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The integration between climate-related financial disclosure and investing in green technology and its impact on firm value
An applied Study

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Abstract

Purpose: The first purpose of this paper is to investigate the effect of climate change disclosure on firm value. The second purpose of this paper is to investigate the effect of investment in green technology on firm value. The third purpose of this paper is to investigate the impact of integration between climate disclosure and investment in green technology on firm value.

Design/methodology/approach: The study was applied to a sample of banks operating in the Arab Republic of Egypt during the period from 2021 to 2024. The study period started in 2021 because the Egyptian Financial Regulatory Authority (EFRA) issued Decision No. 108 of 2021, This decision requires Egyptian companies to submit annual financial reports that include disclosures on climate change risks and their financial impacts. The researcher selected the 15 largest banks in terms of asset size because they share some characteristics that enhance the accuracy disclosure consisting of (33) elements.

Findings: The climate-related financial disclosures has a significant positive impact on bank value measured by Tobin's Q. The results also show that the investment in green technology has a significant positive impact on bank value measured by Tobin's Q. Additionally, the results show that the integration between climate-related financial disclosures and investment in green technology has a positive and significant impact on bank value measured by Tobin's Q.

Keywords: Climate-related financial disclosure - Investing in green technology-Firm value.

1. Introduction

Climate change is disrupting economies, impacting lives, and "costing people, communities and countries dearly today and even more tomorrow". Acknowledging that climate change is continuing at a rate much faster than anticipated, the United Nations has urgently called for nations to take action to combat climate change into its Sustainable Development Goals for 2030. Similarly, the recent report released by the Intergovernmental Panel on Climate Change, where climate change risk is the central focus, also emphasizes the need for a collective global effort if we are to achieve our goal of net-zero carbon emissions (Hewa et al., 2025).

Climate risk can undermine banks' stability; consequently, these risks must be included in their risk framework. Climate change poses three distinct types of climate-related risks to the banking sector. Physical risks, which are associated with extreme weather events, such as floods, hurricanes, and heatwaves, can profoundly affect the economy, resulting in substantial financial losses. Physical risks are related to extreme weather events, such as floods, hurricanes, and heatwaves. They can severely affect the economy and lead to significant financial losses. Second, transition risks are imposed by technological and policy changes that enable a shift to a low-carbon economy. Finally, liability risks result from the increasing compensation given to people and businesses suffering from physical and transitional climate-related risks (Chalabi-Jabado and Ziane, 2024).

Entities should consider how climate change, including their pledges and activities to address climate change, may influence their financial statements and other reporting responsibilities as investors concentrate more attention on climate-related issues. For instance, organizations agree to adopt net-zero or other climate goals and develop a climate strategy that includes a transition strategy, their financial statements may be directly impacted by these plans and objectives (Megeid, 2024).

In 2017, the Financial Stability Board launched the Task Force on Climate-related Financial Disclosures (TCFD) to develop "voluntary, consistent climate-related financial disclosures" to provide decision-useful information "to investors, lenders, and insurance underwriters" to understand material risks (TCFD, 2017).

Amid growing environmental concerns, investment in green technology has become a vital strategy for companies aiming to achieve sustainable development while maintaining economic growth. This approach, which involves the adoption of eco-friendly technologies and practices, has gained considerable traction globally, particularly in nations with rapid industrialization (Zhang et al., 2025).

In the context of the green development era, fostering green technology innovation has emerged as a critical objective for enterprises. Alongside the rapid advancement of emerging technologies such as artificial intelligence and big data, digital transformation has garnered significant attention from businesses worldwide. Promoting digital transformation and enhancing green technology innovation are pivotal strategies for unlocking the potential of scientific and technological advancements and driving the growth of a low-carbon economy. As digital

transformation progresses, green technology innovation has become an indispensable pathway for achieving sustainable corporate development (Xu and He, 2025).

Green investment is a complex management process and economic behavior. It is not easy to achieve the "win-win" of its ecological goals and economic benefits. The literature on the economic consequences of green investment finds that whether firms invest in green technology depends on the size between the investment cost and the benefits of emission reduction, and firms only invest in green technology when they are profitable. For firms, the more concerned issue is not whether the organization is worth greening, but when the environmental protection investment will be rewarded. Based on this, exploring the impact mechanism of green investment behavior on economic performance has important theoretical value and practical significance (Chen and Ma, 2021).

Firm financial performance will affect managers' investment decisions in the environment, which makes them have different investments in coping with social and consumer pressure. On one hand, environmental regulation drives firms to internalize environmental costs, which increases the cost burden of firms. On the other hand, "innovation compensation" effect will attract firms to participate in green practice (Tang et al., 2018). Therefore, the green investment behavior of firms needs to take into account the "cost focus" path and the "value creation" path (Chen and Ma, 2021).

Policymakers, environmental advocates, and institutional investors have become increasingly aware of the potential adverse financial consequences of climate change. These concerns underscore the complex issues associated with the distributional damage from global warming and the strategies that both individuals and capital markets should employ to price and mitigate the impacts of climate change. Climate change risks can be broadly categorized into two main types: physical risks, which encompass losses directly related to climate change, such as natural disasters and extreme weather events; and transition risks, which include the impact of changing policies aimed at transitioning to a low-carbon economy. The multifaceted nature of climate change makes it challenging to quantify its effects on corporate financial positions, markets, and individual wealth. Greater public attention to climate change has led to the implementation of more stringent corporate policies and a reduction in investment activities, which, in turn, put firms under significant economic pressure (Jin et al.,2025).

Consequently, firms are increasingly implementing precautionary measures to improve their resilience against heightened climate-change exposure, including adjusting their capital structure, increasing their cash holdings, and adopting sustainability policies (Ahmad et al., 2023).

2. Analysis of literature review

The first group: Studies that aimed to explore the impact of climate-related financial disclosures on firm value

1- (Alsaifi et al., 2020)

Title: Carbon disclosure and financial performance: UK environmental policy
The outcome of carbon disclosure, the importance of which has grown remarkably in recent years to become a strategic decision-making issue for organizations in today's competitive environment, is a subject of lively debate but remains under-researched in the environmental accounting literature. This study is motivated by this research gap and the growing interest in assessing the financial consequences of corporate involvement in climate change beyond regulatory compliance, as evidenced by firms' voluntary participation in the Carbon Disclosure Project. Using the resource-based view of the firm as a theoretical framework and linking it to carbon disclosure through Carbon Disclosure Project, we conceptualize and empirically investigate the impact of adopting proactive carbon management policies and communicating them to stakeholders, focusing on the financial performance of the top FTSE350 companies between 2007 and 2015. By developing a comprehensive financial performance index and controlling for several firm characteristics, we find strong evidence that voluntary carbon disclosure is positively associated with firm financial performance. The findings in this paper provide new insights and policy implications for managers, financial stakeholders, and regulators.

2- (Maji and Kalita, 2022)

Title: Climate change financial disclosure and firm performance: empirical evidence from Indian energy sector based on TCFD recommendations
The paper aimed to examine the climate change-related disclosure patterns of listed Indian firms and its impact on firm performance. The study conducts content analysis of the annual reports and/or sustainability reports of 22 selected firms from the energy sector for the period spanning 2018–2019 and 2019–2020 based on the four-fold recommendations of TCFD, namely, governance, strategy, risk management and target and metrics, to compute the overall and respective climate-change disclosure scores. Further, a panel data regression model is used to analyse the impact of such disclosure on the performance of the firms. The findings of the study indicate that the disclosure level of Indian firms in the energy sector is moderate. The regression results establish a positive relation between climate change-related financial disclosure and firm performance indicating that firms can witness improved financial performance by disclosing more information on climate change.

