even on environmental disclosure has not been examined in the Egyptian context. Available evidence in other contexts reveals inconsistent results. Applying to developed contexts, prior researchers such as Ben-Amar et al. (2017) applying to the Canadian context and Mardini and Elleuch Lahyani (2022) applying to the French context provide evidence that supports a significant positive influence.

However, applying to Malaysia, the results of Ooi et al. (2019) fail to reveal any association. Accordingly, hypothesis-4 is formulated as follows:

H4: The percentage of foreign directors on corporate boards has no influence on CCD.

#### **2.2.1.5. Board Size**

The responsibility for reporting falls under the authority of the board, which influences the corporate quality of CCD (Ben-Amar and McIlkenny, 2015, Nathalia and Setiawan, 2022). Board members provide the firm with advice and suggestions relating to strategic performance (Federica et al., 2019). Large boards have the potential to better assess CC related risks and opportunities and hence recommend the most suitable action that better serves the interests of all stakeholders, including shareholders (Brahmana et al., 2019, Nathalia and Setiawan, 2022). Board size is claimed to be an effective governance tool that improves environmental disclosure practices by improving monitoring quality, through the presence of a pool of directors that enriches board financial and non-financial expertise diversity (Elzahar and Hussainey, 2012). On the contrary, some research embarrasses this claim, assuming a large number of boards results in poor communication and coordination and slows the decision-making process, hence having a negative effect on corporate disclosure (Kathy Rao et al., 2012). On the other hand, research conducted by Alshbili et al. (2020) reports a non-association between board size and corporate social disclosure.

Applying to the Egyptian context, there is no evidence available on the impact of board size on CCD, however, there is evidence of a negative association between board size and social responsibility disclosure (Elfeky and Abdelaziz, 2022). With respect to board size-CCD association, Cosma et al. (2022) and Ooi et al. (2019) report insignificant results applying to other contexts. Accordingly, hypothesis-5 can be formulated as follows:

H5: Board size has no influence on the level of CCD.

#### **2.2.1.6. Board Independence**

Board members can employ their capabilities and knowledge more freely when they are independent. As a governance tool, it is of primary importance to stakeholders who are keen to evaluate corporate attitude towards CC related issues (Cosma et al., 2022). The presence of independent members on board minimize agency costs through improved transparency and improved legitimacy by considering the interests of shareholders, other groups of stakeholders and the society as a whole (Akbas, 2016, Jaggi et al., 2018, Cosma et al., 2022, Elfeky and Abdelaziz, 2022). Additionally, independent directors can play a crucial role

in improving corporate CCD by adding new insights and perspectives to corporate decision making relating to compliance with CCD requirements (Ooi et al., 2019). The appointment of independent directors increases the opportunity of having superior directors with distinguished capabilities in terms of knowledge, experience and skills (Ntim and Soobaroyen, 2013); hence enables a more effective monitoring over corporate management (Liao et al., 2015). On the contrary, independent directors may harm disclosure practices if they lack deep knowledge and specialization (Elfeky and Abdelaziz, 2022). Some prior researchers (e.g., Ntim et al. 2013; Liao et al. 2014; Sharif and Rashid 2014) support a positive influence of independent directors' percentage on non-financial disclosure. Applying to Egypt, there is no available evidence on the influence of board independence on the quality of CCD, however, the results of Elfeky and Abdelaziz (2022), support a negative association between board independence and social responsibility disclosure. Concerning CCD-board independence association, available evidence applying to other contexts reveals a positive association applying to Malaysia (Ooi et al., 2019). However, Cosma et al. (2022) and Bui et al. (2020) report lack of association of board independence, with CCD and carbon disclosures respectively applying to the European context. Accordingly, hypothesis-6 can be formulated as follows:

H6: The percentage of independent board members has no influence on the level of CCD.

#### **2.2.1.7. *The S&P/EGX ESG Indexing***

Disclosing environmental information, including climate-related issues, in addition to other sustainability related information, is gaining escalating consideration worldwide as a sign of corporate management competency in managing risks (Farooque et al., 2022). In Egypt, the S&P/EGX ESG was initiated in 2010 by the Egyptian Institute of Directors (EIOD), S&P Dow Jones, and Crisil. ESG score research, score calculation, and management are carried out by the EGX, while S&P Dow Jones Indices provides the methodology for defining relevant ESG criteria, and calculating the index (Hassaan, 2017, EGX, 2021). In light of competition between firms listed on the EGX 100 index to also be included in the Egyptian Corporate Responsibility Index (S&P/ESG), which includes the best thirty firms in terms of disclosing environmental, social responsibility, employees, and governance practices, as well as market size and liquidity. Hence, the level of CCD is expected to be higher in firms listed on the index to prove their commitment and maintain their reputation. There is no evidence available on the ESG index listing-CCD association in the Egyptian context; however building on the evidence available from Hassaan (2017), that

firms listed on the S&P/EGX ESG Index make better integrated reporting related disclosures, hypothesis 7 can be formulated as follows:

H7: Firms listed on the S&P/EGX ESG index exhibit a greater level of CCD.

To further grasp relationships and the theoretical underpinning of this study, the proposed conceptual model is portrayed in Figure 1.

### **3. Data and methodology**

#### **3.1. Sample and data**

The empirical analysis targets EGX listed firms that are eligible for CCD mandatory adoption, as required by FRA Decree No. 108. The study period spans from 2021 to 2022, marking the initiation of CCD implementation according to Decree No. 108. Based on the purposive sampling method, the study sample contains all non-financial firms listed on the EGX with an issued capital or net shareholder equity of not less than L.E. 500 million (as specified by Decree No. 108). This results in a sample of 33 firms with 66 observations in total. Table 1 shows the frequency distribution of the sampled firms by sector, identifying a higher incidence of firms in the economic activity framed in Basic Materials and Consumer Cyclical. The financial data was collected from Refinitiv Eikon, while corporate governance data was extracted from firms' annual reports found on Mubasher website ([www.mubasher.info](http://www.mubasher.info)). Regarding CCD-related information for the fiscal year 2021, we have obtained it from firms' annual reports, board of directors' reports, social responsibility reports, sustainability reports, and firms' websites. However, for the fiscal year 2022, CCD-related information is obtained from climate change disclosure reports required by the FRA.

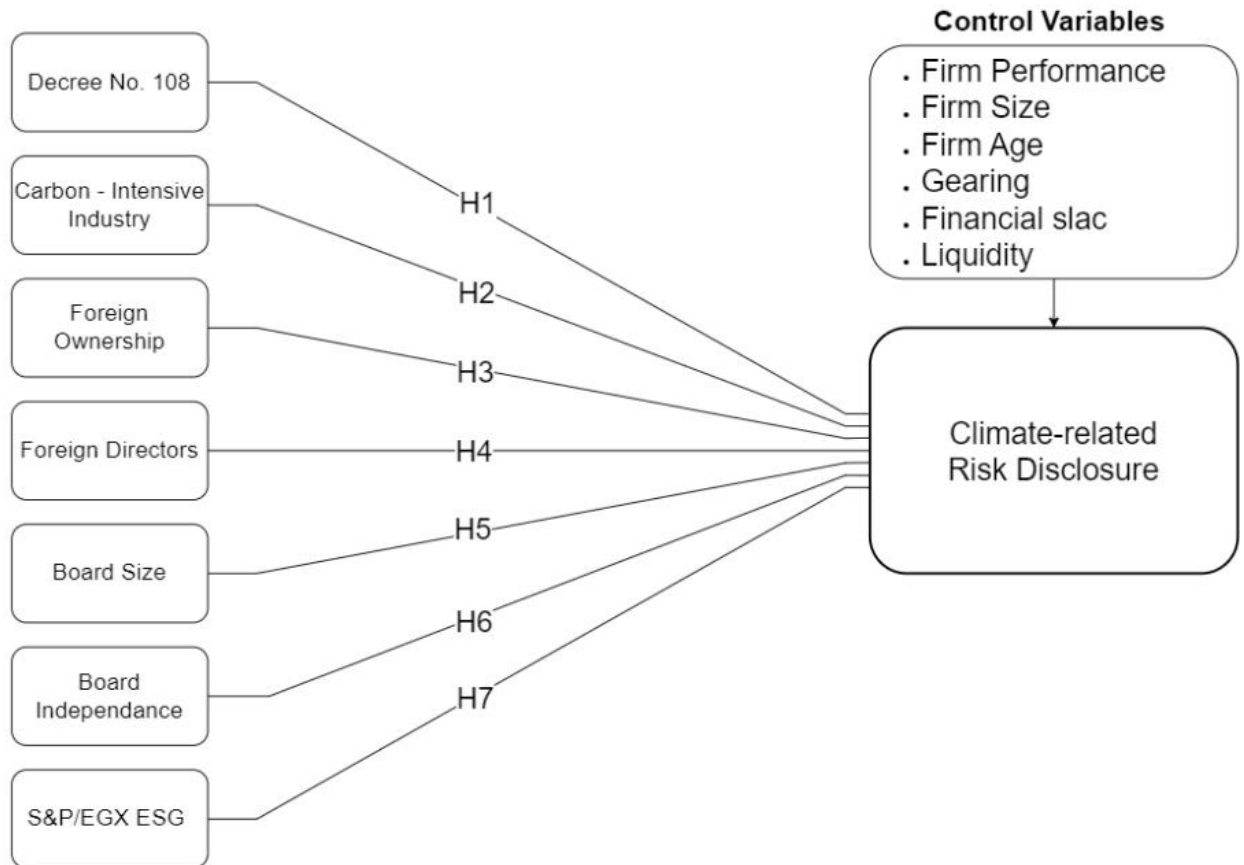
#### **1.1. Measurement of variables**

##### **1.1.1. The dependent variable: Climate-related disclosures**

This study employs content analysis to measure CCD levels in Egyptian firms. This method is used to draw reliable and accurate conclusions from data based on its contextual information (Raimo et al., 2022). It is common to use it in environmental reporting research to assess the level of firms' disclosure on different environmental pillars (Ooi and Amran, 2018, Demaria and Rigot, 2021, Maji and Kalita, 2022). Applying the CCD index suggested by the FRA, the CCD level is measured among the study sample. This index is composed of 17 items grouped into four bedrocks: governance, strategy, risk management, and metrics and targets (see Appendix A). The governance pillar discloses how the organisation manages CC risks and opportunities. The strategy pillar discloses CC

actual consequences and future ones of the organization's enterprises, strategy, and financial planning. The Risk Management pillar discloses the way the organisation finds, analyses, and manages CC risks. Finally, the metrics and targets disclose the measures and objectives employed to analyse and manage relevant CC risks and opportunities.

