



An-Najah National University
Faculty of Graduate Studies

**CORPORATE GOVERNANCE AND CARBON
EMISSIONS DISCLOSURE: THE MODERATING
ROLE OF SUSTAINABILITY COMMITTEE**

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Dedication

﴿وَأَخِرُ دَعْوَاهُمْ أَنْ الْحَمْدُ لِلَّهِ رَبِّ الْعَالَمِينَ﴾ [سورة يونس: 10]

لم تكن الرحلة سهلة، ولا الدرب مُعبَّدًا بالأمنيات، ولا كان الحُلم قريبًا حين بدأ .

لكُنِّي آمنت، وواصلت، وثبَّتُ. والله الفضلُ أوَّلًا وآخرًا،

فمن كان لله، كفاه، وأتمَّ عليه نعمه.

إلى وطني، حيثُ الكرامةُ والعزَّةُ

(فلسطين الحبيبة)

إلى من لا تكفيهم الصفحات، ولا تفي بحقهم الكلمات، إلى والديَّ الغاليين،

نبيي الحبِّ والرضا، زرعنما فيَّ الحُلم، وسقيتماه بصبركما،

فبفضل الله ثم بدعائكما، كان الوصول.

إلى أساتذتي ومعلِّمي،

من كانوا لي معلِّمًا وملهمًا، قدوةً ومُلاذًا،

لكم من الامتتان ما لا يُحاط بحروف.

إلى أهلي، إخوتي وأخواتي،

سند ظهري، وملاذ قلبي،

إلى أصدقائي ورفقاء الدرب، وأعرَّائي،

من شاركوني الحلم والتعب،

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أهدي هذا العمل المتواضع،

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الحمد لله أولاً وآخراً، ظاهراً وباطناً، والشكر له على توفيقه وتيسيره، والصلاة والسلام على نبيه الكريم، الذي أوصانا بردّ الجميل لأهله، والاعتراف بفضل من أسهموا في مسيرتنا.

بدايةً، لا يسعني إلا أن أرفع أسمى آيات الشكر والتقدير لمشرفي العزيزين، الدكتور علاء الدين دويكات والدكتور معز أبو عليا، اللذين كانا خير موجّهين ومؤازرين، فلم يبخلا بعلمٍ أو وقت، وكان لتوجيهاتهما الصادقة، وملاحظتهما البناءة، الدور الأبرز في صقل هذه الرسالة والارتقاء بها.

كما لا يفوتني أن أتوجه بالشكر الخالص والامتنان العميق إلى جامعة النجاح الوطنية، هذا الصرح العلمي الذي أفخر بالانتماء إليه، ولكل القامات الأكاديمية في كليتي الدراسات العليا والأعمال والاتصال، الذين كان لإخلاصهم وتقانيهم الأثر العميق في مسيرتي الأكاديمية.

وكل الشكر والتقدير لزملائي الأعزاء، الذين كانوا رفقاء علم ودرب، وبذلوا من وقتهم وجهدهم وروحهم الطيبة، فكانوا خير سندٍ في كل محطة من محطات هذه الرحلة.

وختاماً، أتقدم بالشكر لكلّ من أسهم، وترك أثراً، وكان له دور - مهما بدا صغيراً - في إنجاز هذه الرسالة، فلولا تراكم الجهود، ما اكتمل البناء.

Declaration

I, the undersigned, declare that I submitted the thesis entitled:

CORPORATE GOVERNANCE AND CARBON EMISSIONS DISCLOSURE: THE MODERATING ROLE OF SUSTAINABILITY COMMITTEE

I declare that the work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

Student's Name: Ali Jehad Salameh

Signature: *A. Salameh*

Date: 24/08/2025

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Abstract

This study explores how corporate governance mechanisms, particularly board characteristics, influence carbon emissions disclosure. Given stakeholder demands for transparency and regulatory pressure emphasizing environmental accountability, governance structures play a crucial role in enhancing environmental disclosures. The study seeks to understand how factors such as board independence, gender diversity, board size, meeting, CEO duality, and the presence of a sustainability committee affect carbon emissions disclosure. The model makes use of 513 firms selected among STOXX Europe 600 index across 17 countries, and 4,617 firm-year observations taken in the period 2015-2023. Information is taken out of the Asset4- LSEG Workspace database. The research tested the hypotheses by using panel data and Based on the pooled least squares (OLS) regression method to test the study hypotheses. The results showed that board independence, gender diversity, board meetings, and board size have a positive impact on CED, and verify that active boards with assigned diversity assist in transparency that extends beyond legal compliance. In contrast, CEO duality is associated with a negative relationship with disclosure, suggesting that consolidation of leadership may impede efforts for transparency.

Additionally, the presence of a sustainability committee appears to significantly moderate the effects of several board characteristics, except board independence, highlighting its complex role in improving carbon emission disclosure. The study highlights practical implications for governance frameworks to align with changing expectations about sustainability and regulatory expectations.

Keywords: Carbon Emissions Disclosure (CED), Board Diversity, Corporate Governance, Sustainability Committee, Europe.

Chapter One

The General Framework of the Study

1.1 Introduction

In recent years, the concept of environmental responsibility has garnered significant attention at both organizational and national levels, particularly with regard to sustainability reporting as an essential requirement for corporations (Boamah, 2022). Organizations are striving to demonstrate their commitment to sustainability and environmental stewardship, prompting the adoption of sustainability reporting to meet stakeholders' demands for transparency. For instance, there is a growing call from stakeholders concerned about global warming to include voluntary disclosures of carbon emissions in decision-making processes related to greenhouse gas emissions and climate change regulations, such as emissions trading schemes (Datt et al., 2019).

The modern economic growth and transformation resulting in general global growth and increase also exacerbate the climate change-related environmental challenges (Zhen & Lu, 2024). The concerns of stakeholders such as environmentalists, civil society, policymakers, regulators, and shareholders are also focused on the fact that the impact of carbon emissions and global warming as the concomitant issues affects the environment and the corporate disclosures concurrently (Haque, 2017). As a result, increased carbon responsibility can be observed. Organisations are faced with a more prominent media and stakeholder scrutiny and increasing competitive competition to date accompanied by a greater strategic urgency to attend to environmental concerns in order to mitigate the carbon emissions (Goud, 2022).

Given the role of corporate governance as a key factor in corporate sustainability, there has been considerable debate on achieving carbon emission reduction goals through enhancing corporate governance (Oyewo, 2023). Therefore, the link between corporate governance and carbon emission disclosures has gained significant interest lately (Goud, 2022). According to empirical evidence, effective practices in governance practices, especially at the board level, create the essential frameworks in line of compatibility between environmental goals and corporate strategy, and in ensuring disclosure to be transparent (Abbasi et al., 2024).