3- (Galeone et al., 2023)

Title: Climate-related financial disclosure in integrated reporting: what is the impact on the business model? The case of Poste Italiane
The purpose of this study is to explain what paths a company can take to reconfigure its business model and corporate reporting tools in line with the United Nations' Sustainable Development Goals (SDGs). The research used a qualitative approach and drew on stakeholder and legitimacy theories to collect primary and secondary data through in-depth interviews, semi-structured questionnaires and observation of corporate documents. Sustainability and climate change issues' relevance in the business model and reporting requires improvement so that stakeholders can participate and become aware of the actions put in place to limit the climate challenge.

4- (Megeid, 2024)

Title: The impact of climate risk disclosure on financial performance, financial reporting and risk management: evidence from Egypt

This research aims to measure the climate risk disclosure level in Egyptian companies and to investigate its determinants. As unfavorable climatic circumstances create systemic risk for businesses throughout the whole global economy, this research examine how the disclosure of climate change risks affects the financial performance, financial reporting, and risk management. Few studies analyze how climate-related risk affects the financial performance of publicly traded companies in Egypt. This research applies regression models using both quantitative and qualitative methodologies. The information was gleaned from the 2019 through 2022 financial statements of 25 publicly traded companies. According to statistical analysis, there is a significant positive association between the financial performance, financial reporting, and risk management of industrial organizations and the disclosure of climate change. The findings show that the financial markets require precise, thorough, and high-quality information about the effects of climate change. This encompasses the threats and chances posed by increasing temperatures, climate-related legislation, and new technology in our rapidly evolving global environment.

5- (Maji et al., 2025)

Title: Corporate climate change financial disclosure and financial performance in emerging nations: evidence from Fortune Global firms

The study aimed to investigate the association between climate change financial disclosure and financial performance, considering the moderating effect of industry sensitivity on developing countries. The study analyzes a panel data set of 93 non-financial companies from developing countries listed in the Fortune Global 500 from 2018 to 2022. The authors have used system generalized method of moments model followed by two-stage least square model and fixed effects model to test the hypotheses. The findings indicated that climate change financial disclosure negatively affects financial performance. Also, climate sensitivity negatively moderates the relationship between climate change disclosure and market performance.

6- (Ghose et al., 2025)

Title: Impact of corporate climate change disclosure on firm performance: empirical evidence from an emerging economy

This study aimed to investigate the impact of corporate climate change disclosure (CCD) on the financial performance of Indian firms. The sample for the study includes 77 Indian firms from 2018–2019 to 2021–2022. Required data are collected from published annual reports, sustainability reports and the Ace Equity Database. The explanatory variable CCD is measured using content analysis based on the Task Force on Climate-related Financial Disclosures (TCFD) framework. The panel fixed-effects or random-effects models have been considered for hypotheses testing. The disclosure level of CCD and its different components is found to be moderate with an average score of 0.364 among top Indian firms. Regression results reveal a

significant positive association between CCD on firms' market-based performance, suggesting its long-term benefits.

7- (Salvi et al., 2025)

Title: Rising temperatures, rising transparency: Revealing the financial benefits of climate change disclosure

One of the main challenges in creating a sustainable economy is the effective management of the risks posed by climate change. The relevance of these topics has heightened the importance of climate change disclosure (CCD), which has increasingly attracted the interest of academics. However, the financial effects of CCD remain an area that is still underexplored. This study aims to fill this important gap by investigating the impact of CCD via social media on the cost of capital and firm value. The econometric analysis, conducted on a sample of 134 international firms over the period from 2019 to 2021, reveals that CCD has a negative effect on the cost of capital and a positive impact on firm value. These results provide significant contributions to the academic literature and offer important practical implications for firms, policymakers, and standard setters.

8- (Mondal and Bauri, 2025)

Title: Climate-related financial disclosures and firm value: evidence from India

The study aimed to examine whether the extent of climate change-related disclosure has an impact on a firm's value. More specifically, this paper has analyzed the level of compliance with climate change-related corporate disclosures following the recommendations provided by the Task Force on Climate-related Financial Disclosures (TCFD) and its impact on the firm's value. The present paper has considered the 39 largest non-financial companies from the NIFTY 50 Index. To measure the level of climate change-related disclosures of the sample companies, the study has examined the compliance level of climate change-related information disclosed in the Sustainability Reports/Integrated Reports/ESG Reports annually, with the help of content analysis method and thereby evaluated the Climate Compliance Index (CCI) score of each company for the periods of 2019–2020 to 2022–2023 following the TCFD recommendations. After that, to assess the impact of climate change-related disclosures in terms of CCI scores on the value of the firms measured by Tobin's Q, we initially employed the ordinary least square model after that to get more unbiased results we also used generalized least square method of regression analysis. The results revealed that the compliance level of climate change-related disclosure following the TCFD recommendations is moderate but increased as compared to the previous study period in the case of select Indian companies. The empirical result demonstrated that climate change-related disclosures are negatively associated with firms' valuation measures, such as Tobin's q. **The second group:** Studies that aimed to explore the impact of investing in green technology in light of sustainable development and its impact on firm value

1- (Duque-Grisales et al., 2020).

Title: Does green innovation affect the financial performance of Multilatinas? The moderating role of ISO 14001 and R&D investment

The purpose of this study is to explore the relationship between green innovation (GI) and financial performance (FP) in emerging markets multinationals from Latin America (Multilatinas). Aligned with the natural resource-based view and institutional theory, and using moderated and hierarchical linear regression analyses with panel data from 86 listed firms during the period 2013–2017, we find that implementing effective GIs is not associated with greater FP. The paper also analyses the moderating effect of Environmental Management Systems (ISO 14001) and research and development (R&D) investment on the relationship between GI and FP. Study found that Multilatinas' implementation of ISO 14001 does not affect the way they adopt GI and thus does not enhance their levels of FP, but a positive moderating effect is generated as companies increase their level of R&D investment.

2- (Indriastuti and Chariri, 2021)

Title: The role of green investment and corporate social responsibility investment on sustainable performance

Studies on green investment and corporate social responsibility (CSR) investment has been conducted by some researchers in the current and future trends of sustainable development. Many of them have focused on the relationship between CSR and financial performance, but only a few have examined how green investment, CSR investment, and sustainability are related to each other. Sustainable performance is based on three aspects: people-planet-profit, or also what is known as the triple bottom line concept. The sample for this study consisted of 132 manufacturing companies listed in the Indonesia Stock Exchange from 2016 to 2019. This study found that green investment and CSR investment positively affect financial performance and sustainable performance. Meanwhile, the financial performance has an insignificant effect on sustainable performance. Besides, financial performance cannot mediate the effect between green investment and CSR investment on sustainable performance.

3- (Du et al., 2022)

Title: Can Green Finance Policies Stimulate Technological Innovation and Financial Performance? Evidence from Chinese Listed Green Enterprises

The impact of China’s green finance policies on renewable energy, clean energy, and other green companies is a hot topic of concern. This study uses the difference-in-differences (DID) model to examine the incentive effect of the Green Credit Guidelines (GCG) on the technological innovation and financial performance of Chinese listed green enterprises. The heterogeneity analysis is carried out from the level of digital finance, green development, and marketization. This study finds that: (1) Green finance is conducive to stimulating the technological innovation and financial performance of green enterprises. (2) Green enterprises in areas with high digital finance levels have a more significant incentive effect on green finance policies, compared to areas with less-developed digital finance. (3) Green enterprises in areas with high levels of green development are more significantly positively affected by green finance policies, compared to areas with less-developed digital finance. (4) The incentive effect of green credit policies on green enterprises in areas

with a high degree of marketization is more significant, compared with regions with a lower level of green development. Finally, some policy implications are proposed to provide a reference for China to improve the green financial system to facilitate the financing of green enterprises.