**Figure 1: The Conceptual model**



**Table 1: Study sample sector-frequency distribution**

<b>Sector</b>	<b>Frequency</b>	<b>Percent</b>
Basic Materials	20	30.3
Consumer Cyclicals	22	33.3
Consumer Non-Cyclicals	4	6.1

Energy	2	3.0
Healthcare	2	3.0
Industrial	12	18.2
Real Estate	4	6.1
Total	66	100.0

The applied index quantifies the level of CCD by a firm using an equal weighting scheme. Freedman and Jaggi (2005) report insignificant variations in results between equal and differential weights. A binary coding system with a value of '1' is used to denote that the reporting indicator is present, while '0' denotes its absence. The CCD score for each firm is expressed as a percentage, ranging from 0% if no indicators were disclosed by the firm, to 100% if all indicators in the index were disclosed. Mathematically, it can be expressed as:

$$CCD_{jt} = \frac{\sum_{i=1}^{k_j} Z_{jt}}{k_j}$$

where  $CCD_{jt}$  represents the CCD score,  $K_j$  is the number of indicators ( $K_j = 17$ );  $j$  represents the firm and  $t$  represents the time.  $Z_{jt}$  equals to 1 if the firm discloses the indicator and 0 otherwise.

Data collected from content analysis needs to be ascertained for reliability before it can be considered trustworthy (Hayes and Krippendorff, 2007). Following previous studies, Krippendorff's alpha is used to assess the inter-rater reliability. Rezaee et al. (2021) suggest that this method is more appropriate for conducting reliability tests involving more than two raters. Krippendorff's alpha " $\alpha$ " is computed among all three raters. Guthrie and Mathews (1985) proposed that a threshold of 80% or higher is considered acceptable. The result in Table 2 reveals a high level of reliability ( $\alpha = 0.9822$ ), with a confidence interval of 0.9754 to 0.9891.

**Table 2 Reliability estimate using Krippendorff's alpha**

	Alpha	LL95%CI	UL95%CI	Units	Observers	Pairs
Ratio	.9822	.9754	.9891	1120	3	3360

### 1.1.2. The independent variables

This study accounts for a set of independent variables: disclosure reform (Decree No. 108), carbon-intensive industry, foreign ownership, foreign directors, board size, board independence, and S&P/EGX ESG indexing. The study sample is

categorised into carbon-intensive industries as well as low-carbon industries, based on the Global Industry Classification Standards (GICS) and the guidance provided by the TCFD in 2017 (TCFD, 2017, Braasch and Velte, 2023). Additionally, this study controls for firm performance, firm size, age, gearing, financial slack, liquidity, and year following previous studies (Baalouch et al., 2019, Maji and Kalita, 2022, Raimo et al., 2022, Bairagi and Ghosh, 2023). Several studies report that firm performance has a significant positive influence on carbon performance (Hsu et al., 2019, Gorgen et al., 2020, Sun et al., 2023, Wu and Wan, 2023). Additionally, firm size is one of the time-varying drivers that are likely to affect CC-related risks. Firm size is proven to have a positive influence on CCD (Kouloukoui et al., 2019, Cosma et al., 2022). Large firms release CCD information because they are more visible, and doing that at a lower cost compared to smaller firms supports this attitude (Tingbani et al., 2020, Cosma et al., 2022). We also include a variable for firm age, as older firms are expected to have more resources available for investing in CC activities compared to younger ones, which may have competing business priorities (Tingbani et al., 2020). Thus, older firms may have a greater focus on gathering and disclosing higher extents of climate information (Raimo et al., 2022). Following Xue et al. (2020), we control the firm's gearing. Highly leveraged firms may lack the necessary funds to engage in high-level environmental disclosure (Andrikopoulos and Kriklani, 2013). Moreover, this study considers the influence of financial slack, as firms with such slack are anticipated to allocate resources towards CC activities, hence related disclosure improves (Tingbani et al., 2020). Finally, we incorporate liquidity, as it plays a key role in determining the firm's disclosure quality (Garg and Kumar, 2018).

## 1.2. Model specification

A paired sample t-test has been executed to evaluate the statistical significance of the difference in CCD quality between the years 2021 and 2022, subsequent to the enforcement of Decree No.108 by the FRA. To examine the influence of independent variables on the CCD level during the period 2021-2022, as displayed in Figure 1, the following multiple regression model with robust standard errors is developed:

$$\begin{aligned}
 \text{CCD}_{it} = & \lambda_1 + \lambda_2 \text{CarbonInt}_{it} + \lambda_3 \text{Fownership}_{it} + \lambda_4 \text{Fdirector}_{it} + \lambda_5 \text{BSZ}_{it} + \\
 & \lambda_6 \text{Bind}_{it} + \lambda_7 \text{EGX}_{it} + \lambda_8 \text{Fper}_{it} + \lambda_9 \text{FSIZE}_{it} + \lambda_{10} \text{FAge}_{it} + \lambda_{11} \text{Fgea}_{it} + \\
 & \lambda_{12} \text{FINSLAC}_{it} + \lambda_{13} \text{Liq}_{it} + \lambda_{14} \text{Year} + \varepsilon_{it}
 \end{aligned}
 \tag{1}$$



Where CCD refers to climate change-related disclosure;  $\lambda_1$  denotes the intercept;  $\lambda_2, \lambda_3, \dots, \lambda_n$  denote the independent variables coefficient;  $i$  and  $t$  represent the firm and time, respectively; Year is a dummy variable that control for year; and  $\varepsilon_{it}$  is the error term. Table 3 presents the variables and their corresponding measurements.

To run the regression model, some assumptions need to be checked. First, Jarque-Bera test is used to check the normality of the residuals (Desgagné and Lafaye de Micheaux, 2018). Additionally, Pearson correlation coefficients are used to assess the possibility of multicollinearity. Moreover, Breusch-Pagan-Godfrey test is used to check the heteroskedasticity in the data (Koenker, 1981). Finally, The Pesaran scaled Lagrange multiplier (LM) test, developed by Pesaran (2004), is employed to identify potential cross-section dependency.

**Table 3 Study variables and their measurements**

Variable	Measurement
<b>Independent variables</b>	
carbon-intensive industry (CarbonInt)	a dummy variable; = (1) if the firm operates in a carbon-intensive industry and = (0) otherwise (Ben-Amar and McIlkenny, 2015, TCFD, 2017).
Foreign ownership (Fownership)	number of shares owned by foreigners to total outstanding shares (Qa'dan and Suwaidan, 2018).
Foreign director (Fdirector)	number of foreign directors on board to the total board number (Issa and Hamman, 2021)
Board Size (BSZ)	total number of members sitting on board (Gull et al., 2018).
Board independence (Bind)	number of independent directors to total number of board directors (Issa and Hamman, 2021).
S&P/EGX ESG (EGX)	dummy variable; = (1) if the firm is listed on S&P/EGX ESG index and (0) otherwise (Hassaan, 2017).
<b>Control Variables</b>	
Firm performance (Fper)	measured as earnings per shares and calculated as (firm's net income - preferred dividends)/the average

	number of outstanding common shares(Sun et al., 2023).
Firm size (FSIZE)	the natural logarithm of total assets(Maji and Kalita, 2022).
Firm age (Fage)	the number of years since the firm's establishment(García-Sánchez et al., 2021).
Gearing (Fgea)	total debt to total equity(Baalouch et al., 2019).
Financial slack (FINSLAC)	cash and cash equivalents/total sales(Tingbani et al., 2020).
Liquidity (Liq)	current assets to current liabilities(current ratio)(Alipour et al., 2019, Tingbani et al., 2020).
Year	Year dummies for 2021 and 2022

## 2. Results and discussion

### 2.1. Descriptive statistics and correlation analyses

The paired-sample t-test result is presented in Table 4. A paired sample t-test has been conducted to assess the statistical significance of the difference in CCD quality between the time periods of 2021 (M=.277, SD=.046) and 2022 (M=.488, SD=.301). Before conducting the analysis, the Kolmogorov-Smirnov test, skewness, and kurtosis have been examined to assess the assumption of a normal distribution of the difference scores of the total CCD (Ghozali, 2012). Kolmogorov's results reveal that the difference score follows a normal distribution, as evidenced by a p-value greater than 0.05. Kolmogorov's findings indicate that the difference score conforms to a normal distribution, as indicated by a p-value exceeding 0.05. The estimated skewness and kurtosis values are -.873 and 1.299, respectively. These values fall within the acceptable range for a t-test, as defined by Posten (1984), which states that skewness should be less than 2.0 and kurtosis should be less than 9. The correlation between the total CCD in 2021 and 2022 is strong and significant ( $r = .838$ ,  $p < 0.01$ ), indicating that the paired sample t-test is suitable for this analysis.

The results in Table 4 reveal that average Total CCD in 2021 is 0.277 while in 2022 is 0.488, which means an increase in the disclosure quality by 0.211, which is a statistically significant difference ( $p < 0.01$ ). Furthermore, the effect size of Cohen's d was calculated to be -1.360, indicating a substantial effect size according to Cohen (1992) classification, hence, confirms the difference.

Thus, H1 is accepted, which suggests the pivotal role of issuing Decree No.108 in significantly improving the level of corporate CCD in the Egyptian context.