Carbon disclosure is an essential aspect of the corporate environmental, social, and governance (ESG) reporting, which in the past has played a major role toward the development of a low-carbon economy (Giannarakis et al., 2017). Carbon-emissions disclosure is a highly important tool to influence the shift to the low-carbon economic course and has become a central constituent of the global policies of environmental awareness over the last several decades (Bae Choi et al., 2013). Publicity of environmental disclosures has an effect on corporate integrity and trustworthiness, reduces the propensity of law suits, protects brand strength, elicits economies of scale and promotes amicable relationship amongst stakeholders. On that note, companies that embrace transparency when it comes to their carbon emissions are in a better context to take strong steps that can help to curb their impact on the climatic effects (Goud, 2022). Also due to the fact that the reporting of carbon emission improves social trust and accountability, there are a number of theoretical frameworks that been studied in examining the nexus of corporate governance and reporting of carbon emissions. Specifically, the legitimacy theory, which is based on the social contract between social and organizations, provides explanatory framework to this connection (Bae Choi et al., 2013). In this respect, carbon accounting serves as a governance tool provided with the clear data, which proves the commitment of a company to environmental and social sustainability (Giannarakis et al., 2017)

Corporate governance is a fundamental and key sustainability mechanism because it is about board and management oversight and the strategic direction of an organization (Oyewo, 2023). One of these strategies that achieves strengthening governance mechanisms is responding to specific policies related to strategic issues such as climate change and carbon emissions disclosure, as governance's role in monitoring management decisions results in enhancing transparency of disclosure through carbon emissions disclosure that meets the needs of stakeholders (Kılıç & Kuzey, 2019). Internal governance is intertwined with many diverse elements of corporate governance, including board characteristics such as board meetings, independence, gender diversity, CEO duality, and board size. Previous literature has found a close link between board characteristics and carbon emissions disclosure. The optimal board is based on agency theory, as the optimal governance role in mitigating agency conflicts according to the carbon-induced change in global climate requires stakeholders to achieve transparency,

consistency, and adequate disclosure of carbon emissions, and effective corporate governance reflects these demands through directors' commitment to enhancing environmental credibility. In the context of achieving the objectives of stakeholders (Karim et al., 2021; Tingbani et al., 2020).

As part of the organization's internal governance, sustainability committees are established to oversee the group's environmental commitments and contribute to its sustainability objectives. Besides, by connecting corporate governance with the disclosure of carbon emissions, these committees make it possible for sustainable practices to be part of daily activities and also support the company's overall strategy (Oyewo, 2023). Such committees help organizations handle environmental rules and societal pressures by bringing together employees from different functional areas, which greatly supports efforts to become more sustainable (Boamah, 2022)

Modern businesses find that investors want to observe more than just their financial achievements. It now looks at a firm's sustainability, how it addresses social and environmental issues and the information it provides about carbon emissions. Consequently, having an account of carbon emissions can enable a company to achieve the positive reputation and meet the Sustainable Development Goals (Goud, 2022). As more companies rely on finding their carbon emissions and factoring them into their reports and this data is regarded as valuable in long-term investment decisions due to its capacity to make the issue of sustainability clear to all (Tingbani et al., 2020).

Accordingly, this paper examines the impact of corporate governance, by board characteristics, on carbon emissions disclosure. It also looks into the role of sustainability committees in moderating this relationship. By doing so, the research aims to clarify the internal governance mechanisms that promote environmental transparency and accountability within organizations.

1.2 Study Problem & Question

In the coming decades, global economic systems will face challenges stemming from the increasing commitment of all economic actors to foster a transition toward a more sustainable economy. Companies are anticipated to pursue these objectives based on the principle of accountability to society, investors, and stakeholders (Taglialatela et al., 2023).

A crucial facet of commitment to sustainability is about environmental changes in terms of especially in relation to carbon emissions disclosure and the challenge of global warming, which has become an interesting trend in recent years, as a business entity cannot be separated from the environment of society as a whole, and the company's activities must be consistent with the prevailing standards in society to achieve environmental legitimacy before society and stakeholders (Khairunnisa et al., 2024).

As organizations seek to expand internationally, their demand to mitigate their environmental and social impacts intensifies, leading regulators to emphasize corporate governance practices that harmonize with environmental objectives (Karim et al., 2021). In this regard, as a result of the global environment suffering from climate change and carbon emissions, and to achieve green environmental goals, it is expected that the application of corporate governance will promote and achieve environmental accountability and the transparency of carbon emissions disclosures (Akhiroh & Kiswanto, 2016).

Proper corporate governance helps businesses disclose more information on their carbon emissions (Karim et al., 2021; Oyewo, 2023). Stakeholders are increasingly concerned about accountability, with more information related to environmental responsibility and carbon emissions disclosure. This concern highlights the increasing pressure on policymakers and regulators to formulate mandatory standards for companies related to carbon emissions disclosure (Ardillah, 2022). These kinds of regulations can create equality among information held by management and stakeholders (Karim et al., 2021).

Key actors—including the board of directors (BoDs), management teams, and CEOs—are integral to achieving these goals, given that their strategic decisions shape the direction of the organization (Álvarez et al., 2014; Ardillah, 2022). This study focuses on analyzing corporate governance characteristics such as board meetings, independence, gender diversity, CEO duality, and board size while examining the moderating effect of the sustainability committee on the direction of the relationship between these characteristics and carbon emissions disclosure. Previous studies have found that board diversity, CEO duality, board independence, board size, board meetings, and sustainability committee meetings negatively affect carbon emissions, i.e., the results reflect the role of board characteristics in positively influencing carbon emissions

disclosure and carbon emissions reduction (Goud, 2022; Haque, 2017; Kılıç & Kuzey, 2019; Oyewo, 2023).

Current research shows significant gaps. Most studies have predominantly examined the relationship between emissions disclosure and conventional firm characteristics (Gonzalez & Ramírez, 2016) specifically focusing on carbon emission reductions and their effects on disclosures (Goud, 2022; Haque, 2017). However, there has been a limited investigation into the role of corporate governance in relation to carbon emissions disclosure (Kılıç & Kuzey, 2019; Lahyani, 2022). Conflicting findings further complicate the matter, particularly concerning board independence (Oyewo, 2023; Tingbani et al., 2020). Additionally, many studies target specific regions or industries (He et al., 2019; Kılıç & Kuzey, 2019), which limits the broader applicability of their findings.

This research aims to explore the impact of corporate governance on carbon emissions disclosure, represented by board characteristics and the moderating role of the sustainability committee in the positive effect between characteristics and carbon emissions disclosure. This study focuses on delving into different board characteristics, including board meetings, independence, gender diversity, CEO duality, and board size. This investigation focuses on two main questions:

Q1: What is the impact of corporate governance represented by board characteristics on carbon emissions disclosure?

Q2: What is the impact of the moderating role of the sustainability committee on the relationship between corporate governance, as indicated by board characteristics, and carbon emissions disclosure?

1.3 Study Importance & Objectives

The significance of the study stems from the unique challenge posed by carbon emissions, a completely different issue due to their ongoing impact on global warming. The research also looks into the detailed and complex rules related to carbon emission regulation. Corporate governance helps to decide which companies will report the most information and take the biggest steps to cut their carbon emissions (Goud, 2022). The paper gives concrete evidence linking board characteristics to carbon emissions reporting and explores the moderating role of the sustainability committee in connecting them.