4- (Song et al., 2023)

Title: The Impact of Green Technology Research and Development (R&D) Investment on Performance: A Case Study of Listed Energy Companies in Beijing, China

The paper aimed to investigate the relationship between green technology R&D investment and corporate performance (ROA). Additionally, the study analyses the influence of three threshold variables (firm size, capital structure and capital density) on the relationship between green technology R&D investment and firm performance. This research used a sample of 44 Beijing-listed energy companies from 2016 to 2021 using a threshold regression model. The findings of the study indicate that the green technology R&D investments only have a positive effect on firm performance within an appropriate green technology R&D investment interval, and a negative effect occurs outside this interval. The results also show that firm size has an inversely- U-shaped relationship, the capital structure has a negative nonlinear relationship and the capital density has an inversely N-shaped relationship. Moreover, the study shows that the green technology R&D investment intensity has a lagged effect on firm performance. The positive influence weakens over time, and the negative influence becomes more pronounced. The findings of the study can help energy companies to develop green technology R&D innovation strategies, such as differentiating green technology R&D expenditures for companies in different development situations. It can also exploit the driving effect of green technology R&D investment on firm performance in the context of China's energy sector restructuring.

5- (Takacs, 2023)

Title: The positive effects of green technology investments on growth expectations

This study presents evidence that investments in green technology and corporate environmental policies, or in other words, a move towards cleaner production, increase investors' growth expectations, resulting in a rise in firms' stock market value. Additionally, the study statistically demonstrates that the positive correlation between cleaner production and growth expectations strengthened during the latter half of the 2010s. The author employs the reverse discounted cash flow method as a novel technique to define the response variable for cleaner production. The study's outcomes carry crucial policy implications since well-targeted measures can amplify the favorable financial effects of green technology investments on regional, industry, or national economy levels. The timeframe of 2010–2019 was chosen for the analysis to investigate relatively stable market conditions following the global crisis of 2008–2009 and preceding the onset of the COVID-19 pandemic in early 2020. The initial search produced a fundamental dataset of 1653 firms.

6- (Khalid et al., 2023)

Title: Does corporate green investment enhance profitability? An institutional perspective

Using the institutional theoretical perspective, this study aimed to unearth the antecedents of the mixed results in the extant literature regarding the association between corporate green investment (CGI) and profitability. The study utilized a novel dataset comprising environmental research data from Chinese A-share listed companies for the period 2010–2019. The findings indicate that CGI enhances profitability and that the positive association is reinforced by the promulgation of Environmental Protection Law 2015. Regional development also augments CGI's positive effect on firms' profitability. Nevertheless, no significant association is observed between firm profitability and CGI among firms operating within environmentally sensitive sectors. Our findings imply that apart from regulatory forces, normative and cognitive pressures are also key instruments that may be employed by governments to motivate firms to embrace greener and more sustainable practices.

7- (Casciello et al., 2024)

Title: Green innovation and financial performance. The role of R&D investments and ESG disclosure

This study investigates the effects of green innovation (GI) on financial performance under both accounting and market-based perspectives in European Union (EU) listed non-financial firms. In addition, this study explores whether the R&D investments and the Environmental, Social and Governance (ESG) disclosure play a mediating role over the association between GI and accounting-based and market-based financial performance, respectively. Based on a sample of 526 firms over the period 2012–2022, we find that GI is negatively associated with accounting-based financial performance and positively associated with market-based financial performance. We further find that GI impacts on accounting-based financial performance via the channel of R&D investments and on market-based financial performance via the channel of ESG disclosure.

8- (Zhang et al., 2025)

Title: Does green innovation promote financial performance of Chinese listed companies?

This study explored the impact of green innovations on a firm's financial performance over time, considering the short-term, transitional and long-term effects. Using data from 4291 Chinese A-share listed companies between 2004 and 2021, we applied a novel long-difference multi-level fixed-effects approach to gain new insights. The findings suggest that the impact of green innovation on return on assets (ROA) is contingent upon the type of innovation, time frame and market conditions. During the transitional phase, the overall level of green innovation and its quality positively influence ROA. However, in the long run, the quantity of green innovation may adversely affect ROA. In addition, leverage emerges as a significant determinant of ROA across firms. Quantile analysis further revealed that green innovation benefits firms with lower ROA but may negatively impact those with higher ROA.

Researcher's comment on literature review

- The researcher concludes that previous studies have examined the impact of each independent variable (climate-related financial disclosures & investing in green technology) on the dependent variable (bank value) individually. This is the first study, to the researcher's knowledge, to examine the effect of integration between climate-related financial disclosures and investing in green technology on bank value. Therefore, expanding the scope of this study by adopting a more comprehensive approach is worthy of investigation, as the overall and interactive impact of these variables together on the bank's value will be studied.
- The vast majority of previous studies was carried out in environments that differ from the Egyptian context, which has unique features that make it a topic worth investigating. As a result, the findings of these studies are only acceptable within their particular context; they cannot be extrapolated to the current research setting.
- The results of previous studies document contradictory results regarding the impact of climate disclosure on the firm value. Some of them concluded that there is a positive impact of climate disclosure on firm value (Alsaifi et al., 2020; Maji and Kalita, 2022; Salvi et al.,2025), and some of them concluded that there is a negative impact of climate disclosure on firm value (Mondal et al., 2025; Maji et al., 2025). The difference in results can be attributed to differences in: the sample size, the characteristics of the company examined, the level of governance within the company and the country, the method of measuring the variables, especially the methodology for preparing the disclosure index. Therefore, the contradiction in previous studies calls for conducting more previous studies on this research area. The researcher agrees with (Mbithi et al., 2020) that this discrepancy in results weakens comparability between researchers and adds little to improving practice. This discrepancy also serves as a strong motivation for further research to analyze the reasons behind these discrepancies. Indeed, for climate disclosure practices to serve their intended purpose of informing decision-makers, they must be clear, precise, and agreed upon.
- Most previous studies focused on economic sectors (Mondal et al., 2025; Maji et al., 2025; Maji and Kalita, 2022) other than the banking sector, which has characteristics that distinguish it from other sectors.

3. Study problem

Accounting disclosure represents the fundamental core and main pillar upon which stakeholders rely to obtain sufficient information about an entity through financial reports, enabling them to evaluate the entity's future performance and its ability to continue.

Institutions in general, and banks in particular, strive to improve future performance levels, in addition to their current good performance. Stakeholders are always looking for future performance indicators that provide them with a sense of reassurance and confidence regarding the bank's ability to continue and achieve its

goals. There is no doubt that disclosing the climate risks that a bank may face and how these risks are managed is among the most important pieces of information and indicators that can determine a bank's ability to continue and create value.

Sustainable development has become an eternal issue for human society. Globally, the adverse impacts of climatic anomalies and marine inundation threats on ecosystems and human production and life have continued to increase. Climate-related risks can have a major impact on the assets and liabilities of some companies, even though financial statements typically only contain a small amount of forward-looking information. Users of financial statements anticipate corporations to provide clear and open disclosures regarding climate change.

Climate disclosures generally have a positive impact on enterprise value by enhancing corporate reputation, building investor confidence, reducing information asymmetry, and fostering green innovation, ultimately leading to better market performance and financial returns. However, this effect is more significant for firms with higher disclosure quality and can be negative if the disclosed information highlights substantial climate risks that the firm is ill-equipped to handle.

Climate risk disclosure requirements (e.g., the Task Force on Climate-related Financial Disclosure (TCFD) framework), ESG reports force companies to face environmental compliance pressure, to maintain capital market trust and reputation. According to stakeholder theory, companies need to balance all parties' interests in their operations and proactively address environmental demands from external stakeholders-including society, governments, investors, and the public. They must demonstrate ecological accountability and a commitment to sustainability by reducing carbon emissions, mitigating environmental risks, and advancing targeted innovations.