**Table 4: Paired-sample T-Test**

	CCD Mean (2021)	CCD Mean (2022)	Mean difference	Correlation	Cohen's d Point Estimate
Total	.277(.267)	.488(.301)	-.211 <sup>**</sup> (.155)	.858 <sup>**</sup>	-1.360
Governance	.273(.275)	.424(.367)	-.152 <sup>**</sup> (.215)	.811 <sup>**</sup>	-.702
Strategy	.291(.316)	.533(.298)	-.242 <sup>**</sup> (.037)	.754 <sup>**</sup>	-1.119
Risk management	.196(.229)	.349(.344)	-.152 <sup>**</sup> (.213)	.794 <sup>**</sup>	-.708
Metrics and targets	0	.288(.451)	-.288 <sup>**</sup> (.451)		-.638

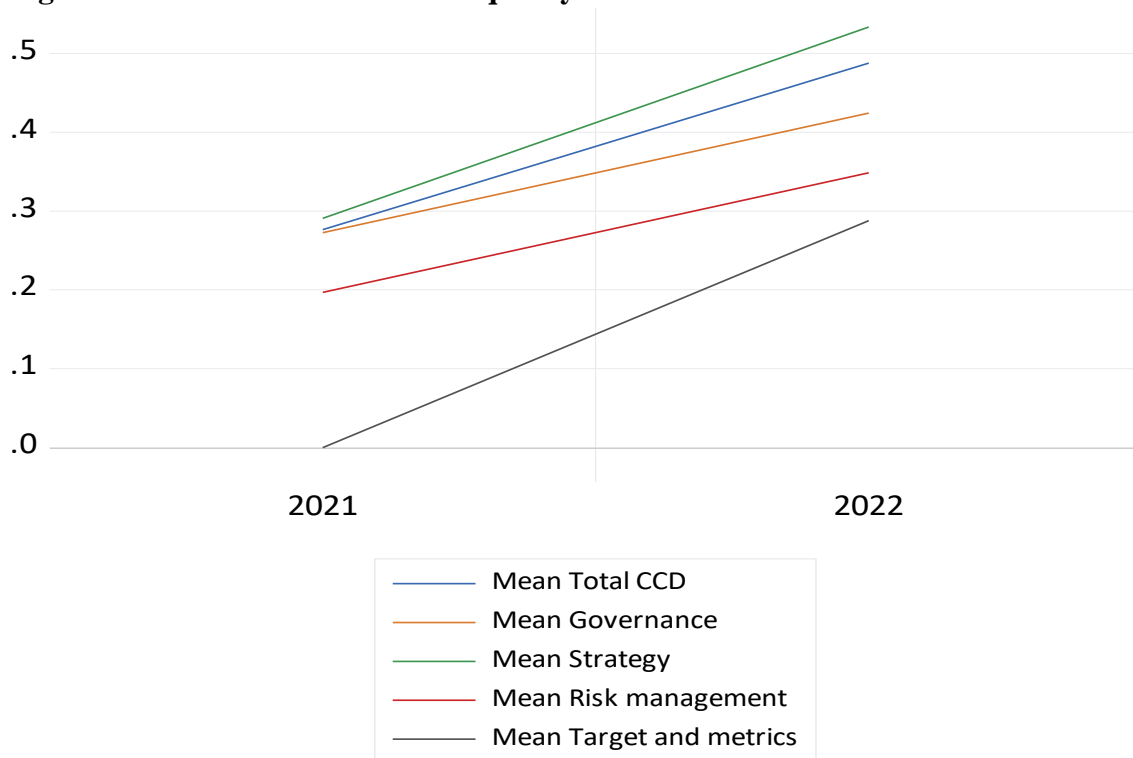
<sup>\*</sup>, <sup>\*\*</sup> denote Significant at 0.05 and 0.01, respectively. SD between parentheses

This result is consistent with prior studies (e.g., Demaria and Rigot (2021) which investigated French firms; Braasch and Velte (2023), which investigated German firms; Cosma et al. (2022), which investigated European banks), that show a noticeable improvement in CCD by listed firms over time. In light of the theoretical foundation employed in this study, this can be attributed to an improved level of awareness among businesses about the climate-related information to be disclosed, and the importance of providing such information. This highlights how CCD is recognised as important by listed firms in order to gain legitimacy and meet the information requirements of shareholders and other groups of stakeholders, who consider CCD of value relevance. Additionally, requiring listed firms eligible for Decree No.108 to provide CCD reports in 2022 explains the significant improvement in CCD levels in 2022 compared to 2021. This emphasises the role of applying good practices on a mandatory basis in fostering capital market reforms in emerging markets.

On the level of CCD sub-indices, the results are in line with the total CCD score as they prove that the average CCD quality in 2022 exceeds the average CCD quality in 2021 across all CCD key areas: governance, strategy, risk management, and metrics and targets. This suggests that the implementation of Decree No. 108, has a positive effect. Figure 2 illustrates the graphical representation of metrics from 2021 to 2022. The findings indicate that in 2021, the strategy metric has the highest disclosure rate at 29.1%, followed by governance at 27.7%. However, there is no disclosure of information pertaining to metrics and targets. Likewise, in the year 2022. The most disclosed area is the strategy metric, accounting for 53.3% of disclosures. Governance is the second

most disclosed area, accounting for 42.2% of disclosures. However, metrics and targets have witnessed improvement from 0% in 2021 to 28.8% in 2022. The most significant improvement in disclosure quality is observed in metrics and targets, with a mean difference of -0.288 ( $p < 0.01$ ). This is followed by improvements in the strategy area. These results reflect the efforts of the FRA in providing support and following up to foster firms' implementation of the requirements of Decree No. 108. Nevertheless, the lowest improvement in disclosure quality is observed in both governance and risk management areas, with a mean difference of -0.152 ( $p < 0.01$ ). Although there is a noticeable improvement in disclosures pertaining to both areas in 2022, the results imply the need for more training in these two areas, as their application may not be quite clear due to their early stage of implementation. This finding supports the claim of Braasch and Velte (2023) that weaknesses in some areas may highlight the need for further learning or may be a sort of firm reluctance to fully adapt to the climate targets of the Paris Agreement, so the provided disclosures are mainly to sustain their legitimacy. To further indicate the progress of CCD practices over time, Figure 2 further displays a trend of increasing the level of CCD from 2021 to 2022.

**Figure 2: The mean value of CCD quality over time**



With respect to the descriptive statistics of the variables under scrutiny in this study, they are displayed in Table 5. The mean value of the dependent variable, CCD, is 0.308. This implies that sampled firms, on average, provide approximately 30.8% of the required information. This is most likely a result of the novel CCD practice, which is satisfactory as a starting level of adoption. However, firms need to make additional efforts to enhance the level of CCD. Furthermore, FRA may promote transparency by incentivizing firms to enhance their disclosure practices. With respect to the presence of foreign directors on the boards of firms listed on the EGX, the findings reveal that the percentage varies from 0% to a maximum of 32.7%, with an average of 11.9%. This is the first study to our knowledge to investigate this variable within the Egyptian context. However, compared with other markets (25% applying to France, in Mardini and Elleuch Lahyani , 2022), this finding indicates a limited representation of foreign directors on Egyptian boards. With respect to the average percentage of foreign ownership, it is 16.3%. This suggests that Egyptian firms generally have a low level of foreign ownership during the study period. Board size varies from 3 to 15 (mean value = 8.94), indicating that the sampled firms' boards consist of approximately 9 directors on average. Finally, board independence averages 0.474, indicating a moderate presence of independent directors on Egyptian corporate boards.

Regarding the control variables, the sampled firms exhibit an average performance of 0.0587. Additionally, the results indicate that the sample firms age averages 34 years and firm size averages -.004. The findings indicate a relatively high liquidity ratio of 182% and a relatively low average gearing ratio of 22%. For the categorical variables displayed in Table 6, it is found that 24.2% of the sample-firms are listed on S&P/EGX ESG index, while 33.3% of the firms operate in a carbon-intensive industry.

**Table 5: Descriptive statistics**

	Mean	SD	Minimum	Maximum	Skewness	Kurtosis
CCD	.308	.301	0	1	.277	-.995
Fdirector	.067	.119	0	.327	1.343	-.021
Fownership	.163	.245	0	.870	1.345	.809
BSZ	8.94	2.828	3	15	.480	-.531
Bind	.474	.350	0	1	-.011	-1.589
Fper	.0587	.105	-.132	.364	1.341	1.496
Fsize	-.004	.218	-.398	.441	.230	.582
Fage	34.56	18.844	3	81	1.023	.389
Fgea	.227	.199	0	.700	.799	-.350

FINSLAC	-.885	.545	-2.50	.14	-.011	-.071
Liq	1.824	1.219	.411	5.06966	1.337	.979

**Table 6: Categorical Variables**

Variable	Frequency	Percent
<b>CarbonInt</b>		
carbon-intensive industry (1)	22	33.3
Low-carbon industry (0)	44	66.7
<b>EGX (S&amp;P ESG Index)</b>		
listed (1)	16	24.2
Non-listed (0)	50	75.8

With respect to correlations among our study variables, Table 7 displays the Pearson-correlations among them. The results indicate that multicollinearity is not an issue, as the coefficients are below the maximum threshold of 0.8 (Field, 2013). CCD exhibits a statistically significant positive association, at 5% level, with Fdirector, Fownership, and BSZF. However, contrary to expectations, there is a negative association between Bind and CCD which would be further confirmed throughout the regression analysis.

**Table 7: Correlation analysis**

	CCD	Fdirector	Fownership	BSZ	Bind	Fperf	FSIZE	Fage	Fgea	FINSLAC	Liq
CCD	0										
Fdirector	.020*	0									
Fownership	.031**	.563**	0								
BSZ	.182*	.086*	-.020	0							
Bind	-.247*	-.219	-.207	.126	0						
Fper	.114*	-.226	-.195	.344**		0					
FSIZE	.288**	-.040	-.056	.193*	-.036	.157*	0				
Fage	.018**	-.309	-.289*	-.124*	-.009	-.013	-.099	0			
Fgea	-.012*	.035	.005	-.101	.032	.028*	-.093	-.237	0		
FINSLAC	-.236*	.326**	.197	.074	-.024	.052	.030	-.239	-.186	0	
Liq	-.159*	-.185	-.238*	.321**	.107	.229*	.175*	.268*	-.575**	.309*	0

\*, \*\* denote Significant at 0.05 and 0.01, respectively.