This study aims to address knowledge gaps in corporate governance and carbon emissions disclosure. Despite the significant role of corporate governance in promoting sustainability mechanisms, particularly in environmental aspects, most previous studies have focused on the relationship between carbon emissions disclosure and traditional corporate characteristics such as company age, size, profitability, and financial leverage (Gonzalez & Ramírez, 2016; Prado et al., 2009; Prasetyo & Mimba, 2021). There has been a lot of research on reducing carbon emissions, but little attention has focused on the characteristics of disclosure and what drives it (Goud, 2022; Haque, 2017; Oyewo, 2023). Disclosure research rarely looks at characteristics such as the number of board meetings, board independence, gender diversity, has two CEOs and board size (Kılıç & Kuzey, 2019; Lahyani, 2022; Park et al., 2023). Though the sustainability committee helps with environmental compliance and providing clear information on carbon emissions, its role in moderating the link between governance and environmental sharing has not been widely studied.

The importance of this study also lies in its attempt to address the inconsistencies revealed in the previous literature regarding the impact of certain governance characteristics on disclosure, such as board independence and the role of the sustainability committee (Oyewo, 2023; Tingbani et al., 2020). Previously, studies have often looked only at a certain region or just one sector, so we cannot apply their outcomes on a larger scale (He et al., 2019; Kılıç & Kuzey, 2019; Lahyani, 2022; Park et al., 2023). where the limited environment in which the study was conducted and the limited sample and sectors included in the study sample, in this regard, made it impossible to generalize the results. In light of the mounting societal and regulatory pressures on companies to adopt responsible practices that contribute to achieving sustainable development goals, this study highlights the importance of its contribution to clarifying how to employ corporate governance tools, and the Sustainability Committee, to achieve effective environmental disclosure and carbon emissions disclosure, thereby strengthening stakeholder confidence, enhancing credibility, and driving more effective environmental commitments (Oyewo, 2023).

Lately, there has been a noticeable shift towards analyzing corporate governance's impact on carbon emissions disclosure, making it a focal point of interest. This study aims to address gaps in the existing literature, which has been limited and often confined to

specific contexts, creating a knowledge void. To tackle this, the study broadens the scope by including companies from various countries, specifically examining those listed on the STOXX 600 across 17 European nations. This approach enhances the generalizability of our findings across different settings and countries. Despite existing literature, there remains a lack of clarity on how the BoDs influences sustainability disclosure, particularly concerning carbon emissions. Additionally, previous studies have yielded inconsistent results. This research stands out as one of the first to focus on the sustainability committee's role as a moderating variable, in conjunction with various demographic characteristics, in sustainability practices across a diverse range of companies. This study aims to address these conflicting findings and provide new insights through a comprehensive analysis of the relationship between corporate governance through a set of board characteristics and carbon emission disclosure.

The primary objective of this study is to investigate how corporate governance—specifically through the structure of board characteristics and activities—can influence carbon emissions disclosure. To accomplish this, the study will assess the impact of board diversity, encompassing factors such as independence, gender diversity, duality, board meetings, and board size, on carbon emissions disclosure. Additionally, it will explore the role of sustainability committees as a moderating factor in this relationship. The study will also delve into "related theories" that examine the connections between these dimensions.

1.4 Contribution of the Study

This article adds in the theoretical literature, as well as practical implications in the area of corporate governance and disclosure of sustainability.

From a theoretical point of view, the research expands upon the pivotal knowledge inflicted by earlier literature by solving another aspect of the traditional aspects of a firm the company size, profitability, and leverage. These dimensions have been examined sparingly in prior studies in carbon emission disclosure. The investigation further narrows its scope to the specific characteristics of boards of directors such as independence, gender diversity, CEO duality, board meetings, and board size, thus creating a more nuanced picture of the role that the functions of the governing bodies have in environmental responsibility. Moreover, the research sheds light on the confusing

and occasionally conflicting results in previous literature and, in particular, the impacts of the independentness of the board and duality of the CEO. One of its unique contributions is the introduction and empirical testing of sustainability committee as a moderating variable, which has sparingly been done in the earlier studies. Through this moderating role, the study offers new information on how the sustainability related governance mechanisms strengthen the relationship between board characteristics and carbon emissions disclosure.

Secondly, at the applied level, the study obtains meaningful implications for regulatory agencies, corporation governance and policy makers. The findings allow to design effective disclosure rules to achieve transparency and comparability horizontally, within firms, for the reporting of carbon emissions. For corporate leaders and boards, the study confirms that strong governance practices can add environmental legitimacy that facilitates stakeholder trust and the promotion of sustainable development. Being given a rich and broad sample of listed companies of STOXX600 in 17 European countries, the study adds to the generalizability of the obtained conclusions, so that the provided recommendations would be useful to cope with sectorial and cross-sectorial transition situations.

Chapter Two

Theoretical Background, Literature Review and Hypotheses Development

2.1 Sustainability and Environmental Disclosure Framework

Sustainability reporting has emerged as a critical focal point for corporations, intensifying discussions surrounding sustainability and corporate social responsibility across both local and global positions (Boamah, 2022). There is increasing pressure from stakeholders putting on companies to disclose ever greater amounts of non-financial information about their operations. As a result, companies are under constant pressure to demonstrate their interest in social responsibility and sustainability reporting (Datt et al., 2019).

With the widening concerns of social and environmental responsibility by stakeholders, more complete reporting than just financial performance and profitability is needed. Companies tend to align loyalty with societal demands and expectations so that the company's goals are achieved by aligning with the expectations of various stakeholders and society in general. For this reason, companies provide more transparent disclosures and reveal more information to inform society of their commitment to social and environmental responsibility, which positively affects not only society's perception, but also the company's operations (Choi et al., 2013).

By improving transparency through disclosure of sustainability and social and environmental responsibility, which reflects greater trust among stakeholders. Transparency of sustainable practices including carbon emissions speaks to the environmental responsibility of the company, increases the company's reputation and attracts the attention of investors. There is sufficient evidence showing a positive association between environmental disclosure and corporate value (Goud, 2022), and corporate social and environmental responsibility disclosure is also a key factor in enhancing stakeholder relations (Cucari et al., 2018).

2.1.1 Sustainability

In recent decades, increasing environmental crises and economic turmoil have heightened stakeholder awareness of sustainability issues. As a result, Sustainability reporting has gained momentum, with a particular focus on corporate social responsibility and environmental reporting (Binh & Lee, 2024). Although there are no common or voluntary reporting frameworks in most countries, there is a great deal of commitment and diversity in corporate reporting practices, which have been used to highlight companies' positive achievements and create legitimacy in society (Hu & Loh, 2018).

The concept of sustainability pertains to the capacity to uphold an entity or process over time, encompassing improvements in economic, environmental, and social systems for human development. Sustainability also entails maintaining a dynamic equilibrium between population and the environmental carrying capacity, allowing for development and growth without causing irreversible harm (Mensah, 2019). This concept emphasizes the optimal way for populations to live within their economic and social spheres, as well as the conscientious use of available environmental resources. Additionally, sustainability is intertwined with the responsibility towards future generations, presenting practical challenges due to the unpredictability of their needs (Thomas, 2015).