Improving pollution situations through environmentally friendly investments has gradually become an important business decision for companies and a significant manifestation of corporate social responsibility. Decisions regarding green investment have a significant impact on the economy. As a financial activity aimed at environmental protection, green investment plays a crucial role in promoting eco-friendly economic development, enhancing economic efficiency, and strengthening sustainable development . In the long term, green investment-often referred to as environmental investment, Environmental, Social, and Governance (ESG) investment, socially or sustainably responsible investment, or responsible investment-embodies the concept that green investment is an activity designed to protect the environment, reduce pollution, decrease carbon emissions, utilize alternative energy sources, and conserve natural resources.

Integrating green technology investments with climate disclosures is crucial because it enhances transparency, builds stakeholder trust, and provides a clear signal of a firm's commitment to sustainability and long-term value. Disclosures help validate green investments by showcasing operational efficiencies and resilience, which in turn attract investor confidence and can improve access to finance. This synergy creates a positive feedback loop, enabling firms to translate sustainability efforts into

tangible benefits, such as improved market reputation, reduced costs, and enhanced long-term competitiveness. The important role that banks play in bringing about economic development requires a broader and more comprehensive understanding of the performance of these banks and knowledge of the factors that can affect their performance, the most important of which are: the level of disclosure of climate risks and investment in green technology. In light of this discussion, the researcher can formulate the study's problem in the following main question:

What impact can the integration of green technology investment and climate-related financial disclosures have on bank value?

4. Study objectives

Motivated by a sense of urgency to provide investors with information on climate-related risk for their investment decisions, we examined the following points:

1- The effect of climate-related financial disclosures on firm value.
2- the effect of investment in green technology on firm value.
3- the impact of integration between climate-related financial disclosures and investment in green technology on firm value.

5. Study importance

The research derives its importance from the following:

Scientific importance: This stems from the following:

1- The importance of the topic addressed by the study in contemporary accounting thought, as climate disclosure, investment in green technology, and sustainable finance are modern trends in accounting thought that require further study and analysis. Climate risk disclosure is also a very important issue that has captured the attention of accounting thought and regulatory bodies due to the impact of climate on society as a whole. Many international professional organizations have issued numerous standards and guidelines addressing climate risk disclosure, which constitutes an application of good practices for corporate governance and sustainable development.
2- The study attempts to build a framework to measure the impact of integration between climate-related financial disclosures and investment in green technology on bank value.

Practical Importance: This stems from the following:

1- Evaluating the level of climate-related financial disclosures in the annual financial reports of a sample of banks operating in Egypt. The study results help provide practical evidence on the level of climate disclosure to determine the need to improve this type of disclosure.
2- The study results will provide practical evidence of the importance of investing in green technology to improve bank performance and value. Furthermore, the climate disclosure index will enable financial institutions and decision- and policy-makers to monitor the development of climate disclosures and mitigate implementation obstacles. The results obtained through this study will be important for financial institutions, particularly

banks, as banks can shed light on the study results and use them as an indicator and guide for improving bank performance.

3- The study results will help provide important information to regulatory and supervisory bodies to improve climate disclosures, reduce information asymmetry among stakeholders, especially investors, and guide decision-makers.

6. Study hypotheses

In light of the results of previous studies and in light of the theories explaining climate disclosures, and based on the problem and questions of the study, the answer to these questions was envisioned by formulating the study hypotheses as follows:

H1. There is a significant positive effect of the climate-related financial disclosures on firm value.

H2. There is a significant positive effect of the investing in green technology on firm value.

H3. There is a significant positive effect of the integration between investment in green technology and climate-related financial disclosures on firm value.

7. Scope and limitations of the study

First: **The application environment**: An applied study on a sample of banks operating in Egypt. Therefore, caution must be exercised when generalizing the results of this study to environments other than the application environment due to the differences in political, economic, cultural and social systems between countries. Likewise, caution must be exercised when generalizing the results of this study to sectors other than the banking sector due to the differences in the characteristics and laws of each sector from the other. Egypt was selected as one of the largest emerging economies in Africa. Egypt is also one of the most popular investment destinations in the Middle East and North Africa. On the other hand, the institutional environment in emerging economies differs markedly from that in advanced economies, which are characterized by significant government intervention, weak legal institutions, high ownership concentration, and inefficient financial markets. In emerging economies, these institutional elements may shape the business structure and thus affect corporate governance and disclosure levels.

Second: Scientific limitations: The study will be limited to financial disclosures related to climate and investment in green technology as independent variables, and bank value as the dependent variable. Bank value will be measured using Tobin's in the basic analysis, and return on assets and return on equity in the additional analysis.

Third: Application period: from 2021 to 2024. The study period started in 2021 because the Egyptian Financial Regulatory Authority (EFRA) issued Decision No. 108 of 2021, This decision requires Egyptian companies to submit annual financial reports that include disclosures on climate change risks and their financial impacts.

8. Study methodology

The study methodology is based on two main axes:

1- **The first axis: the deductive approach**: In this study, the researcher moves from the general to the specific, with the aim of deriving the necessary proposals and results to answer the study's questions, and deducing testable

hypotheses in light of the study's problem. Specialized scientific references and professional publications related to the study's topic are reviewed with the aim of forming the theoretical framework for the study.

2- **The second axis: the inductive approach**: The study moves from the specific to the general. This approach is used to complete the applied aspect of the research, as follows:

- Identify the study variables and collect and analyze data to test the study hypotheses.
- Measure the independent variables during the study period and develop an index to measure the level of climate disclosures, according to a scientific methodology. Measure the dependent variable and the control variables.
- Values and ratios for the study variables are obtained by using content analysis to analyze banks' financial reports.
- Explore the impact of the level of climate disclosures and investment in green technology on bank value through multiple linear regression and statistical analysis using statistical programs to verify the validity of the hypotheses reached through the theoretical study, determine the extent to which the hypothesis is acceptable, and reach conclusions.

9. Study content

To achieve the study's objectives, it will be divided into the following:

1- The impact of climate-related financial disclosures on firm value
2- Investing in green technology in light of sustainable development and its impact on firm value
3- The complementary role of climate disclosure and investment in green technology and its impact on firm value
4- An applied study

1. The impact of climate-related financial disclosures on firm value

Corporate boards are now understanding the critical importance of managing climate risks, a key emergent form of business risk. Climate risks comprise of potential impacts arising from changes in natural weather patterns, the incidence of natural disasters and the technological, market, policy and legal repercussions associated with such risks. Climate risk information is extremely important to stakeholders, especially because it affects investors' decision-making (Kölbel et al., 2024).

Climate change has important consequences for the valuation of tangible and intangible assets , as well as financial performance (Secinaro et al., 2020). As a result, it is widely believed that climate change risks should be identified and managed by the board of directors in the same way as any other strategic risk . According to the stakeholder theory, implementing environmental practices can help a company reduce environmental risks and production costs. Furthermore, this implementation has the potential to improve the company’s relationship with its key stakeholders and thus enhance its competitive advantage and financial performance in the long term (Dahmen and Chouaibi, 2024).

Reporting on the financial implications of climate-related risks is at a nascent stage. The integration of climate risks into the investment decision-making process can prove to be challenging (Krueger et al., 2020). Investors and other capital market participants still find climate-related risks difficult to price and hedge and perceive the information about climate risks as too inaccurate and boilerplate (Krueger et al., 2020).

While pursuing economic growth, the proper handling of issues related to climate change has become a hot topic in academic circles. The role of enterprises in promoting sustainable development and combating climate change has become increasingly prominent. To strategically address these climate challenges, numerous firms and entities strive to share insights on the climate-related risks and opportunities they encounter, ensuring clarity and organization in their disclosures. In this context, the Financial Stability Board (FSB) initiated the Task Force on Climate-related Financial Disclosures (Gao et al., 2024).