## 2.2. Multivariate analysis

Table 8 presents the findings of the Ordinary Least Squares regression analysis, encompassing observations from a span of two years. These findings emphasise the factors influencing the level of CCD. The independent variables explain approximately 37% of the variation in CCD level. Hence, this study model demonstrates greater explanatory power compared to studies conducted in other developing countries, such as Ardi and Yulianto (2020) in Indonesia (35%) and Al Amosh et al. (2022) in Jordan(36%).

The Jarque-Bera test indicates that the residuals of the variables exhibit a normal distribution. It shows a value of 4.176, which is larger than 0.05. The Breusch-Pagan-Godfrey test shows the absence of heteroskedasticity. It shows a chi-square value of 0.3899, which is larger than 0.05. Finally, the serial correlation LM test indicates that the model does not suffer from the serial correlation problem. It shows a chi-square value of 0.4360, which is larger than 0.05. Table 8 shows that firms in carbon-intensive industries exhibit a greater level of CCD in comparison to firms in low-carbon industries ( $\lambda_2 = 0.099$ ,  $p < 0.01$ ). Thus, hypothesis H2 is supported. The results align with those of Ben-Amar and McIlkenny (2015) and Braasch and Velte (2023), indicating that firms belonging to carbon-intensive industries are more expected to strategically disclose significant information pertaining to climate-related matters. The findings are in line with shareholders' and stakeholders' theories in providing all the information needed by different user groups of firm reports to enable them to assess firm performance and make rational decisions. Additionally, the findings support the legitimacy theory, which advocates that firms in carbon-intensive industries face significant pressure to legitimise their activities through high levels of CCD.

Additionally, the presence of foreign owners has a statistically significant and positive influence on the level of CCD ( $\lambda_3 = 0.175$ ,  $p < 0.01$ ), thus providing support for H3. The study finding is consistent with Zhang (2022) study, which suggests a positive relationship. One possible explanation could be that foreign investors, including multinational corporations, often possess diverse values and extensive knowledge due to their exposure to foreign markets(Muttakin and Subramaniam, 2015). These investors are likely to have a heightened awareness of the increasing societal demand for businesses to demonstrate environmental responsibility that is in line with the notions of legitimacy theory and green investment trend. Additionally, they are likely to place pressure on firms to disclose CC related information to better assess the impact of climate-related risks on corporate performance. The findings align with the shareholders theory, which suggests that management's primary objective is to meet the information requirements of shareholders to reduce agency costs arising from information

asymmetry. Hence, CCD should be enhanced to serve the objective of creating value and meeting the interests of shareholders.

With respect to foreign directors related variable which is to the best of our knowledge is investigated for the first time within the Egyptian context, results reveal the foreign director's presence on boards has a statistically significant and positive effect on the level of CCD ( $\lambda_4 = 0.299$ ,  $p < 0.01$ ), thus not providing support for H4. This result is inconsistent with that of Ooi et al. (2019). However, it is consistent with results of prior research (Issa and Hamman, 2021, Mardini and Elleuch Lahyani, 2022). This supports the human capital theory, which suggests that foreign directors bring value to the boardroom by offering diverse concepts, knowledge, and perspectives. This contributes to the development of sustainability culture within the firm, enhances the firm's ability to make effective decisions to deal with environmental issues, and thus CCD quality will improve. Moreover, the results provide support for the legitimacy theory. Diverse nationality and experience boards increase the potential for such boards to make strategic decisions for preserving corporate legitimacy and reputation, as proposed by the legitimacy theory. Foreign directors are expected to support addressing environmental concerns through improved disclosure. They are likely to appreciate the need to provide shareholders and other stakeholders with CCD as they are likely to be of value relevance to different users of corporate reports.

With respect to the number of board members, results prove its significant influence on the level of CCD ( $\lambda_5 = 0.021$ ,  $p < 0.01$ ) which is inconsistent with H5 and the results of Ooi et al. (2019), Cosma et al. (2022), and Raimo et al. (2022) which demonstrate non-association. However this finding supports that of Elshandidy and Neri (2015), Saggarr and Singh (2017), and Qa'dan and Suwaidan (2018), which demonstrate a positive association of board size with the level of CCD. One possible explanation could be that larger boards tend to have a diverse composition of directors with accounting/financial qualification (Salem et al., 2019), resulting in enhanced monitoring capabilities and ultimately leading to higher CCD. This supports the human capital theory, which proposes that cognitive disparities among board members influence their ability and effectiveness to critically evaluate situations. This is likely to affect the firm's quality of CCD. Additionally, a reasonable number of directors can improve management monitoring, hence improves CCD to enable informed decisions by mitigating the information gap between management on one side and shareholders and other stakeholders on the other side.

With respect to the influence of board independence, results show independence as negatively affects the quality of CCD ( $\lambda_6 = -0.194$ ,  $p < 0.01$ ), leading to the rejection of H6. The results align with those of Qa'dan and Suwaidan (2018) and Baalouch et al. (2019). This finding contradicts



shareholders and stakeholders' theories, which propose that independent directors exhibit greater conscientiousness and prioritise stakeholders' including minority shareholders' interests in their decision-making on the board. Moreover, the results contradict with those of Ooi et al. (2019), that report a positive association of independent directors with climate change disclosure quality. One possible explanation could be that such directors may be hesitant to prioritise non-financial disclosure because of inadequate understanding of the reliability and trustworthiness of climate related information and its possible consequences on corporate sustainability.

Finally, the results reveal that firms listed on the S&P/EGX ESG exhibit a significantly greater level of CCD compared to non-listed ones ( $\lambda_2 = 0.246$ ,  $p < 0.01$ ). This supports H7 and is consistent with the findings of Hassaan (2017) as boards in such firms are likely to provide high-quality disclosures that help investors evaluate business performance (Samaha and Dahawy, 2010), thus affecting the CCD quality. Additionally, they are keen to protect their legitimacy and the shareholders' wealth by showing that they are the best in terms of financial and non-financial performance (Hassaan, 2017).

Regarding the control variables, the findings show a significant and positive influence of firm performance on the CCD ( $\lambda_8 = 0.099$ ,  $p < 0.01$ ). Accordingly, financially successful firms may have greater capacity to allocate resources towards climate-related initiatives and reporting compared to financially distressed firms. The findings are in line with those on environmental disclosure (García-Sánchez et al., 2021, Maji and Kalita, 2022, Sun et al., 2023). Firm size also has a significant-positive influence on the CCD ( $\lambda_9 = 0.558$ ,  $p < 0.01$ ). Larger firms possess greater resources for reporting CC compared to smaller firms. Similarly, firm age has a significant-positive influence on the CCD ( $\lambda_{10} = 0.290$ ,  $p < 0.01$ ). According to García-Sánchez et al. (2021), old firms are more inclined to adopt novel reporting initiatives and provide higher quality disclosures as they are more experienced and keen to protect their current status. In contrast, firm gearing has a significant-negative influence on the CCD ( $\lambda_{11} = -0.148$ ,  $p < 0.01$ ). This finding does not support that of Baalouch et al. (2019), whose evidence assumes that highly leveraged firms often disclose high level of nonfinancial information to alleviate investor concerns about their level of debt. Finally, both financial slack and liquidity have a negative impact on the CCD level. This is in line with the result reported by Tingbani et al. (2020) on the overall influence of financial slack and liquidity on CCD level.

**Table 8 Regression results**

<b>Variables</b>	<b>Model 1</b>	<b>Model 2</b>
CarbonInt	0.099 <sup>***</sup> (0.017)	0.067 <sup>**</sup> (0.026)
Fownership	0.175 <sup>***</sup> (0.061)	0.163 <sup>***</sup> (0.037)
Fdirector	0.299 <sup>***</sup> (0.017)	0.282 <sup>***</sup> (0.008)
BSZ	0.021 <sup>***</sup> (0.003)	0.434 <sup>***</sup> (0.043)
Bind	-0.194 <sup>***</sup> (0.029)	-0.094 <sup>***</sup> (0.024)
EGX	0.246 <sup>***</sup> (0.010)	0.218 <sup>***</sup> (0.026)
Fper	0.475 <sup>***</sup> (0.089)	0.650 <sup>***</sup> (0.072)
FSIZE	0.558 <sup>***</sup> (0.021)	0.0024 <sup>**</sup> (0.0010)
Fage	0.290 <sup>***</sup> (0.023)	0.196 <sup>***</sup> (0.036)
Fgea	-0.148 <sup>***</sup> (0.018)	-0.083 <sup>***</sup> (0.017)
FINSLAC	-0.094 <sup>***</sup> (0.016)	-0.073 <sup>**</sup> (0.032)
Liq	-0.141 <sup>***</sup> (0.055)	-0.106 (0.037)
Year	0.081 <sup>**</sup> (0.044)	0.106 <sup>***</sup> (0.038)
C	-0.220 <sup>***</sup> (0.030)	-0.187 <sup>***</sup> (0.038)
No. of Observations	66	66
R <sup>2</sup>	37.05%	34%
Jarque-Bera	4.176	4.591
Breusch-Godfrey Serial Correlation LM Test	$\chi^2 = 0.4360$	$\chi^2 = 0.822$
Heteroskedasticity Breusch-Pagan-Godfrey Test	$\chi^2 = 0.3899$	$\chi^2 = 0.528$

\* , \*\* , \*\*\* denote Significant at 0.05 and 0.01, respectively.

### 2.3. Robustness checks

To check the regression model estimate, robustness tests are used (Al Amosh et al., 2022); this is done through diagnostic tests that add, remove, or alter variables (Lu and White, 2014). This study has conducted a replication of analysis using alternative measurements of control variables, namely firm performance, liquidity, and size, as suggested by previous literature. This is performed to evaluate the reliability and consistency of study's results. Hence, the proposed model is demonstrated as follows, based on the given premises.

$$\begin{aligned}
 CCD_{it} = & \lambda_1 + \lambda_2 \text{CarbonInt}_{it} + \lambda_3 \text{Fownership}_{it} + \lambda_4 \text{Fdirector}_{it} + \lambda_5 \text{BSZ}_{it} + \\
 & \lambda_6 \text{Bind}_{it} + \lambda_7 \text{EGX}_{it} + \lambda_8 \text{Fper}_{it} + \lambda_9 \text{FSIZE}_{it} + \lambda_{10} \text{Fage}_{it} + \lambda_{11} \text{Fgea}_{it} + \\
 & \lambda_{12} \text{FINSLAC}_{it} + \lambda_{13} \text{Liq}_{it} + \text{Year} + \varepsilon_{it}
 \end{aligned}
 \tag{2}$$

Where Fper indicates firm performance, measured as net income after tax divided by year-end total assets:ROA (Sun et al., 2023); FSIZE represents firm size, measured as the market capitalization natural logarithm (Tajuddin et al., 2017); Liq represents liquidity, measured as cash plus cash equivalents plus receivables plus short-term investment divided by current liabilities: quick ratio(Iskandar, 2020). The remaining variables definitions are like those in model 1.