As corporate activities expand both locally and globally, which has a sustainable impact on the level of society and the environment, the size of expectations from stakeholders on companies increases in light of these effects (Frias-Aceituno et al., 2013). In this regard, the focus of regulatory bodies at the level of countries of the world has increased in the commitment to corporate governance proportionately and more appropriately with the wide-ranging environmental issues (Cucari et al., 2018). Given that preserving the environment is one of the central issues that sustainability urges, preserving it and preserving the rights of future generations, the phenomenon of global warming and climate change and the lack of interest by companies makes the matter more dangerous, as the government and groups responsible for the environment discussed setting regulations related to greenhouse gas emissions and taking proactive measures related to carbon emissions (Tila & Augustine, 2019).

In light of the urgent need for collective action, the United Nations launched the 17 Sustainable Development Goals in 2015, as goal number 13 for sustainable development relates to climate change, as it refers to combating climate change and its effects on the Earth, and goal number 7 is related to clean energy and all energy issues to reduce greenhouse gases (UN Climate Change Annual Report, 2018).

Contemporary sustainability concepts aim to combine social, environmental, and economic models to address ongoing human challenges. By focusing on environmental models, such as biodiversity and environmental safety, in an attempt to reduce environmental risks to reduce the impact on the environment and preserve the requirements of future generations (Mensah, 2019).

2.1.1.1 Corporate Environmental Sustainability Disclosure (CESD)

The increasing complexity and importance of corporate economic activities, beyond recovery purposes, has led to increased requirements for companies to adopt sustainable paths and disclose more relevant information that reflects trustworthy behavior on issues related to and centered around environmental activities (Cucari et al., 2018; Shaukat et al., 2016). Gray et al (1995) defined corporate environmental sustainability disclosure (CESD) as the disclosure of a company's activities and public image on topics related to environmental sustainability. Indeed, the values and motivations held by corporate executives influence the practice of such disclosures about environmental strategies and practices, as these strategies and practices embody corporate social and environmental responsibility efforts as a result of stakeholder and societal demands, enhancing the image and justifying existence (Cucari et al., 2018.)

In recent years, there has been an increasing interest in issues related to corporate responsibility and ethics, especially with regard to environmental issues. This interest has increased significantly, and the focal point for disclosure of information on these issues was in the late 1970s (Frias-Aceituno et al., 2013). As a result, companies have become more socially responsible and environmentally concerned. These companies can work to reduce pollution and carbon emissions while increasing profits, relying on environmental strategies that are not being imitated (Mensah, 2019). As a result, efforts to address environmental issues and reduce emissions that affect climate change will lead to a competitive advantage for the most proactive companies (Álvarez et al., 2014).

In order to promote sustainable development in the business environment, it is important to integrate environmental, social and governance disclosure through a comprehensive approach and strategy by the management of companies (Gonenc & Krasnikova, 2022). In light of strengthening relationships with stakeholders by providing comprehensive information and disclosures, which enhances accountability and trust. Thus, companies can reduce risks and exploit opportunities by contributing positively to society and the environment and enhancing their competitiveness in the long term(Shaukat et al., 2016). In light of the organizations' focus on sustainability and efforts focused on internal initiatives, through corporate governance and boards of directors in community contributions, thus including processing information related to carbon emissions disclosure and emissions management, which is considered an essential part of environmental information and disclosure in environmental information reports (Binh & Lee, 2024). Recently, investors and stakeholders have increased their focus on environmental information, especially the extent to which companies' activities impact the environment. Investors rely on information to evaluate current investments from an environmental perspective, and to assess prospects related to costs associated with combating pollution. As a result, pressure has increased from investors and stakeholders on companies to provide more disclosures related to carbon emissions and greenhouse gases (Giannarakis et al., 2017).

Different theories suggest how corporations are responsible for satisfying society's expectations. The legitimacy theory indicates that an organization is legitimate by taking its environmental responsibility towards a different set of stakeholders. Due to the increasing interest in environmental issues, companies have started using ecological practices(Goud, 2022) . Essentially, it is since the company is seeking to reach an agreement with stakeholders on how the company's activities are incorporated into the social contract. One way to do this is by disclosure of carbon emissions in annual reports and sustainability reports. There is increasing pressure on businesses from organizations, government agencies, and communities to disclose more about the things that cause global warming and climate change such as carbon emissions(Choi et al., 2013). Such kind of phenomenon shows that corporate behavior can be determined by external parties. Consequently, companies have also started (voluntarily) and disclosed them (Kılıç & Kuzey, 2019).

2.1.1.2 Carbon Emissions Disclosure

The process of disclosing and disclosing carbon emissions is considered a pivotal and fundamental step towards achieving a low-carbon global economy, as a tangible first step towards reducing greenhouse gases (Caby et al., 2024). The issue of environmental pollution has become a controversial issue recently, which requires economic development to focus efforts on protecting the environment and the extent of the impact of companies' activities on the environment, especially the issue of carbon emissions that cause the phenomenon of global warming (Khairunnisa et al., 2024). Therefore, the issue has become very interesting and has raised increasing concerns among stakeholders regarding the increasing disclosure of company activities and their relationship to carbon emissions (Pattberg, 2017). With the increasing interest day after day, there have been increasing calls and pressures from regulatory bodies and policymakers to impose standards that require companies to increasingly disclose information related to carbon emissions, and this disclosure will reduce the problem of information asymmetry between management and different stakeholders (Goud, 2022).

Recent trends towards sustainability by organizations in order to achieve sustainable development goals through efforts towards achieving broader societal contributions. Therefore, reporting on environmental, social and governance issues is now normal for companies as it helps present a clear and unified picture of sustainability (Oyewo, 2023). Due to the serious nature of climate change, companies should openly report their carbon emissions. When a firm is open about its information, it assumes responsibility and sometimes improves how it is seen by the public, helps attract investment, supports its reputation and makes it compete better in the market (Gonenc & Krasnikova, 2022). Under this structure, corporate governance is necessary, helping ensure that the disclosures made to stakeholders are open, equal and fair and that stakeholders are protected against possible conflicts of interest (Binh & Lee, 2024).

A range of terms linked to carbon emissions have been explored in the literature such as carbon disclosure, carbon accounting, and carbon reporting. The words are often used in the same way, but they have small differences in what they mean (Pattberg, 2017). According to findings, about 129 articles about carbon accounting were released between 1998 and 2011 and more are being released now, due to increased interest in sustainability and disclosing carbon emissions (Stechemesser & Guenther, 2012).

Carbon emissions are when gases that contain carbon are released into the air and most often these are known as greenhouse gases and often identified as carbon dioxide or CO₂. When the industrial revolution started, the amount of CO₂ in the atmosphere experienced a rapid rise (Khaq et al., 2022).