TCFD recommendations cover the following four thematic areas (TCFD, 2017):

1- **Governance**: Information about the governance processes, controls and procedures that a reporting entity uses to monitor and manage climate-related risks and opportunities.
2- **Strategy**: Information about an entity's strategy for managing climate-related risks and opportunities.
3- **Risk Management**: Information about how climate-related risks and opportunities are identified, assessed, given preference and monitored, and whether and how these processes are integrated into its overall risk management framework.
4- **Metrics and Targets**: This section provides information about how an entity measures, monitors and manages climate-related risks and opportunities and assesses its performance, including progress towards the targets it has set.

Firms highly susceptible to physical climate risks often face a heightened risk of severe weather events. Such companies may suffer immediate consequences of direct damage to their corporate assets, such as production sites, logistics warehouses and offices. This leads to a decrease in the value of these fixed assets and incurs additional recovery costs. In addition, fluctuations in climate conditions, such as extreme temperatures, necessitate increased energy consumption to regulate temperatures in the facilities and plants of affected firms, 1 escalating their operational expenses. While some firms manage to pass on some operational costs to consumers by raising selling prices, fully transferring these costs is often not entirely feasible. This can lead to squeezed profit margins and reduced investor attractiveness. Furthermore, climate change can provoke resource shortages or scarcities, like water or metals, posing long-term consequences of supply chain disruptions and operational challenges. Finally, anticipation of more frequent and severe climate events may drive up insurance premiums for companies, placing an additional financial burden on them (Li et al., 2024).

Climate risk disclosure enables companies to align with stakeholder expectations, showcasing dedication to sustainability and transparency. Proactively disclosing climate-related risks and strategies provides companies with a competitive advantage and attracts environmentally conscious investors, customers and partners. It elevates a company's reputation and refines its market positioning (Kapoor et al., 2025).

Published studies have examined the relationship between climate disclosure in general and corporate value (Alsaifi et al., 2020; Mondal and Bauri, 2025 Megeid; 2024), but the results remain inconclusive. In addition, these studies have not specifically focused on the relationship between climate change-related financial disclosures and corporate value. Within the banking industry, such empirical investigations are far less frequent, because the financial industry is often excluded from samples for methodological reasons. The disclosure of climate-related financial information may vary among different sectors and geographic regions (Ngo et al., 2023). Empirical evidence regarding the banking industry is so far very limited. The study will attempt to fill this research gap.

Banks are both impacted by climate change and crucial for the implementation of sound practices and behaviors to combat climate change. Banks want to present themselves as good citizens when they are located in a developed and environmentally friendly country, profitable, less risky, and subject to multiple-listing constraints (Caby et al., 2020).

Alsaifi et al., (2020) demonstrated that voluntary carbon disclosure is positively associated with firm financial performance, focusing on the financial performance of the top FTSE350 companies between 2007 and 2015. Environmental disclosures made by the company will give a positive signal to investors where the company has carried out environmental performance well and has an advantageous effect on the company's value (Hardiningsih e al., 2024).

Though adopting ESG initiatives has considerable short-term expenses, a firm may profit from these investments by creating an enduring foundation for survival and may be successful in creating brand awareness (Tahmid et al., 2022).

Ganda (2018) investigate the South African firms' carbon emission disclosure between the period from 2010 to 2015. The study reported that carbon emission disclosure generates a positive linkage with asset profitability but a negative relationship with the market-to-book ratio.

Salvi et al. (2025) reported climate change disclosure through social media has a positive impact on firm value and a negative effect on the cost of capital.

In the Indian context, Mondal and Bauri (2025) aimed to analyze the level of compliance with climate change-related corporate disclosures following the recommendations provided by the Task Force on Climate-related Financial Disclosures (TCFD) and its impact on the firm's value. with the application to non-financial companies for the periods of 2019–2020 to 2022–2023. The study reported that climate change-related disclosures are negatively associated with firm value.

In the same line with (Mondal and Bauri, 2025), Berkman et al., (2024) reported that the level of mandatory disclosures of financial risk attributable to climate change is negatively related to firm valuation for US firms. higher levels of disclosure signal greater risk exposures, implying a negative relationship between disclosure levels and firm value due to the disclosures acting as proxies for adverse exposures to financial risks attributable to climate change (Liu et al., 2024). When a firm discloses carbon, the market reacts negatively because shareholders feel the company incurs disclosure costs (Mahmudah et al., 2023).

In the Indonesian context, Mahmudah et al. (2023) reported that carbon disclosure has a negative effect on firm value. firms conducting carbon disclosures are not aimed at cost efficiency; firms do this because of regulatory pressure and other stakeholders to gain social legitimacy (Schaltegger et al., 2015). When a company seeks to mitigate the impact of climate change, for example, efforts to develop or acquire technology to produce low-carbon products will impact cash outflows, ultimately impacting the cost of capital. Investors will consider this, so it affects the firm value (Mahmudah et al., 2023).

Interestingly, despite the potential impact of climate-related financial disclosures on capital markets, empirical evidence on their value proposition is limited, particularly in the banking sector, which is the lifeblood of the rest of the economic sector in an emerging economy like Egypt. Therefore, this study aims to contribute to the existing literature by examining the impact of climate-related financial disclosures on bank value.

2. Investing in green technology in light of sustainable development and its impact on firm value

In the light of growing global problems such as climate change, population growth, environmental pollution, and inefficient use and depletion of natural resources, countries need to employ technologies and approaches towards economic activity that are environmentally less harmful and that preserve resources. Sustainable development is associated with less environmental damage and is driven by comprehensive and all-encompassing policies, both international and of single countries that take into account the needs of future generations. Among these policies, several suggest employing green technologies (Guo et al., 2020,a).

Green technology can be defined as the processes and use of technology to minimize material wastage and energy consumption. Green technology refers to the development and use of technologies that minimize the negative impacts of human activities on the environment and society. It encompasses a wide range of products, services and practices that support a more sustainable future (Khan et al., 2024).

Optimizing firm value is the main goal of a company. Firm value describes the performance of management in carrying out the work entrusted to them by shareholders regarding the management of the company. Increasing the firm's value is what shareholders expect because the welfare of shareholders will increase with an increase in the firm's value. Investment decisions are one of the factors that can increase firm value. Studies related to the effect of investment decisions on firm

value have become a topic of much debate over the last few decades, both in countries with emerging markets and those with developed markets (Suteja et al., 2023).

To increase the value of the firm, managers must be able to take the right steps and strategies. In addition to being able to maintain good performance, company managers must be able to make informed investment decisions ,allowing the company to maximize existing assets with investments made to obtain greater cash inflows in the future. With the right investment decisions, maximizing assets in their use, as well as improving company performance, this is a positive signal for investors to place their funds due to investors' trust in the company so that with increasing capital coming into the company, the stock price will increase. and the number of shares outstanding will increase, causing the market capitalization value and firm value to also increase (Somjai et al., 2020).

In addition to decisions and company financial performance, there are also internal and external factors of the company, where the value of the company can be affected. In modern times, along with the increase in the earth's temperature and the increase in gas emissions, companies in all industrial sectors have begun to pay attention to the importance of the impact of carbon emissions on environmental damage. Concern for the environment, especially for disclosure and efforts to reduce carbon emissions, the image and value of the firm can increase in the eyes of stakeholders, especially investors. Investors in assessing a company not only look at the company's financial performance, but also the company's reputation. Company reputation can be formed and built by increasing awareness of the environment and social responsibility. High firm value is not only based on good financial factors, but also on future business prospects. Environmental preservation is the company's responsibility to the environment. In order for a company to support environmental preservation, the company must spend funds to invest in things that can support environmental preservation. Investments made to preserve the environment can also be referred to as green investment. Green investment is useful in reducing the negative impact on the environment resulting from business activities that are directly related to the environment without reducing the production and consumption of non-energy goods (Kelvin et al., 2017).