Table 8 shows the results of the regression for model 2. The regression findings closely align with the main study model, exhibiting minimal disparities in the statistical significance and coefficient magnitudes.

Robustness analysis emphasises the assumption that Fownership, Fdirector, and BSZ have a significant positive influence on the extent of climate change-related disclosures. The p-values associated with these variables are 0.163, 0.282 and 0.434, respectively. Furthermore, the findings validate the inverse association between independence of corporate-boards and the CCD level. Robustness analysis indicates that firms listed on the S&P/EGX ESG Index and those operating in carbon-intensive industries tend to provide a higher level of CCD. As for the control-variables, the robustness results confirm the positive influence of firm performance, size, and age. Furthermore, the findings confirm the negative impact of firm gearing, financial slack, and liquidity. This suggests that the regression result is robust.

### **3. Conclusions, limitations, and avenues for future research**

This study contributes to the current body of accounting literature through the assessment of the quality of climate change disclosure and its key drivers in publicly traded firms on the Egyptian stock exchange, as a leading Arab and African emerging market, following the issuance of Decree No. 108 by the Egyptian Financial Regulatory Authority. This decree is in line with the TCFD guidelines as part of the reforms to globalise the Egyptian capital market. Hence, the results of this study highlight the extent to which the Egyptian capital market adapts to international best practices and enforces their application in form and appearance. Furthermore, the study provides an integrative theoretical foundation to help in interpreting the study findings. The findings indicate a substantial improvement in the quality of climate change-related disclosures among Egyptian firms in 2022 compared to 2021, highlighting the role of Decree No. 108. This provides support for recent policy reform efforts in Egypt, particularly in relation to climate change related disclosures (e.g., managing climate change risks and opportunities, its actual consequences and future concerns on the firm's enterprises, strategy, and financial planning; the way the firm finds, analyses, and manages climate risks; and the measures and objectives employed to analyse and manage relevant climate risks and opportunities). CCD requirements are designed to increase the degree of transparency in corporate reports by showing the

financial impact of climate change, as suggested by the TCFD. They also aim to mitigate the environmental impact of firm activities by encouraging green investments. On the level of climate change disclosure pillars (governance, strategy, risk management, and metrics and targets), the findings highlight that Egyptian firms still exhibit low disclosure levels in metrics and targets area. Thus, there remains ample opportunity for further improvement. The Egyptian firms' reaction to Decree No.108 necessitates a more dedicated effort to recognise and assess the risks and potentials associated with climate change from an operational standpoint. Regarding the determinants of climate change disclosures in the Egyptian context, being the first to scrutinise the quality of CCD and its determinants following the issuance of FRA Decree No.108, this study adds to the climate change emerging body of literature (Ben-Amar and McIlkenny, 2015, Tingbani et al., 2020, Velte et al., 2020, Bairagi and Ghosh, 2023). Our findings suggest that the quality of CCD has a statistically significant-positive association with foreign ownership, foreign directors, board size, and firm performance. Moreover, firms operating in industries with high carbon intensity and listed on the S&P/EGX ESG index exhibit a tendency to have a high level of climate change related disclosures. Surprisingly, independent directors are not exerting a positive influence on CCD quality. Therefore, board independence is not among the key drivers that improve the quality of climate-related disclosures among Egyptian publicly traded firms. This highlights the need to carefully select independent directors to make sure that they are aware of climate-related issues and their possible consequences for businesses. Finally, with respect to the theoretical foundation employed in this study (stakeholders, shareholders, legitimacy, and human capital theories), it has been proven to provide competent insights that can depict climate change related issues in the Egyptian context. Hence, it can help in interpreting such issues in other emerging markets.

The study also has numerous practical implications for relevant parties. First, the study benefits international institutions such as the TCFD, which initially formulated the CCD requirements that are followed by the FRA in Egypt, and the IFRS Foundation, which is working on adopting CCD IFRS S2 to be effective beginning in 2024 to enable users of firm reports to make more informed decisions based on the financial consequences of climate related risks and opportunities on firm current and future performance. They need to know the extent to which their imported guidelines are effective in emerging economies. Second, the study results are of benefit to corporate boards and management by identifying the essential determinants that motivate firms to include CCD in their annual reports. Third, the findings have implications for capital market regulators, policymakers, and governmental agencies, as they highlight the importance of enhancing and standardising disclosure rules to promote greater transparency among business firms. The findings urge policymakers and corporate boards to

establish a sub-committee on climate governance to improve the strategic and organisational integration of climate-change-related matters. Having a committee in place can improve the oversight of CCD practices. Such an approach can encourage direct foreign investment and hence promote the growth of the national economy, which is still emerging. Besides, the results are important to financial analysts and investors who are looking for promising investment opportunities with value creation potential. Fourth, the results are also of importance to other stakeholders' groups to better judge the other non-financial aspects of corporate performance, providing them with a clearer vision on how to integrate financial and non-financial performance by considering the determinants of climate change-related risks and opportunities. Finally, from a managerial standpoint, the results of this study support existing literature suggesting that board characteristics and the presence of foreign directors are valuable and help in climate change governance (Elshandidy and Neri, 2015, Kouloukoui et al., 2019, Sharma et al., 2020). The findings suggest that firm's management can benefit from a balance between foreign and local directors. This balance allows firms to leverage the international experience of foreign directors, resulting in potential benefits. Therefore, it is crucial for business owners to stay informed about the most recent advancements in corporate governance and carefully select directors who can contribute to improving their competitive advantage.

As with other empirical works, this study has limitations. Such limitations are considered as motives to carry out future research. Firstly, we examine climate change disclosure practices from a quantitative perspective. Future research may employ interviews and case studies to get deeper insights from parties involved in such practices. Secondly, our study mainly focuses on firms listed on the Egyptian stock exchange, so the results may not be evocatively generalised to other contexts with different frameworks. It would be informative if future research examines a cross-country context that is controlled for dissimilarities in regulatory and institutional aspects and/or replicate the study on other emerging economies to better generalise the results. Thirdly, due to the recent adoption of CCD, the duration of our study period is considered relatively short, which resulted in a relatively small sample, so future studies can use longer sample periods to increase the sample size and better observe annual changes. Fourthly, our study investigates the determinants of overall climate-related disclosure employing some variables, so future research can investigate other determinants and their association with CCD sub-indices. Additionally, future research can investigate the consequences of CCD and their association with CCD sub-indices. Finally, future research can investigate the convergence with IFRS S2 on climate related disclosures that would be effective starting from 2024 and scrutinise determinants and consequences of its application in both developed and developing contexts.

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## References

- AKBAS, H. E. 2016. The relationship between board characteristics and environmental disclosure: Evidence from Turkish listed companies. *South East European Journal of Economics and Business (Online)*, 11, 7.
- AL AMOSH, H., KHATIB, S. F. & HUSSAINEY, K. 2022. The Financial Determinants of Integrated Reporting Disclosure by Jordanian Companies. *Journal of Risk and Financial Management*, 15, 375.
- AL AMOSH, H. & MANSOR, N. 2021. Disclosure of integrated reporting elements by industrial companies: evidence from Jordan. *Journal of Management and Governance*, 25, 121-145.
- ALIPOUR, M., GHANBARI, M., JAMSHIDINAVID, B. & TAHERABADI, A. 2019. Does board independence moderate the relationship between environmental disclosure quality and performance? Evidence from static and dynamic panel data. *Corporate Governance: The International Journal of Business in Society*, 19, 580-610.
- ALSHBILI, I., ELAMER, A. A. & BEDDEWELA, E. 2020. Ownership types, corporate governance and corporate social responsibility disclosures: Empirical evidence from a developing country. *Accounting Research Journal*, 33, 148-166.
- AMEL-ZADEH, A. 2021. The Financial Materiality of Climate Change: Evidence from a Global Survey. Available at SSRN 3295184.
- AMRAN, A., OOI, S. K., WONG, C. Y. & HASHIM, F. 2016. Business strategy for climate change: An ASEAN perspective. *Corporate Social Responsibility and Environmental Management*, 23, 213-227.
- ANDERSSON, M., BOLTON, P. & SAMAMA, F. 2016. Hedging climate risk. *Financial Analysts Journal*, 72, 13-32.
- ANDRIKOPOULOS, A. & KRIKLANI, N. 2013. Environmental disclosure and financial characteristics of the firm: The case of Denmark. *Corporate Social Responsibility and Environmental Management*, 20, 55-64.
- ARDI, J. W. & YULIANTO, A. 2020. The Effect of Profitability, Leverage, and Size on Environmental Disclosure with the Proportion of Independent Commissioners as Moderating. *Accounting Analysis Journal*, 9, 123-130.
- AZIZUL ISLAM, M. & DEEGAN, C. 2008. Motivations for an organisation within a developing country to report social responsibility information: Evidence from Bangladesh. *Accounting, Auditing & Accountability Journal*, 21, 850-874.
- BAALOUCH, F., AYADI, S. D. & HUSSAINEY, K. 2019. A study of the determinants of environmental disclosure quality: evidence from French listed companies. *Journal of Management and Governance*, 23, 939-971.