"Carbon accounting" serves as an encompassing term that includes the measurement, collection, valuation, and communication of greenhouse gas emissions from specific sources. It recognizes these emissions not only as liabilities but also as assets, facilitating the provision of vital information to both internal and external stakeholders (Stechemesser & Guenther, 2012). This broad definition covers mandatory and voluntary processes such as estimation, measurement, reporting, verification and auditing to account for emissions and removals of greenhouse gases such as carbon dioxide from the atmosphere, including at both the national and international levels (Haigh & Shapiro, 2012). The second concept, "carbon reporting" is more specific, focusing on the voluntary or mandatory reporting of carbon emissions by companies, addressing the information requirements and specific conditions and methods for reporting as outlined in the Kyoto Protocol Guide. In relation to the third concept, carbon disclosure involves translating the concept of carbon for companies into a risk assessment process that identifies market opportunities and their financial impacts on companies and investors (Nuber & Velte, 2021). This process shifts the focus from methods and processes to a broader societal purpose. It exemplifies information governance by emphasizing the commitment to governance through the provision of information. It serves as a mechanism for transparency and accountability to influence relevant parties. For climate governance through disclosure, the target parties are profit-seeking actors (investors) and information holders (firms), leading to a change in the strategic behavior of those actors. (Khaq et al., 2022; Pattberg, 2017).

Carbon emissions disclosure has gained significant momentum recently, but companies are struggling to provide high-quality carbon emissions information due to the lack of global standardization in carbon disclosure, and therefore there is significant variation in detail, methodology, and scope across companies (Wang et al., 2023). Moreover, accurate technological knowledge and staying updated on trends, requirements, and technologies pose major obstacles for companies in the process of disclosure. Regulatory authorities and policymakers can play a pivotal role by establishing a roadmap for

companies, leading to enhanced disclosure quality and transparency. Additionally, this can facilitate capital flows towards sustainable projects in green finance (Banerjee et al., 2021). Large multinational corporations, predominantly based in economically prosperous countries responsible for the majority of carbon emissions, carry a moral obligation and environmental burden on stakeholders and society. Focusing on joint-stock and multinational corporations in reducing carbon emissions and emphasizing corporate governance as a crucial sustainability mechanism is essential for achieving decarbonization goals. Consequently, the association between corporate governance and carbon emissions disclosure is gaining significant momentum (Oyewo, 2023).

2.1.1.2.1 Regulatory environment

Companies' adherence to regulatory principles and guidelines for disclosing and mitigating carbon emissions reflects the requirements and expectations of stakeholders. Regulatory intervention is necessary to enhance the quality of information, ensuring coherence and relevance of carbon-related data and reporting. Without regulatory intervention, monitoring would be lacking and disclosures would become unreliable. In response, various organizations and protocols have been established to regulate the disclosure of carbon emissions and address climate change to combat global warming (Houqe & Khan, 2023).

Adopting the Kyoto Protocol in 1997 and its subsequent enforcement in 2005 marked a crucial turning point in global efforts to address climate change. It became a primary catalyst for corporations and institutions to engage in activities aimed at mitigating climate change by imposing mandatory targets for companies to reduce their greenhouse gas emissions. It played a prominent role in the European Union countries, which led to companies, especially environmentally sensitive ones, to increasing pressure to prevent carbon emissions at the organization level by disclosing their emissions and taking serious steps to reduce them (Haque, 2017; Kılıç & Kuzey, 2019). More than 800 of the world's largest companies at that time entered into an agreement to reduce carbon emissions. Moreover, the use of increasing policies to respond to the impact of climate change through taxes or binding standards concerned with corporate activities (Abbasi et al., 2024).

The Carbon Disclosure Project (CDP) in the UK began in 2000 as a non-profit organization. The action focuses on filling the information gap between businesses and those connected to them by reporting what's happening each year from leading companies worldwide. The result is captured by asking corporations to fill a voluntary questionnaire that addresses important responses to climate change and global warming challenges. Using the CDP's framework helps investors and other stakeholders compare and judge how different companies approach climate issues (Karim et al., 2021; Kılıç & Kuzey, 2019).

Since then, major organizations and countries have enforced rules to ensure companies share information on their emissions to help combat global warming. Though most countries leave reporting on carbon emissions as a voluntary step, the United Kingdom, Australia, France and New Zealand require it. This applies especially to 2013, when the UK insisted that all companies on the London Stock Exchange disclose how much carbon they emit (Houqe & Khan, 2023). In 2015, the United Nations agreed to renew the world by 2050 by disclosing 17 goals related to sustainable development, including two goals related to climate change and clean energy, in light of developing mechanisms to measure climate change as a strategy followed by companies, in addition to creating awareness related to preserving the environment and promoting sustainable development goals (Goud, 2022). In addition, in 2019, the European Commission issued guidelines on climate change reporting in line with the recommendations of the Financial Disclosure Committee on Climate, with the aim of reducing problems with voluntary carbon emissions disclosure, environmental misinformation and information asymmetry (Nuber & Velte, 2021). Developments in the enactment of legislation and laws followed, including New Zealand, specifically in 2020, through the enactment of a law entitled Emissions Trading Reform, and it became one of the first countries in the world to issue an official law to reach zero carbon emissions in the form of carbon dioxide by 2050 (Houqe & Khan, 2023).

2.1.2 Corporate governance

Corporate governance is widely recognized as a key sustainability mechanism for organizations (Oyewo, 2023). It refers to the technique by which organizations are governed, directed and managed to ensure that decisions made are in line with the desires of various stakeholders and is closely linked to the oversight and strategic direction of

companies (Okudo & Amahalu, 2021). Additionally, it is an important mechanism in managing relationships between owners, investors and stakeholders (He et al., 2019).

Corporate governance is about the way a company is governed. It focuses on ensuring that the decisions made by those who run the company are appropriate, so it mainly focuses on managing the relationship between shareholders and managers (Budiharta & Kacaribu, 2020; Okudo & Amahalu, 2021). Corporate governance includes the formal and informal processes through which a company is managed, including meeting the legal and policy requirements of the company (Mahmood et al., 2018). This includes the interaction between stakeholders and managers, as governance ensures that investors receive adequate returns on their investments. In addition, an effective governance system shows how managers are held to their obligations in line with the guiding principles reflected in corporate governance (Liao et al., 2015). By maximizing shareholder value legally, ethically and sustainably, it is the blood that fills the veins of transparent corporate disclosure and high-quality accounting, by ensuring equality and transparency for different stakeholders. Therefore, governance ensures that the company's activities and business are appropriate for managers in line with stakeholders and society (Al-Qahtani & Elgharbawy, 2020). This is an explanation of the interaction between managers and stakeholders, as corporate governance is considered a concept based on agency theory by providing investment returns to investors and preventing management from acting in an opportunistic manner based on self-interest (Khaq et al., 2022).

The study of corporate governance includes two main dimensions. The first-dimension concerns policy, including oversight of long-term strategies and specific policies such as CEO appointments, dismissals, and disclosure in response to important strategic issues such as climate change. The second-dimension from the scholars' perspective revolves around the structure of the BoDs. The study of the structure of the BoDs is of great importance due to the pivotal role that the structure of the BoDs plays in performance, productivity, and influential decisions (Galbreath, 2010). Governance mechanisms, specifically boards of directors, have been subject to in-depth research by researchers and scholars, focusing on whether boards of directors have the ability to move towards greater sustainability. The focus was on the characteristics of the board and the extent of their impact on the environment. The greatest focus by scholars of sustainability and

management was on the extent to which the sustainable development goals affect value creation after companies adopt efforts to integrate them into their strategies (Tagliatalata et al., 2023).