The importance of understanding green technologies in investment decision-making and how they could be incorporated to increase the financial satisfaction of investors and other stakeholders is also under-explored (Gilchrist and Zhong, 2021).

Green technologies are associated with long-run financial performance (Xu et al., 2024). Green investment is an important aspect of corporate investment and is the main measure used by companies to gain competitive advantage. Increasing expenditures on environmental pollution control and adjusting the industrial structure are conducive to improving green economic development indicators. Therefore, companies can gain sustainable competitive advantage by reducing the adverse impacts of business activities on the natural environment. This forms new habits and market competition patterns that automatically limit company production behaviour, gradually improve environmental quality, and make green investment an

inseparable part of company investment. Companies that make green investments may have greater competitive market advantages than other companies. Companies will better master green investment technology and related information; therefore, green investment is an important driving force for sustainable development, which ultimately improves financial performance (Maharani et al., 2024).

In the context of banking, green investment can be seen from the bank's efforts to respond and follow up on environmental and social issues by reducing the negative impacts of investment activities on the environment and society by considering the triple bottom line concept, namely profit, people, and planets (Murwaningsari and Rachmawati, 2023).

Investments in green technology and corporate environmental policies, or in other words, a move towards cleaner production, increase investors' growth expectations, resulting in a rise in firms' stock market value (Takacs, 2023).

According to Antonietti and Marzucchi (2014), investing in environmentally friendly technologies not only boosts the efficiency of company but also allows it to enter more tightly regulated overseas markets. This investigation is especially significant since it emphasizes the synergistic potential of sustainability and a strong economy. By illustrating how green technology investment strategies may contribute to a "win−win" situation, improving both the environment and corporate performance.

Green technology has a positive impact on economic growth and provide a scientific basis for strategic planning at the national and business levels, encouraging a focus on the development of green innovation not only as a means of reducing the impact of climate change but also as a strategic direction for increasing competitiveness (Padilla-Lozano et al., 2024).

several studies have reported the positive influence of investing in green technology on firm profitability (Shabbir and Wisdom, 2020; Khalid et al., 2023). However, several researchers have claimed that investments in environmental initiatives can hinder profitability (Lee et al., 2015; de Souza Cunha and Samanez, 2013).

These contradictory findings can be explained by the differences in study contexts, the sizes of the firms under observation, the empirical methodologies used for analysis, the extent of environmental performance, and the directions of association and time horizons (Khan et al., 2021).

3. The complementary role of climate disclosure and investment in green technology and its impact on firm value

Banks have always played an active role in the economic and social development of countries by having the ability to select investment projects, manage risks, and decide who has access to capital and what activities are financed. By performing this function, these institutions have a huge impact on society and, consequently, on sustainable development understood as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Miralles-Quirós et al., 2019). According to theory, a company's primary goal is to maximize its corporate value. Therefore, it is necessary to know what the value

of the bank is, the factors that affect the value of the bank, and the methods for measuring the value of the bank.

In recent years, the concept of firm value has drawn the attention of current and previous academics and researchers due to its ability to explain an organization's efficacy and long-term growth over time. As in the present corporate world, the main motive of a business organization has changed into wealth maximization from profit maximization, so the primary concern of any business organization is to ensure high firm value, which has a great connection with the investors' investing decisions (Sarker and Hossain, 2024).

With the evolution and development of industry and the increasing public awareness of environmental issues, green technology innovation has received a great deal of attention. There is growing scientific evidence that a firm's external pressure has increased from climate change, social development, and environmental degradation. At the same time, firms are facing increasing competition due to globalization and the emergence of new technologies. This dual environmental and competitive pressure has increased corporate focus on 'greener' and 'more sustainable' production, and has led to a focus on whether green technology innovation can address both issues simultaneously to reduce environmental consequences and improve financial performance. Thus, the relationship between green technology innovation and corporate financial performance has attracted significant interest among scholars in recent years. Green technology innovation is defined as innovation that includes pollution prevention, waste recycling and utilization, development of green products, and the treatment of the environment. It generally involves producing a 'double dividend' in the form of benefits to consumers or businesses and a significant reduction in environmental damage; in other words, benefiting the environment while helping to improve corporate financial performance (Qing et al., 2022,p).

Numerous studies reported that the implementation of environmentally sustainable innovations has the potential to increase the financial profitability of companies by minimizing costs, enhancing resource efficiency and opening new market opportunities. Green innovation provides firms with the opportunity to differentiate themselves in environmentally conscious markets, thereby fostering a competitive advantage. Furthermore, companies that adopt green technologies often experience increased market share and profitability owing to improved corporate reputation and customer loyalty (Zhang and Zhang, 2025).

Enterprise environmental protection expenditure and green technology innovation are "double edged swords". On the one hand, due to increasing environmental protection expenditure and green technology innovation, enterprises have established a "green" corporate image, which makes it easier to obtain the support of stakeholders, develop green innovative products and improve their core competitiveness. On the other hand, the application of enterprise funds in environmental protection expenditure and green technology innovation also

increases the burden on enterprises and brings challenges to enterprise management (Song et al. 2017).

Green investment is a complex management process and economic behavior. It is not easy to achieve the "win-win" of its ecological goals and economic benefits. The literature on the economic consequences of green investment finds that whether firms invest in green technology depends on the size between the investment cost and the benefits of emission reduction, and firms only invest in green technology when they are profitable. For firms, the more concerned issue is not whether the organization is worth greening, but when the environmental protection investment will be rewarded (Chen and Ma, 2021).

Green technology investment is a substantive strategy adopted by firms and cultivates firms' sustainable competitive advantage . Besides Green technology investment, environmental information disclosure (EID) is another strategy that firms often adopt to respond to environmental pressure in recent, while the former belongs to the substantive strategy and the latter belongs to the symbolic strategy. Considering the diversity of firms' environmental strategies, there is still a lack of further research on the impact of these two environmental strategies on firms' financial performance. The combination of the two can provide operational implications for strategy makers of firms (Ma et al., 2021).

The rise in public awareness of green energy, engagement with other green enterprises, and cooperation with many sectors all facilitate the growth of the eco-business network. It may also be seen as a method by which manufacturing conforms to a non-polluted environment. Employers may enhance their environmental sustainability via green technology innovation by reducing energy consumption, providing prompt wastewater disposal, and controlling trash through recycling. Employers are thereby reducing environmental pollution while simultaneously attaining industrial growth and structural transformation. Initiatives by industry leaders, especially those facilitating the transfer of digital and sustainable green technologies, will revolutionize industries towards greater sustainability, affecting the whole supply chain (Wang et al., 2024).

The level of carbon information disclosure is crucial in directing the decision-making processes and activities of enterprises, particularly in the realm of green technology development. It serves a crucial function in meeting environmental standards. By increasing market transparency, decreasing information asymmetry, and improving business financial conditions, the quality of carbon information disclosure (CID) plays a most important role in facilitating green technology innovation (GTI). High-quality CID ensures timely and accurate carbon information and builds investor confidence in companies' environmental policies. Companies providing accurate and thorough carbon information fulfill regulatory standards and improve their market value (Zheng et al., 2025).

The urgent need to address climate change is driving a worldwide shift to a green economy and new regulatory requirements. Understanding how companies are

responding to changing requirements and the physical risks of climate change has increasingly become a topic of academic interest (Borghei et al., 2024).