- BAIRAGI, R. K. & GHOSH, P. K. 2023. Adoption and Determinants of Task Force on Climate-related Financial Disclosures (TCFD) Reporting Frameworks by Australian Stock Exchange (ASX) Listed Companies.
- BAKER, H. K., PANDEY, N., KUMAR, S. & HALDAR, A. 2020. A bibliometric analysis of board diversity: Current status, development, and future research directions. *Journal of Business Research*, 108, 232-246.
- BEN-AMAR, W., CHANG, M. & MCILKENNY, P. 2017. Board gender diversity and corporate response to sustainability initiatives: Evidence from the carbon disclosure project. *Journal of business ethics*, 142, 369-383.
- BEN-AMAR, W. & MCILKENNY, P. 2015. Board effectiveness and the voluntary disclosure of climate change information. *Business Strategy and the Environment*, 24, 704-719.
- BHADURI, A., BOGARDI, J., SIDDIQI, A., VOIGT, H., VÖRÖSMARTY, C., PAHL-WOSTL, C., BUNN, S. E., SHRIVASTAVA, P., LAWFORD, R. & FOSTER, S. 2016. Achieving sustainable development goals from a water perspective. *Frontiers in Environmental Science*, 4, 64.
- BIERMANN, F., KANIE, N. & KIM, R. E. 2017. Global governance by goal-setting: the novel approach of the UN Sustainable Development Goals. *Current Opinion in Environmental Sustainability*, 26, 26-31.
- BRAASCH, A. & VELTE, P. 2023. Climate reporting quality following the recommendations of the task force on climate-related financial disclosures: A Focus on the German capital market. *Sustainable Development*, 31, 926-940.
- BRAHMANA, R., UNG, L.-J. & KIU, J.-S. 2019. Does board capital affect the corporate financial distress level? A study from Malaysia. *Kasetsart Journal of Social Sciences*, 40, 695-702.
- BUI, B., HOUQE, M. N. & ZAMAN, M. 2020. Climate governance effects on carbon disclosure and performance. *The British Accounting Review*, 52, 100880.
- CCPI. 2023. *Climate Change Performance Index 2023* [Online]. Available: <https://ccpi.org/ranking/> [Accessed].
- CHAUVEY, J.-N., GIORDANO-SPRING, S., CHO, C. H. & PATTEN, D. M. 2015. The normativity and legitimacy of CSR disclosure: Evidence from France. *Journal of Business Ethics*, 130, 789-803.
- CHELLI, M., DUROCHER, S. & RICHARD, J. 2014. France's new economic regulations: insights from institutional legitimacy theory. *Accounting, Auditing & Accountability Journal*, 27, 283-316.
- CHEN, Z., ZHANG, L. & WENG, C. 2023. Does climate policy uncertainty affect Chinese stock market volatility? *International Review of Economics & Finance*, 84, 369-381.
- CHUA, W. F., JAMES, R., KING, A., LEE, E. & SODERSTROM, N. 2022. Task Force on Climate-related Financial Disclosures (TCFD) Implementation: An Overview and Insights from the Australian Accounting Standards Board Dialogue Series. *Australian Accounting Review*, 32, 396-405.

- COHEN, J. 1992. Statistical power analysis. *Current directions in psychological science*, 1, 98-101.
- COSMA, S., PRINCIPALE, S. & VENTURELLI, A. 2022. Sustainable governance and climate-change disclosure in European banking: The role of the corporate social responsibility committee. *Corporate Governance: The International Journal of Business in Society*, 22, 1345-1369.
- DEEGAN, C. 2002. Introduction: The legitimising effect of social and environmental disclosures—a theoretical foundation. *Accounting, auditing & accountability journal*, 15, 282-311.
- DEEGAN, C. 2011. *Financial Accounting Theory: European Edition*, McGraw Hill.
- DEMARIA, S. & RIGOT, S. 2021. Corporate environmental reporting: Are French firms compliant with the Task Force on Climate Financial Disclosures' recommendations? *Business Strategy and the Environment*, 30, 721-738.
- DESGAGNÉ, A. & LAFAYE DE MICHEAUX, P. 2018. A powerful and interpretable alternative to the Jarque–Bera test of normality based on 2nd-power skewness and kurtosis, using the Rao's score test on the APD family. *Journal of Applied Statistics*, 45, 2307-2327.
- EGX. 2021. *S&P/EGX ESG Index Methodology* [Online]. Available: [https://www.egx.com.eg/getdoc/fdd6f085-d88e-4072-a753-fa540d136442/SP\\_ESG\\_Index\\_en.aspx](https://www.egx.com.eg/getdoc/fdd6f085-d88e-4072-a753-fa540d136442/SP_ESG_Index_en.aspx) [Accessed November 7, 2023].
- ELFEKY, M. I. A. & ABDELAZIZ, H. A. E. 2022. The impact of corporate governance structure on corporate social responsibility: An applied study on Egyptian companies. *Scientific Journal for Financial and Commercial Studies and Research, Faculty of Commerce, Damietta University*, , 3, 363-418.
- ELSHANDIDY, T. & NERI, L. 2015. Corporate governance, risk disclosure practices, and market liquidity: Comparative evidence from the UK and Italy. *Corporate Governance: An International Review*, 23, 331-356.
- ELZAHAR, H. & HUSSAINEY, K. 2012. Determinants of narrative risk disclosures in UK interim reports. *The Journal of Risk Finance*, 13, 133-147.
- ESHO, E. & VERHOEF, G. 2020. A holistic model of human capital for value creation and superior firm performance: The Strategic factor market model. *Cogent Business & Management*, 7, 1728998.
- FAROOQUE, O. A., DAHAWY, K. M., SHEHATA, N. F. & SOLIMAN, M. T. 2022. ESG Disclosure, Board Diversity and Ownership: Did the Revolution Make a Difference in Egypt? *Corporate Ownership & Control*, 19, 67-80.
- FEDERICA, R., SCAFARTO, V., FLAVIANO, M. & DELLA CORTE, G. 2019. The concept of board capital in corporate governance research: A structured literature review. *New challenges in corporate governance research: theory and practice*, 333-348.
- FIELD, A. 2013. *Discovering statistics using IBM SPSS statistics*, sage.
- FREEDMAN, M. & JAGGI, B. 2005. Global warming, commitment to the Kyoto protocol, and accounting disclosures by the largest global public firms from polluting industries. *The International Journal of Accounting*, 40, 215-232.



- GARCÍA-SÁNCHEZ, I.-M., RAIMO, N. & VITOLLA, F. 2021. Are environmentally innovative companies inclined towards integrated environmental disclosure policies? *Administrative Sciences*, 11, 29.
- GARG, M. C. & KUMAR, S. 2018. The Relationship Between Corporate Environmental Reporting Practices and Company Characteristics: Evidence from India. *IUP Journal of Accounting Research & Audit Practices*, 17.
- GATIMBU, K. K., OGADA, M. J., BUDAMBULA, N. & KARIUKI, S. 2018. Environmental sustainability and financial performance of the small-scale tea processors in Kenya. *Business Strategy and the Environment*, 27, 1765-1771.
- GE, J. & LIN, B. 2021. Impact of public support and government's policy on climate change in China. *Journal of Environmental Management*, 294, 112983.
- GHADGE, A., WURTMANN, H. & SEURING, S. 2020. Managing climate change risks in global supply chains: a review and research agenda. *International Journal of Production Research*, 58, 44-64.
- GHOZALI, I. 2012. Aplikasi Analisis Multivariat dengan Program IBM SPSS 20 (Edisi keenam). Semarang: Universitas Diponegoro. Sugiyono.(2008). *Metode Penelitian Bisnis*, 2085-1375.
- GIANNARAKIS, G., KONTEOS, G., SARIANNIDIS, N. & CHAITIDIS, G. 2017. The relation between voluntary carbon disclosure and environmental performance: The case of S&P 500. *International Journal of Law and Management*, 59, 784-803.
- GÖRGEN, M., JACOB, A., NERLINGER, M., RIORDAN, R., ROHLEDER, M. & WILKENS, M. 2020. Carbon risk. Available at SSRN 2930897.
- GULL, A. A., NEKHILI, M., NAGATI, H. & CHTIOUI, T. 2018. Beyond gender diversity: How specific attributes of female directors affect earnings management. *The British Accounting Review*, 50, 255-274.
- GUO, M. & ZHENG, C. 2021. Foreign ownership and corporate social responsibility: evidence from China. *Sustainability*, 13, 508.
- GUTHRIE, J. & MATHEWS, M. R. 1985. Corporate social accounting in Australasia. *Research in corporate social performance and policy*. Jai Press.
- HAHN, R., REIMSBACH, D. & SCHIEMANN, F. 2015. Organizations, climate change, and transparency: Reviewing the literature on carbon disclosure. *Organization & Environment*, 28, 80-102.
- HANG, M., GEYER-KLINGEBERG, J. & RATHGEBER, A. W. 2019. It is merely a matter of time: A meta-analysis of the causality between environmental performance and financial performance. *Business Strategy and the Environment*, 28, 257-273.
- HAO, L.-N., UMAR, M., KHAN, Z. & ALI, W. 2021. Green growth and low carbon emission in G7 countries: how critical the network of environmental taxes, renewable energy and human capital is? *Science of the Total Environment*, 752, 141853.
- HAQUE, F. 2017. The effects of board characteristics and sustainable compensation policy on carbon performance of UK firms. *The British Accounting Review*, 49, 347-364.