Recently, corporate governance and its relationship with carbon emissions have gained a lot of momentum and research, considering that corporate governance is a key sustainability mechanism for companies (Oyewo, 2023). According to what scholars have concluded, the strategies that should be followed to achieve decarbonization are to enhance corporate governance, as a self-regulatory mechanism that improves the practice of sustainability in companies (Tingbani et al., 2020). With reference to the pivotal role of corporate governance in disclosing carbon emissions, the quality of corporate governance has a positive impact on the disclosure of carbon emissions, and the implementation of corporate governance improves the company's performance, which has a positive impact on companies. Therefore, companies with good financial performance disclose carbon emissions more widely, considering that disclosure is evidence of transparency in the information provided to the public, and reflects the quality of corporate governance to greater disclosure of carbon emissions (Prasetyo & Mimba, 2021).

In addition, one of the main pillars of corporate governance is transparency, including the disclosure of carbon emissions, and enhancing corporate governance will lead to more mature decisions at the level of carbon emissions disclosure (Prasetyo & Mimba, 2021). The literature also indicates the extent to which corporate governance, represented by the characteristics of the BoDs, is linked to sustainability reports (Okudo & Amahalu, 2021). Corporate governance ensures more transparent disclosures. As a result of the pressures on management to disclose carbon emissions and reduce these emissions in the long term, and as a result of the impact of the global climate, there is a continuous demand from stakeholders and society for more transparency and consistency in the approach to disclosing carbon emissions (Karim et al., 2021). As a result, effective corporate governance reflects this message by forcing managers to enhance environmental credibility in response to the requirements of stakeholders and society (Mahmood et al., 2018). Corporate governance includes many features such as diversity in board characteristics such as meetings, independence, gender diversity, CEO duality, board

size, and, where studies and trends have recently increased towards the role of board characteristics in disclosing carbon emissions.

Efforts have been directed towards mitigating global warming and disclosing carbon emissions through improving governance mechanisms. One of the most important trends is the pivotal role played by the organizational pyramid, represented by the BoDs, as it is responsible for the strategic direction and performance of the company. Thus, it is considered a factor influencing corporate behavior (Tagliatalata et al., 2023). Research indicates that boards of directors, as governance mechanisms, are intricately linked to a company's strategic direction and decisions. There is compelling empirical evidence demonstrating a positive correlation between the characteristics of the BoDs and environmental disclosures. Corporate governance aims to harmonize sustainability goals with the company's objectives, which are established by the BoDs. Therefore, the board's characteristics play a pivotal role in achieving these desired goals (Oyewo, 2023). As a result, the responsibilities of boards of directors are extensive, encompassing not only the interests of shareholders but also those of various stakeholders and the community (Ardillah, 2022).

As the BoD's is tasked with managing the company following its goals and objectives and acting as a representative of the company both internally and externally, they need to gain legitimacy from various stakeholders. To achieve this, companies need to fulfill their social responsibility towards society, particularly in disclosing their carbon emissions. Companies are increasingly under pressure to demonstrate their commitment to addressing climate change and aligning their activities with social values to maintain their social and environmental responsibility, legitimacy, and community acceptance (Simamora et al., 2022). In addition, as a result of the ongoing pressures and the emergence of government regulations related to the environment and carbon emissions disclosure, companies find themselves motivated to adopt innovative strategies to achieve improved environmental disclosures and achieve environmental legitimacy (Goud, 2022).

Enhancing carbon disclosure begins with boards. It is important to enhance governance mechanisms to achieve the characteristics of an effective board and to achieve successful carbon disclosure strategies. Through governance mechanisms such as board

independence, gender diversity, duality, independence and board size, as measures to improve the strategies implemented by entities to improve board performance, and to achieve environmental development goals related to carbon emissions disclosure (Haque, 2017; Oyewo, 2023). In addition, there is a lot of literature on the effectiveness of the BoDs in reducing environmental concerns, given that carbon disclosure is considered part of carbon mitigation activities in general, but corporate governance is considered the main driver of carbon emissions reduction (Goud, 2022).

The BoDs of an organization is a composition of the organization that is indicative of how well the organization directs its operations and makes decisions on how to get to its desired objectives. Board characteristics are critical for the sustainability and carbon emissions disclosure strategic decisions. Previous literature has delved into the relationship between board structure and characteristics and carbon emissions disclosure, and discovered the extent to which board characteristics affect carbon information disclosure (Haque, 2017). Previous literature has found that boards that are balanced in terms of experience, independence, gender diversity, board size, and board meetings make informed decisions, which improves performance, and the extent to which gender diversity and independence have a positive impact on increasing carbon disclosure information to maintain the company's legitimacy (Lahyani, 2022). The literature findings continued for the roles played by corporate entities towards achieving better performance of board decisions in forming good boards in terms of gender diversity, independence, duality, frequent meetings, board size, and improving the role of the board in sustainability to achieve the desired goals, which include decarbonization (Oyewo, 2023).

The higher the level of internal governance represented by board characteristics, the more positive their effects on carbon information disclosure and sustainability disclosure (He et al., 2019). Tagliatela et al (2023) also added that board characteristics influence how a firm makes strategic decisions related to sustainability reporting to provide information to different stakeholders and enhance its legitimacy.

In this regard, corporate governance represented by the characteristics of the BoDs affects the extent of disclosure of sustainability and carbon emissions because they make important decisions in implementing the strategic objectives to be achieved.

2.1.3 The Sustainability Committee

Recently, there has been a trend of sustainability and corporate governance effectiveness. As a result, corporate social responsibility committees / sustainability committees have been established in large corporate organizations. The committees help boards of directors focus on the trend toward sustainability. They are responsible for reviewing policies and performance in matters related to environmental and social issues, and they practice and have experience and skills in linking the company to social responsibility and sustainability in the company to the company's strategies and directions (Mahmood et al., 2018).

The formation of a sustainability committee is an important aspect of corporate governance and an indicator of the extent of a company's commitment to sustainability issues towards its stakeholders. In addition, the strength of the relationship with stakeholders is linked to the provision of reports that include various issues related to social responsibility and sustainability, and the presence of a sustainability committee in the company is positively related to the quality of sustainability reports. Sustainability committees are also called environmental governance mechanisms, which indicate the objective intention to control relevant issues and are considered an important element of human capital that develops management and motivates it to work. Given that the effectiveness of the board is not based only on the composition of the board, but also depends on its structure. Therefore, the presence of a sustainability committee is a good indicator to stakeholders that the company pays great attention to relevant issues, and it also indicates proactive governance represented by the strategic orientation towards a low-carbon future (Tingbani et al., 2020).