Many countries have experienced exponential economic expansion and industrialization over the last few decades; however, rampant resource depletion leads to environmental hazards and climate change. These issues compel policymakers to devise long-term, constructive answers on a war footing. In this wake, green technologies are considered a dominant tool in reducing carbon emissions (Qi and Yang, 2023).

Amid escalating global climate challenges, the interplay between corporate climate risk disclosure and green technological innovation has become a pivotal scholarly focus in sustainability research. Climate risk information disclosure significantly enhances green innovation capabilities through dual pathways: elevating media attention and reducing agency costs. Specifically, media scrutiny exerts external pressure via reputational incentives and public oversight, driving firms to accelerate green technology deployment. Concurrently, reduced agency costs mitigate information asymmetry between shareholders and management, enabling optimized resource allocation for long-term innovation investments (Zhong and Jin, 2025).

According to stakeholder theory, firms need to balance all parties' interests in their operations and proactively address environmental demands from external stakeholders-including society, governments, investors, and the public. They must demonstrate ecological accountability and a commitment to sustainability by reducing carbon emissions, mitigating environmental risks, and advancing targeted innovations. These requirements prompt companies to reassess the impact of environmental risks on long-term operations, push management to incorporate green technologies into strategic priorities, and shift more funds from traditional high-pollution businesses to green technology research and development (Wang, 2021).

Compared with the climate transition risk, climate-related physical risks such as extreme weather and floods will form an immediate impact on enterprises by causing direct economic losses (e.g., asset damage and supply chain disruption), forcing enterprises to improve climate resilience through green technology innovation to cope with the risk. At the same time, physical risk disclosure may signal to the market that the enterprise is facing an existential crisis, triggering investors' concern about long-term operational capability, and then forcing the enterprise to accelerate the layout of green technology and reconstruct competitive advantages through innovation to stabilize investor expectation (Zhong and Jin, 2025).

The efforts of the United Nations to combat climate change are opening new avenues for corporate finance and investment. At the 2014 Paris Summit, developed nations emphasized the importance of sustainable business practices that prioritize environmental protection and resource efficiency. In response, socially responsible companies are taking proactive measures such as investing in green technology to reduce harmful carbon emissions (Leonidou et al., 2015).

Incorporating green finance with ESG strategies can lead to a variety of benefits for firms, such as enhancing their non-financial attributes like market reputation, consumer satisfaction, and social values (Mohammad and Wasiuzzaman, 2021).
According to Rabaya and Saleh (2022), aligning green finance with ESG disclosures can improve a firm's long-term sustainable policy and investment decisions. Hence, integrating green finance with ESG strategies can lead to numerous advantages for companies seeking to priorities sustainability and gain a sustainable competitive advantage.
Additionally, Lee and Kim (2021) suggest that by integrating green finance with ESG strategies, firms can adopt sustainable business practices that lead to reduced cash flow volatility, an efficient governance structure, and significant investments in social and environmental values.
Moreover, the integration of green finance with ESG activities enables firms to develop a new range of products that meet customer demand for environmentally friendly and quality-of-life-improving products (Habib et al., 2025). According to Alareeni and Hamdan (2020), integrating green finance with ESG compliance in the context of United States enhances firm performance.
Liang and Renneboog (2021) reported that incorporating a green finance ESG strategy can mitigate agency conflict and boost investor confidence in a firm's market acceptance and future investment prospects.
Integrating green finance with ESG practices has been shown to increase institutional investor's returns and reduce uncertainty regarding future cash flows. In addition, firms implementing CSR policies have better access to external finance, as stakeholders can more easily manage and maintain transparency. This, in turn, allows firms to invest in projects that promote efficient resource management. So, firms that implement ESG strategies may gain a competitive advantage by reducing the cost of financing, as higher ESG scores not only optimize organizational resources but also promote long-term sustainability (Habib et al., 2025).
Integrating green innovation with disclosure is crucial for fostering sustainable business practices and achieving long-term value. This integration enhances transparency, strengthens corporate governance, and signals a commitment to sustainability, attracting investors and improving a company's reputation. Simultaneously, it drives internal improvements in risk management and resource allocation, leading to better green innovation performance (Ho et al., 2023).
Green investment and CSR are forms of corporate responsibility to the stakeholder. Recently, stakeholder demands have reflected an increase in global concerns about weather conditions, natural disasters, and greenhouse gas emissions. Companies are morally obliged to adopt effective environmental performance initiatives to reduce environmental damage. Stakeholders play a major role in influencing the environmental performance of companies including (1) green government, through a strict carbon tax in addition to green laws; (2) green consumers, through a high preference for environmentally friendly products regardless of price; (3) environmentally friendly employees who prefer to work in companies with high

carbon performance; and (4) green investors who give preference to green portfolios and independent environmental interest groups (Indriastuti and Chariri, 2021).

4. An applied study

4.1 Sample

Financial institutions, especially banks, play a pivotal role in the competitive economy through circulating money with matching the demand of both depositors and borrowers. In the most emerging economy, like Egypt, the banking sector is growing rapidly and working as the mainstay with the combination of conventional and Islamic banking system. This study uses data obtained from annual reports, sustainability reports, and company websites. The object of research is the banking companies in Egypt from 2021 to 2024. Egypt is a developing country, making it a fascinating context for such research. The banking industry has been considered to be a non-environmentally sensitive industry due to the non-polluting nature of their business. However, banks have a substantial indirect impact on the environment, due to their financial intermediary role. For instance, they can significantly contribute to sustainable development by facilitating green financial products aimed at the reduction of energy consumption and carbon emissions. Therefore, caution must be exercised when generalizing the results of this study to environments other than the application environment due to the differences in political, economic, cultural and social systems between countries. Likewise, caution must be exercised when generalizing the results of this study to sectors other than the banking sector due to the differences in the characteristics and laws of each sector from one another. The researcher selected the 15 largest banks in terms of asset size because they share some characteristics that enhance the accuracy of content analysis.

4.2 Variables definitions

Table 1 shows the definition and measurement of study variables:

Table 1
Variables definitions

Variable	Description	Measure
dependent variable		
BV	Bank value	Tobin's Q
Independent variables		
INVT	Investing in green technology	Environmental investment divided by total investment
CFD	Climate-related Financial Disclosures	An indicator designed for this goal
Control variables		
BS	Board size	Number of all directors in the board of directors
GD	Gender diversity	Total number of women on the board divided by the total number of board members
FS	Firm size	The natural logarithm of total assets
AT	Auditor type	A dummy variable is equal to 1 if a company is audited by one of the big four,0 otherwise
List	List	A dummy variable is equal to 1 if a bank is listed,0 otherwise

4.3 Descriptive statistics

A descriptive analysis is a step that helps us in describing the characteristics of our sample. Table 2 shows the descriptive statistics for each variable in our analysis. We

can see from this table that the average of bank value of the sample is 2 with a minimum of 0.92 and a maximum of 3.6. The average of Tobin's Q is greater than one, it indicates that the market value of a company's assets is higher than the cost to replace those assets. The average of Climate-related Financial Disclosures is 59.3%. This signifies that Climate-related Financial Disclosures is high in the financial reports of Egyptian banks, indicating that the banks' management is interested in disclosing this information. With regard to the control variables, an examination of the descriptive statistics revealed that the average ratio for board gender diversity of banks is 0.1894. This indicates that about 19% of board members of Egyptian banks are women. The average of board size is 9.3, with a minimum of 4 and a maximum of 13. This is also consistent with the findings of Asare et al., (2022), who discovered that the average board size for firms is 9/8 directors. The banks have an average size around 2,1822 with a minimum of 1.47 and a maximum of 3.64, indicating that the banks in our sample are of different sizes. The average of auditor type is 0.73. As a result, a majority of banks rely on the Big Four (BIG4) audit companies to improve audit quality. Descriptive statistics also show that 73% of banks are listed on the stock exchange.