- HASSAAN, M. 2017. An Empirical Study of the Readiness of the Egyptian Capital Market to Move to the Mandatory Application of Integrated Reports. *Accounting Thought Journal, Ain Shams University*, 4, 441-519.
- HAYES, A. F. & KRIPPENDORFF, K. 2007. Answering the call for a standard reliability measure for coding data. *Communication methods and measures*, 1, 77-89.
- HAZAEA, S. A., ZHU, J., KHATIB, S. F., BAZHAIR, A. H. & ELAMER, A. A. 2022. Sustainability assurance practices: A systematic review and future research agenda. *Environmental Science and Pollution Research*, 29, 4843-4864.
- HEROLD, D. M. 2018. Demystifying the link between institutional theory and stakeholder theory in sustainability reporting. *Economics, Management and Sustainability*, 3, 6-19.
- HSU, C.-S., LAI, W.-H. & YEN, S.-H. 2019. Boardroom diversity and operating performance: the moderating effect of strategic change. *Emerging Markets Finance and Trade*, 55, 2448-2472.
- HSU, P. H., LI, K. & TSOU, C. Y. 2023. The pollution premium. *The Journal of Finance*, 78, 1343-1392.
- ISKANDAR, D. 2020. Analysis Of Ratio Return on Equity, Quick Ratio, Debt to Equity Ratio, Towards Internet Financial Reporting and Size of Companies As Moderating Variables (Empirical Study On Sub Sectors of Various Industries Listed in Indonesia Stock Exchange). *Saudi Journal of Economics and Finance*, 4, 187-195.
- ISSA, S. O. & HAMMAN, A. M. 2021. Board Mechanisms and Environmental Disclosure Quality of Listed Oil and Gas Firms in Nigeria. *Gusau Journal of Accounting and Finance*, 2, 17-17.
- ISSB 2023. IFRS S2 Climate-related Disclosures.
- IWAMOTO, H. & SUZUKI, H. 2019. An empirical study on the relationship of corporate financial performance and human capital concerning corporate social responsibility: Applying SEM and Bayesian SEM. *Cogent Business & Management*, 6, 1656443.
- JAGGI, B., ALLINI, A., MACCHIONI, R. & ZAGARIA, C. 2018. The factors motivating voluntary disclosure of carbon information: Evidence based on Italian listed companies. *Organization & Environment*, 31, 178-202.
- JAMALI, D. & KARAM, C. 2018. Corporate social responsibility in developing countries as an emerging field of study. *International journal of management reviews*, 20, 32-61.
- JONES, T. M., HARRISON, J. S. & FELPS, W. 2018. How applying instrumental stakeholder theory can provide sustainable competitive advantage. *Academy of Management Review*, 43, 371-391.
- KATHY RAO, K., TILT, C. A. & LESTER, L. H. 2012. Corporate governance and environmental reporting: an Australian study. *Corporate Governance: The international journal of business in society*, 12, 143-163.

- KAUR, A. & LODHIA, S. 2018. Stakeholder engagement in sustainability accounting and reporting: A study of Australian local councils. *Accounting, Auditing & Accountability Journal*, 31, 338-368.
- KHALFAOUI, R., MEFTEH-WALI, S., VIVIANI, J.-L., JABEUR, S. B., ABEDIN, M. Z. & LUCEY, B. M. 2022. How do climate risk and clean energy spillovers, and uncertainty affect US stock markets? *Technological Forecasting and Social Change*, 185, 122083.
- KHAN, M., SERAFEIM, G. & YOON, A. 2016. Corporate sustainability: First evidence on materiality. *The accounting review*, 91, 1697-1724.
- KHATIB, S. F., ABDULLAH, D. F., ELAMER, A. A. & ABUEID, R. 2021. Nudging toward diversity in the boardroom: A systematic literature review of board diversity of financial institutions. *Business strategy and the environment*, 30, 985-1002.
- KOENKER, R. 1981. A note on studentizing a test for heteroscedasticity. *Journal of econometrics*, 17, 107-112.
- KOULOOUKOU, D., SANT'ANNA, Â. M. O., DA SILVA GOMES, S. M., DE OLIVEIRA MARINHO, M. M., DE JONG, P., KIPERSTOK, A. & TORRES, E. A. 2019. Factors influencing the level of environmental disclosures in sustainability reports: Case of climate risk disclosure by Brazilian companies. *Corporate Social Responsibility and Environmental Management*, 26, 791-804.
- LIAO, L., LUO, L. & TANG, Q. 2015. Gender diversity, board independence, environmental committee and greenhouse gas disclosure. *The British accounting review*, 47, 409-424.
- LIN, B. & WU, N. 2023. Climate risk disclosure and stock price crash risk: The case of China. *International Review of Economics & Finance*, 83, 21-34.
- LU, X. & WHITE, H. 2014. Robustness checks and robustness tests in applied economics. *Journal of econometrics*, 178, 194-206.
- LV, W. & LI, B. 2023. Climate policy uncertainty and stock market volatility: Evidence from different sectors. *Finance Research Letters*, 51, 103506.
- MAJI, S. G. & KALITA, N. 2022. Climate change financial disclosure and firm performance: empirical evidence from Indian energy sector based on TCFD recommendations. *Society and Business Review*, 17, 594-612.
- MANGENA, M., TAURINGANA, V. & CHAMISA, E. 2012. Corporate boards, ownership structure and firm performance in an environment of severe political and economic crisis. *British Journal of Management*, 23, S23-S41.
- MARDINI, G. H. & ELLEUCH LAHYANI, F. 2022. Impact of foreign directors on carbon emissions performance and disclosure: empirical evidence from France. *Sustainability Accounting, Management and Policy Journal*, 13, 221-246.
- MONASTEROLO, I. 2020. Climate change and the financial system. *Annual Review of Resource Economics*, 12, 299-320.
- MONASTEROLO, I. & DE ANGELIS, L. 2020. Blind to carbon risk? An analysis of stock market reaction to the Paris Agreement. *Ecological Economics*, 170, 106571.

- MUTTAKIN, M. B. & SUBRAMANIAM, N. 2015. Firm ownership and board characteristics: do they matter for corporate social responsibility disclosure of Indian companies? *Sustainability Accounting, Management and Policy Journal*, 6, 138-165.
- NATHALIA, C. & SETIAWAN, D. 2022. Does board capital improve climate change disclosures? *Cogent Business & Management*, 9, 2121242.
- NGUYEN, A. H. & NGUYEN, L. H. 2020. Determinants of sustainability disclosure: Empirical evidence from Vietnam. *The Journal of Asian Finance, Economics and Business (JAFEB)*, 7, 73-84.
- NGUYEN, T. H. H., NTIM, C. G. & MALAGILA, J. K. 2020. Women on corporate boards and corporate financial and non-financial performance: A systematic literature review and future research agenda. *International review of financial analysis*, 71, 101554.
- NISANCI, D. A. 2021. FSB Task Force on Climate-related Financial Disclosures. *World Scientific Encyclopedia of Climate Change: Case Studies of Climate Risk, Action, and Opportunity Volume 3*. World Scientific.
- NTIM, C. G. & SOOBAROYEN, T. 2013. Corporate governance and performance in socially responsible corporations: New empirical insights from a Neo-Institutional framework. *Corporate Governance: An International Review*, 21, 468-494.
- O'DWYER, B. & UNERMAN, J. 2020. Shifting the focus of sustainability accounting from impacts to risks and dependencies: Researching the transformative potential of TCFD reporting. *Accounting, Auditing & Accountability Journal*, 33, 1113-1141.
- OOI, S. K. & AMRAN, A. 2018. Enabling climate change reporting in Malaysia. *World Review of Entrepreneurship, Management and Sustainable Development*, 14, 507-527.
- OOI, S. K., AMRAN, A., YEAP, J. A. & JAAFFAR, A. H. 2019. Governing climate change: the impact of board attributes on climate change disclosure. *International Journal of Environment and Sustainable Development*, 18, 270-288.
- PÁSTOR, L., STAMBAUGH, R. F. & TAYLOR, L. A. 2021. Sustainable investing in equilibrium. *Journal of Financial Economics*, 142, 550-571.
- PATTBERG, P. 2017. The emergence of carbon disclosure: Exploring the role of governance entrepreneurs. *Environment and Planning C: Politics and Space*, 35, 1437-1455.
- PATTEN, D. M. 1992. Intra-industry environmental disclosures in response to the Alaskan oil spill: A note on legitimacy theory. *Accounting, organizations and Society*, 17, 471-475.
- PESARAN, M. H. 2004. General diagnostic tests for cross section dependence in panels. *Available at SSRN 572504*.
- PHAM, L., HAO, W., TRUONG, H. & TRINH, H. H. 2023. The impact of climate policy on US environmentally friendly firms: A firm-level examination of stock return, volatility, volume, and connectedness. *Energy Economics*, 119, 106564.

- POSTEN, H. O. 1984. Robustness of the two-sample t-test. *Robustness of statistical methods and nonparametric statistics*. Springer.
- QA'DAN, M. B. A. & SUWAIDAN, M. S. 2018. Board composition, ownership structure and corporate social responsibility disclosure: the case of Jordan. *Social Responsibility Journal*, 15, 28-46.
- RAIMO, N., NICOLÒ, G., TARTAGLIA POLCINI, P. & VITOLLA, F. 2022. Corporate governance and risk disclosure: evidence from integrated reporting adopters. *Corporate Governance: The International Journal of Business in Society*, 22, 1462-1490.
- REZAEI, Z., ALIPOUR, M., FARAJI, O., GHANBARI, M. & JAMSHIDINAVID, B. 2021. Environmental disclosure quality and risk: the moderating effect of corporate governance. *Sustainability Accounting, Management and Policy Journal*, 12, 733-766.
- SAGGAR, R. & SINGH, B. 2017. Corporate governance and risk reporting: Indian evidence. *Managerial Auditing Journal*, 32, 378-405.
- SAINI, N. & SINGHANIA, M. 2019. Performance relevance of environmental and social disclosures: The role of foreign ownership. *Benchmarking: An International Journal*, 26, 1845-1873.
- SALEM, I. H., AYADI, S. D. & HUSSAINEY, K. 2019. Corporate governance and risk disclosure quality: Tunisian evidence. *Journal of Accounting in Emerging Economies*, 9, 567-602.
- SAMAHA, K. & DAHAWY, K. 2010. Factors influencing corporate disclosure transparency in the active share trading firms: An explanatory study. *Research in Accounting in Emerging Economies*. Emerald Group Publishing Limited.
- SHARMA, P., PANDAY, P. & DANGWAL, R. 2020. Determinants of environmental, social and corporate governance (ESG) disclosure: a study of Indian companies. *International Journal of Disclosure and Governance*, 17, 208-217.
- SHOCKER ALLAN, D. & PRAKASH, S. S. 1974. An Approach to Incorporating Social Preferences to Developing Corporate Action Strategies. *The Unstable Ground: Corporate Social Policy in a Dynamic Society*, 67-80.
- SONG, H. J., YOON, Y. N. & KANG, K. H. 2020. The relationship between board diversity and firm performance in the lodging industry: The moderating role of internationalization. *International Journal of Hospitality Management*, 86, 102461.
- SSEI, S. S. E. I. 2021. *Egyptian FRA: Mandatory ESG and Climate Disclosure Regulation* [Online]. Available: <https://sseinitiative.org/all-news/egyptian-fra-issued-mandatory-esg-and-climate-disclosure/> [Accessed Wednesday, August 9 2023].
- SUN, Y., ZOU, Y., JIANG, J. & YANG, Y. 2023. Climate change risks and financial performance of the electric power sector: Evidence from listed companies in China. *Climate Risk Management*, 39, 100474.