The importance of the existence of sustainability committees in companies is increasing in an attempt to satisfy the interests of stakeholders and gain legitimacy, as sustainability committees are responsible for mitigating sustainability risks and maximizing its opportunities and all procedures and strategies related to enhancing the sustainability image of the organization, and an indicator of the adopted legitimacy. Through environmental strategies aimed at preserving the environment to reduce global warming and carbon emissions, the sustainability committee has become important in disclosing carbon emissions (Mahmood et al., 2018). Previous literature in this field indicates that environmental committees appear to encourage more disclosure of greenhouse gases

associated with global warming and climate change, as they stimulate more disclosure of greenhouse gases resulting from carbon emissions. In addition, disclosures are positively related to the presence of a social responsibility committee in the company (Tingbani et al., 2020).

The effectiveness and efficiency of corporate internal organization in the objectivity and transparency associated with measuring, recording and disclosing carbon emissions in regulatory requirements, policies and procedures that change expectations of social demands. Sustainability committees/environmental committees are considered to be management's reputation for implementing plans and rules to measure and disclose carbon emissions as a means to reduce global warming (Tila & Augustine, 2019). However, the business environment plays a pivotal role in corporate social responsibility in meeting stakeholders' requirements. It has been shown by much previous research that sustainability committees act to safeguard different stakeholders, raise the social responsibility of the company and build shareholder value within the company. When companies have environmental committees, they tend to share information about their carbon emissions that exceeds the amounts shared by other firms (Taglialatela et al., 2023). So, environmental committees show an aggressive effort to address environmental problems and come up with plans and laws to deal with carbon emissions linked to global warming (Kılıç & Kuzey, 2019).

The topic of disclosure of carbon-emissions, in the current discussion of corporate governance, has assumed a commanding ground, and it is on this basis that some of the ruling bodies under corporate governance have been seeking the cutting edge due to their capability of influencing the planning of strategies. It was demonstrated that highly empowered and independent such committees demonstrate strong leadership and follow proactive steps to educate and promote the firm about its accountability towards the environment and to be socially responsible on top of this. Theoretically, the novelty of such committees is that it can bring organizational aspirations to strategies and operationalized plans and thereby place the firm on more sustainable pathways.

2.2 Theories

In recent years, the issue of environment has gained greater centrestage in the global discussions and national policy frameworks (Prado-Lorenzo et al., 2009). Researchers have also used agency theory, legitimacy theory and stakeholder theory to improve the understanding of corporate governance together with carbon emissions disclosure (Abbasi et al., 2024; Galbreath, 2010; Goud, 2022; Kılıç & Kuzey, 2019; Tingbani et al., 2020). All these theories help explain the effect of corporate governance on the company's reporting on carbon emissions. In addition, the limitations of those theories prove that a single environmental model, including carbon emissions disclosure, is necessary (Oyewo, 2023).

The agency theory is the most popular theory related to corporate governance mechanisms and carbon emissions disclosure (Galbreath, 2010). This theory assumes that agents (managers) and Principals (shareholders) have different levels of knowledge and the idea of the theory is to watch over this relationship between them (Jensen & Meckling, 1976). The theory proposes a framework that links carbon emissions disclosure to the mechanism of the theory and that good governance increases the ability of the company to resolve existing disputes and reduce conflicts between stakeholders. Dealing with agency theory with corporate governance increases the effectiveness associated with emerging challenges such as carbon emissions and also maintains control over the opportunism of managers. Therefore, agency theory is closely associated with effective corporate governance represented by the characteristics of boards of directors. Consequently, it mitigates the agency problem by holding managers accountable to stakeholders (Goud, 2022).

Legitimacy theory posits that organizations employ the disclosure of social and environmental information as a mechanism to sustain their legitimacy within societal expectations (Dowling & Pfeffer, 1975). Especially, disclosing carbon emissions publicly shows an organization is willing to meet climate change standards, helping it keep its legitimacy (Goud, 2022). Legitimacy theory posits that environmental legitimacy is built through the perception of an organization as environmentally responsible to its stakeholders and society as a whole. In this regard, companies convince stakeholders that their activities are consistent with stakeholders' expectations regarding carbon emissions to legitimize and maintain the social contract, by disclosing the practice

of carbon management in their activities through various channels such as annual reports and sustainability reports (Kılıç & Kuzey, 2019). According to Suchman (1995), legitimacy theory proposes the concept of a social contract between the organization and society. Legitimacy refers to a general perception or assumption that the organization's activities are desirable, acceptable, and appropriate within a social framework and system based on certain norms, values, and beliefs. Therefore, any behavior that violates these norms and values is subject to severe sanctions by society. Therefore, the role of the BoDs lies in the effectiveness and ability to focus on carbon-related issues to gain legitimacy and reach societal expectations. In addition, societal expectations are not permanent and change, so improving the effectiveness of management in response to changing societal requirements requires (Choi et al., 2013). With the recent great interest in climate change and carbon emissions, companies must improve the effectiveness of the BoDs to maintain the social contract and maintain legitimacy. Therefore, investing in board members and their characteristics to enhance environmental protection can be considered an economic transfer of valuable resources, and improving the BoDs by setting more ambitious controls regarding greenhouse gases reflects positively on productivity (Nuber & Velte, 2021).

According to stakeholder theory, an organization includes different stakeholders who influence and are influenced by it (Oyewo, 2023). Given that stakeholders can be influential, (powerful) and important stakeholders, organizations should therefore consider the various interests of stakeholders when developing plans or strategies (Freeman, 2010). With regard to environmental sustainability, organizations take into account stakeholders directly and indirectly in relation to carbon emissions in their activities and through the application of effective corporate governance. Companies take effective and appropriate measures to reduce environmental pollution to gain the satisfaction of stakeholders and achieve legitimacy (Oyewo, 2023). In addition, the theory hypothesizes that if the influence and power of stakeholders are wide, companies will respond to related pressures, by disclosing more about social and environmental aspects in their practices as well as in their disclosures (Kılıç & Kuzey, 2019). According to Tingbani et al (2020), a stakeholder is defined as any group or person capable of influencing and being influenced by the attainment of an organization's objectives. In addition, studies show that stakeholders also like how companies handle environmental

issues. Thus, companies seek to become involved in environmental matters and disclosure, especially greenhouse gas emissions, with more disclosure to address these matters.

Stakeholder theory and legitimacy theory intersect in how they explain corporate governance and carbon emissions disclosures, with absolute disclosure acting as a governance mechanism (Oyewo, 2023). These theories complement each other, leading previous studies to connect them. Legitimacy theory underlines how companies should speak to society to be understood and stakeholder theory helps businesses determine what each stakeholder needs. The difference in societies and organizations' actions over climate change and emissions can cause people to doubt the validity of the organization's goals (Gonzalez & Ramírez, 2016). Here, legitimacy theory explains broader ways in which society expects companies to behave, while stakeholder theory is better for resolving issues raised by specific groups (Tingbani et al., 2020).

Carbon emissions disclosure is better explained by adding agency, stakeholder and legitimacy theories. Under agency theory, we focus on our internal sets of rules to limit misunderstandings, while stakeholder theory values the input of others outside the organization. The theory of legitimacy suggests that openness helps a person remain socially accepted. All these theories together help explain how corporate attributes influence the sharing of carbon emission disclosure.