Table 2
Descriptive statistics

Variables	N	Range	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
BV	60	2.68	.92	3.60	2.0000	.10854	.84072
INVT	60	.19	.02	.21	.1133	.00701	.05433
CFD	60	.51	.25	.76	.5928	.01866	.14452
BS	60	8	5	13	9.30	.208	1.608
CFD	60	.52	.07	.59	.1894	.01135	.08794
FS	60	2.17	1.47	3.64	2.1822	.06941	.53768
AT	60	1.00	.00	1.00	.7333	.05757	.44595
LIST	60	1.00	.00	1.00	.7333	.05757	.44595

4.4 Regression results

This paper measures The integration of climate disclosure and investment in green technology and its impact on firm value, by using a three regression models. The estimation models are represented as follows:

Model (1)
$BV = \beta_0 + \beta_1 CFD + \beta_2 BS + \beta_3 GD + \beta_4 FS + \beta_5 AT + \beta_6 LIST + e$

Model (2)
$BV = \beta_0 + \beta_1 INVT + \beta_2 BS + \beta_3 GD + \beta_4 FS + \beta_5 AT + \beta_6 LIST + e$

Model (3)
$BV = \beta_0 + \beta_1 CFD + \beta_2 INVT + \beta_3 CFD*INVT + \beta_4 BS + \beta_5 GD + \beta_6 FS + \beta_7 AT + \beta_8 LIST + e$

Table 3 shows the regression results for model (1). The adjusted R Square of first model is 0.308, which indicates that the model can explain approximately 30.8

percent of the variance in the dependent variable. The results indicate that climate-related financial disclosures has a significant positive impact on bank value measured by Tobin's Q (p-value = 0.019). These results support hypothesis H1.
Regarding to control variables, board size has a significant positive impact on bank value (p-value = 0.011). Additionally, auditor type has a significant positive impact on bank value (p-value = 0.001). However, board gender diversity and bank size have a negative and insignificant impact on bank value (p-value = 0.227) & (p-value = 0.129), respectively.

Table 3
Regression results for model (1)

Model (1) Dependent Variable: BV	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.295-	.876		-.337-	.738
CFD	1.697	.700	.292	2.424	.019 **
BS	.170	.064	.324	2.651	.011 **
GD	-1.453-	1.189	-.152-	-1.223-	.227
FS	-.305-	.198	-.195-	-1.543-	.129
AT	.788	.224	.418	3.526	.001 ***
LIST	.102	.260	.054	.394	.695
R-squared	37.8%				
Adjusted R	30.8%				
*** p<0.01, ** p<0.05, * p<0.1					

Table 4 shows the regression results for model (2). The adjusted R Square of second model is 0.983, which indicates that the model can explain approximately 98.3 percent of the variance in the dependent variable. The results indicate that investing in green technology has a significant positive impact on bank value measured by Tobin's Q (p-value = 0.000). These results support hypothesis H2.

Table 4
Regression results for model (2)

Model (2) Dependent Variable: BV	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.134-	.128		-1.040-	.303
INVT	15.434	.316	.997	48.920	.000 ***
BS	.035	.010	.068	3.431	.001 ***
GD	.385	.188	.040	2.046	.046 **
FS	-.021-	.030	-.014-	-.704-	.484
AT	.232	.035	.123	6.578	.000***
LIST	-.193-	.040	-.102-	-4.765-	.000 ***
R-squared	98.5%				
Adjusted R	98.3%				
*** p<0.01, ** p<0.05, * p<0.1					

Table 5 shows the regression results for model (3). The adjusted R Square of third model is 0.989, which indicates that the model can explain approximately 98.9 percent of the variance in the dependent variable. The results indicate that integration between investing in green technology and climate-related financial disclosures has a significant positive impact on bank value measured by Tobin's Q (p-value = 0.000). These results support hypothesis H3.

Table 5
Regression results for model (3)

Model (3) Dependent Variable: BV	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.207-	.113		-1.838-	.072
INVT	15.288	.271	.988	56.392	.000***
CFD	.251	.094	.043	2.679	.010***
BS	.022	.009	.041	2.372	.021**
GD	.368	.156	.039	2.358	.022**
FS	-.004-	.027	-.003-	-.159-	.874
AT	.226	.031	.120	7.271	.000***
LIST	-.163-	.035	-.087-	-4.609-	.000***
CFD*INVT	.058	.014	.064	4.068	.000***
R-squared	99%				
Adjusted R	98.9%				
*** p<0.01, ** p<0.05, * p<0.1					

4.5 Multicollinearity test

To test the presence of multicollinearity, we calculated the Pearson correlation and the variance inflation factor (VIF) for all the explanatory variables considered in our research. Table 6 shows the correlation analysis of all variables in the model. According to the table no (6), there is no significant correlation among independent variables, and they have a maximum correlation coefficient of 0.779, which is less than 0.80, indicating that there is no problem with multicollinearity (Ahmed et al., 2024). According to the VIF statistics, multicollinearity is not a problem in model; all values are less than or equal to 1.635, which is far below the maximum threshold. Values less than 10, which is the limit drawn by Myers (1990). As shown in Table 7. Tobin's Q is positively correlated with investing in green technology (0.779, $p < 0.01$), climate-related financial disclosures (0.309, $p < 0.05$), board size (0.351, $p < 0.01$) and list (0.336, $p < 0.01$).

Correlations

		BV	INVT	CFD	BS	GD	FS	AT	LIST
BV	Pearson Correlation	1	.779**	.309*	.351**	-.231-	-.166-	.212	.336**
	Sig. (2-tailed)		.000	.016	.006	.076	.205	.105	.009
INVT	Pearson Correlation	.779**	1	.320*	.361**	-.319-*	-.197-	.093	.429**
	Sig. (2-tailed)	.000		.013	.005	.013	.132	.478	.001
CFD	Pearson Correlation	.309*	.320*	1	.281*	-.301-*	.108	-.264-*	.214
	Sig. (2-tailed)	.016	.013		.029	.019	.410	.041	.100
BS	Pearson Correlation	.351**	.361**	.281*	1	-.307-*	.039	-.265-*	.302*
	Sig. (2-tailed)	.006	.005	.029		.017	.767	.041	.019
GD	Pearson Correlation	-.231-	-.319-*	-.301-*	-.307-*	1	-.050-	.277*	-.317-*
	Sig. (2-tailed)	.076	.013	.019	.017		.702	.032	.014
FS	Pearson Correlation	-.166-	-.197-	.108	.039	-.050-	1	.001	-.424-**
	Sig. (2-tailed)	.205	.132	.410	.767	.702		.696	.001
AT	Pearson Correlation	.212	.093	-.264-*	-.265-*	.277*	.001	1	-.023-
	Sig. (2-tailed)	.105	.478	.041	.041	.032	.696		.863
LIST	Pearson Correlation	.336**	.429**	.214	.302*	-.317-*	-.424-**	-.023-	1
	Sig. (2-tailed)	.009	.001	.100	.019	.014	.001	.863	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 6

Collinearity Statistics

Table 7
VIF Statistics

Models	Model 1		Model 2		Model 3	
	Collinearity Statistics		Collinearity Statistics		Collinearity Statistics	
Variables	Tolerance	VIF	Tolerance	VIF	Tolerance	VIF
CFD	0.810	1.234			0.810	1.234
INVT			0.679	1.172	0.679	1.172
BS	0.784	1.275	0.723	1.383	0.744	1.289
GD	0.759	1.317	0.728	1.374	0.743	1.342
FS	0.734	1.362	0.745	1.343	0.738	1.353
AT	0.835	1.198	0.808	1.238	0.809	1.221
LIST	0.618	1.618	0.612	1.634	0.615	1.635

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