- TAJUDDIN, A. H., ABDULLAH, N. A. H. & TAUFIL MOHD, K. N. 2017. The influence of firm size on IPO oversubscription: evidence from Bursa Malaysia. *International Journal of Research in Management, Economics and Commerce*, 7, 45-50.
- TAURINGANA, V. 2021. Sustainability reporting adoption in developing countries: managerial perception-based determinants evidence from Uganda. *Journal of Accounting in Emerging Economies*, 11, 149-175.
- TCFD, T. F. O. C.-R. F. D. 2017. Final report: recommendations of the task force on climate-related financial disclosures.
- TFCD 2023. Task Force on Climate-related Financial Disclosures 2023 Status Report.
- THRELFALL, R., KING, A., BARTELS, W., SHULMAN, J. & HAYES, M. 2020. Towards net zero: How the world's largest companies report on climate risk and net zero transition. *KPMG: Amstelveen, The Netherlands*.
- TINGBANI, I., CHITHAMBO, L., TAURINGANA, V. & PAPANIKOLAOU, N. 2020. Board gender diversity, environmental committee and greenhouse gas voluntary disclosures. *Business Strategy and the Environment*, 29, 2194-2210.
- ULUCAK, R. 2020. How do environmental technologies affect green growth? Evidence from BRICS economies. *Science of the Total Environment*, 712, 136504.
- VELTE, P., STAWINOAGA, M. & LUEG, R. 2020. Carbon performance and disclosure: A systematic review of governance-related determinants and financial consequences. *Journal of Cleaner Production*, 254, 120063.
- WAHH, W. B., KHIN, E. W. S. & ABDULLAH, M. 2020. Corporate Risk Disclosure in Emerging Economies: A Systematic Literature Review and Future Directions. *Asian Journal of Accounting Perspectives*, 13, 17-39.
- WANG, H., TONG, L., TAKEUCHI, R. & GEORGE, G. 2016. Corporate social responsibility: An overview and new research directions: Thematic issue on corporate social responsibility. Academy of Management Briarcliff Manor, NY.
- WU, G. S. T. & WAN, W. T. S. 2023. What drives the cross-border spillover of climate transition risks? Evidence from global stock markets. *International Review of Economics & Finance*, 85, 432-447.
- XUE, B., ZHANG, Z. & LI, P. 2020. Corporate environmental performance, environmental management and firm risk. *Business Strategy and the Environment*, 29, 1074-1096.
- YASSEN, A. N., NAM, W.-H. & HONG, E.-M. 2020. Impact of climate change on reference evapotranspiration in Egypt. *Catena*, 194, 104711.
- ZAID, M. A., WANG, M., ADIB, M., SAHYOUNI, A. & ABUHIJLEH, S. T. 2020. Boardroom nationality and gender diversity: Implications for corporate sustainability performance. *Journal of Cleaner Production*, 251, 119652.
- ZHANG, S. Y. 2022. Are investors sensitive to climate-related transition and physical risks? Evidence from global stock markets. *Research in International Business and Finance*, 62, 101710.

## **Appendix A. Climate change disclosure index**

### **Governance (Corporate governance around climate-related risks and opportunities)**

- 1 Corporate board overlooks climate-related risks and opportunities (yes/no).
- 2 If the board overlooks climate-related risks and opportunities, how?
- 3 Management has a role in assessing and managing climate-related risks and opportunities (yes/no).
- 4 If management has a role in assessing and managing climate-related risks and opportunities, how?

### **Strategy (environmental processes, control and limiting the impacts of climate-related risks on the organization's businesses, strategy, and financial planning)**

- 5 The corporation identifies climate-related risks and opportunities over the short, medium, and long term (yes/no).
- 6 If the corporation identifies climate-related risks and opportunities over the short, medium, and long term, how?
- 7 The corporation incorporates the impact of climate-related risks and opportunities in its strategy, and financial planning.
- 8 The corporation invests annually in infrastructure relating to climate change mitigation, adaptation, and product development (yes/no).
- 9 If the corporation invests in infrastructure relating to climate change mitigation, adaptation, and product development, how?

### **Risk management (corporate identification, assessment and management of climate-related risks)**

- 10 The corporation has developed specific processes for identifying and assessing climate-related risks (yes/no)
- 11 If the corporation has developed specific processes for identifying and assessing climate-related risks, how?
- 12 The corporation has developed specific processes for managing climate-related risks (yes/no)
- 13 If the corporation has developed specific processes for managing climate-related risks, how?
- 14 The processes for identifying, assessing and managing climate-related risks are integrated into the organization's overall risk management (yes/no).
- 15 If the processes for identifying, assessing and managing climate-related risks are integrated into the organization's overall risk management, how?

### **Metrics and targets (carbon and greenhouse gas emissions)**

- 16 Metrics used to assess climate-related risks and opportunities and performance in line with its Strategy and risk management process.
- 17 Total carbon and greenhouse gas emissions due to corporate activities

## الإفصاح عن التغيرات المناخية فى الشركات المصرية ومحدداته الأساسية ما بعد تطبيق قرار هيئة الرقابة المالية رقم ١٠٨

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ملخص الدراسة

تقوم الدراسة بقياس مستوى الإفصاح عن التغيرات المناخية من قبل الشركات التي يتم تداول أسهمها بالبورصة المصرية والتي تعد من البورصات الرائدة عربيا وأفريقيا، وذلك بعد صدور القرار رقم ١٠٨ لسنة ٢٠٢١ من قبل هيئة الرقابة المالية المصرية، وذلك إعمالا لتوصيات فريق عمل الإفصاحات المالية المتعلقة بالمناخ (TCFD). علاوة على ذلك، تبحث الدراسة في الدوافع الرئيسية للإفصاح عن التغيرات المناخية في الشركات المدرجة بالبورصة المصرية بهدف تقييم مدى فعالية تطبيق توصيات TCFD في الأسواق الناشئة، وما إذا كان تطبيقها على أساس إلزامي يعد أمرا جوهريا. ومن خلال الاستعانة بأسلوب تحليل المحتوى، تم فحص التقارير السنوية لـ ٣٣ شركة مساهمة خلال الفترة من ٢٠٢١ إلى ٢٠٢٢. وتم احتساب الدرجة الكلية لإفصاح الشركات عن المعلومات المتعلقة بالتغيرات المناخية بحسب درجات المؤشرات الفرعية التي تشتمل على أربعة ركائز؛ الحوكمة المتعلقة بالتغيرات المناخية، الجوانب الاستراتيجية المتعلقة بالعمليات البيئية والرقابة والحد من المخاطر، وعملية إدارة المخاطر المتعلقة بالتغيرات المناخية، وأخيرا المقاييس والأهداف المتعلقة بالمخاطر والفرص ذات الصلة بالمناخ مثل تلك المتعلقة بانبعاثات الكربون والغازات الدفينة. وتم استخدام نموذج انحدار المربعات الصغرى العادية في تحديد العوامل التي تؤثر في جودة الإفصاح. ووفق النتائج فإن متوسط درجة إفصاح الشركات المصرية قد بلغ ٤٨.٨% من إفصاحات تغير المناخ التي فرضتها هيئة الرقابة المالية. إضافة إلى ذلك، هناك تحسن ملحوظ وذو دلالة إحصائية في درجة الإفصاح عن التغيرات المناخية في عام ٢٠٢٢ (بداية إلزام الشركات المدرجة بالبورصة بتطبيق بنود القرار رقم ١٠٨ وما ترتب عليه من ضرورة ملاءمة نموذج الإفصاح المالي المتعلق بالتغيرات المناخية بواسطة الشركات المشمولة بالقرار)، مما يؤكد على الدور الفعال للقرار رقم ١٠٨، كما يبشر بإمكانية تعزيز ممارسات الإفصاح المالي عن التغيرات المناخية مع مرور الوقت، خاصة مع قرب تطبيق المعيار المحاسبي IFRS S2 الذى ينظم ذلك الشأن. ويؤكد تحليل الانحدار أن كلا من عمل الشركة بإحدى الصناعات التي تزيد بها انبعاثات الكربون، والملكية الأجنبية، ووجود أعضاء أجنبيات بمجلس الإدارة، وحجم مجلس الإدارة، وإدراج الشركة بمؤشر ESG S&P/EGX تعد من المحددات الرئيسية، حيث أثبتت النتائج أن لها أثر معنوي موجب على جودة الإفصاح المالي للشركات عن التغيرات المناخية. إلا أن النتائج تشير إلى أن وجود أعضاء مجلس إدارة مستقلين له أثر معنوي سالب على مستوى الإفصاح مما يسلط الضوء على ضرورة مراعاة توافر الوعي بالفرص والتحديات المرتبطة بالتغيرات المناخية وانعكاسها على الأداء الحالي والمستقبلي للشركات لدى أعضاء مجلس الإدارة المستقلين عند اختيارهم. كذلك تؤكد النتائج على سلامة وتكامل الإطار النظري المقترح (نظريات أصحاب المصلحة، والمساهمين، والشرعية، ورأس المال البشري). وتعد نتائج الدراسة ذات أهمية كبيرة لواضعى السياسات، والجهات التنظيمية، والهيئات الدولية، والمستثمرين، وواضعى المعايير المحاسبية، والشركات التي تهتم بتقييم الأهمية الاستراتيجية للإفصاح عن التغيرات المناخية والعوامل المحددة لجودته. كذلك تسهم النتائج التي تم التوصل إليها في تطوير السياسات واللوائح التي تعزز الاستثمارات الخضراء.

الكلمات المفتاحية: الإفصاح عن التغيرات المناخية، TCFD، تحليل المحتوى، FRA، القرار رقم ١٠٨، IFRS S2، ESG S&P/EGX.