2.3 Hypotheses Development

In response to global climate change caused by organizations through emissions of gases such as carbon emissions that cause global warming, it has become a pressing issue due to its negative impact on the environment. To maintain the social contract, companies want to address the issues that cause these emissions and reduce environmental pollution (Oyewo, 2023). Consequently, businesses are introducing governance structures to enhance board work, accomplish the social contract objectives and preserve their legitimacy. Through preserving nature and making more information about their carbon emissions available (Karim et al., 2021).

Since boards of directors are involved in guiding the company toward its goals, it is important for them to act responsibly and choose decisions that fit with the theory of

legitimacy and by which the firm and society maintain a mutual agreement and remain legitimate (Karim et al., 2021). Boards make their decisions by considering how the company's strategy fits with what society expects and how better corporate governance can improve the work of directors. Earlier research clearly indicates that board characteristics play a vital role, especially in impacting the disclosure of carbon emissions (Abbasi et al., 2024; Galbreath, 2010; Goud, 2022; Kılıç & Kuzey, 2019; Oyewo, 2023; Tingbani et al., 2020). In light of the above, this study focuses on the corporate governance variables such as independence, gender diversity, meeting, duality, and Size and their impact on carbon emissions disclosure, and the sustainability committee as a moderating variable for the direction of the relationship between the diverse characteristics of the BoDs and carbon emissions disclosure.

2.3.1 Board Independence and Carbon Emissions Disclosure

The main role of boards of directors is to guide and oversee senior management, ensuring alignment with investors' interests. Independent board members enhance this oversight by providing objective assessments, as they are not involved in daily operations (Goud, 2022; Oyewo, 2023). Their independence serves as a safeguard against undue influence from executives (Haque, 2017). Research underscores the significance of board independence in promoting a long-term perspective that encompasses both sustainability and accountability. Given the promotion of sustainability and planning in parallel between financial and environmental accountability. Thus, independent directors are encouraged to move towards disclosing information related to social and environmental responsibility (Park et al., 2023). thereby underscoring the vital role independent boards play in adopting environmentally responsible policies (Liao et al., 2015).

As independent directors are interested in tendencies towards responding to concerns related to accountability, maintaining stakeholder satisfaction and maintaining legitimacy, they pay increasing attention to meeting the sustainability responsibility of companies. Which in turn improves their social standing and social acceptance (Tila & Augustine, 2019). According to what scholars have found, independent directors push for the dissemination of environmental information as a strategy and tactic regarding which the organization is environmentally responsible. Thus, improving the quality of the decision related to carbon emissions disclosure (Oyewo, 2023). According to what the agency theory confirms, an independent BoDs is more efficient and capable of

managing and monitoring the activities of the company and with a higher level of transparency, which improves the value and performance of the company in the long term (Kılıç & Kuzey, 2019). Stakeholder theory points to a positive relationship between board independence and environmental disclosures due to their limited influence by stakeholders compared to executives (Liao et al., 2015). Moreover, legitimacy theory also demonstrates that companies have direct contact with the public (Lahyani, 2022). This means that the environment of the company is improved through the presence of an independent BoDs, ethically or culturally diverse, and mechanisms of social responsibility that improve environmental decisions and their implementation (Goud, 2022).

Based on the literature, independent directors support activities on climate change and reveal information about carbon emissions. They emphasized achieving results over the long run, maintaining durable plans, and maintaining environmental disclosures (Haque, 2017). Additionally, independent directors enhance transparency and may support initiatives and regulations to ensure their company does not conceal issues in its disclosures and environmental data. The presence of independent directors in a company can help people notice if its results are not strong, leading them to introduce policies and actions in support of climate change (Park et al., 2023). Previous literature has examined the independence of the board members and carbon emission disclosure (Haque, 2017; Kılıç & Kuzey, 2019; Lahyani, 2022; Liao et al., 2015; Oyewo, 2023; Tila & Augustine, 2019). According to Oyewo (2023) independent members on the board are linked to better environmental disclosures by companies. Also, Kılıç and Kuzey (2019) discovered that companies with more independent directors presented a better response to the carbon disclosure projects (Borghei, 2021; Lahyani, 2022; Liao et al., 2015) also found a positive association between board independence and carbon emissions disclosure. Therefore, the following hypothesis arises:

Hypothesis 1: There is a positive association between board independence and carbon emissions disclosure.

2.3.2 Board Gender Diversity and Carbon Emissions Disclosure

There has been a growing preference in academic journals to look at the involvement of women on corporate boards. Various researchers have investigated the connection between more women on a board and improved sustainability/environment reports and for the most part, found that the roles of women do make a difference (Abbasi et al., 2024; Caby et al., 2024; Karim et al., 2021; Liao et al., 2015). The existing body of literature robustly indicates that organizational diversity significantly enhances problem-solving capabilities and contributes to the overall effectiveness of the organization. Gender diversity, in particular, is a crucial element within the framework of corporate governance (Liao et al., 2015; Park et al., 2023). It has also been shown in several studies that women are key to promoting sustainability and responsible social and environmental practices on boards. It has been noticed that when there are more women on company boards, the quality and effectiveness of their environmental disclosures tend to improve (Haque, 2017; Karim et al., 2021; Okudo & Amahalu, 2021).

Corporate governance has an important aspect related to gender diversity. Although both male and female directors are concerned with environmental issues, and also with the ethical practices of stakeholders, female directors are more concerned with environmental issues and ethical practices of stakeholders. In other words, environmental disclosure is positively related to gender diversity (Caby et al., 2024; Oyewo, 2023). It is connected with the stakeholder theory structure since the role of gender diverse boards is explained by the related theories of how gender diversity is connected to the stakeholder theory structure which is women are more concerned with environmental issues, humane, and concerned with more about quality of life. In addition to their unique upbringing and instilling values that are compatible with care and compassion. Therefore, they are more responsive to stakeholder demands (Abbasi et al., 2024; Goud, 2022; Haque, 2017). Ensuring the presence of women on boards ensures balanced decision-making and more engagement with stakeholders. Consequently, diverse boards record higher performance and disclosure regarding carbon emissions (Lahyani, 2022). In addition, women's participation has a strong impact on reducing greenhouse gases, and gender diversity improves governance quality, enhances carbon emissions reporting, and increases the tendency to make environmentally friendly decisions (Gonenc & Krasnikova, 2022). Consequently, increasing the tendency to adopt carbon reduction

strategies (Tila & Augustine, 2019). From the perspective of resource dependency theory, women are more likely to influence society and initiate sustainability, and are more concerned with social justice. Therefore, women tend to be more concerned with environmental issues than men (Tagliatalata et al., 2023).

Carbon emissions disclosure and transparency are related as a result of pressures from society at large, markets, and shareholders (Gonzalez & Ramírez, 2016). According to the literature, the presence of women on the BoDs enhances corporate governance and the decision-making process in the company. There is strong evidence of associations between gender diversity on boards and environmental disclosures. Diverse boards show different incentives to disclose more information related to carbon emissions, reduce information asymmetry, and enhance reputation (Lahyani, 2022). There is extensive research concerning how gender diversity on boards impacts carbon emissions disclosure (Abbasi et al., 2024; Caby et al., 2024; Karim et al., 2021; Liao et al., 2015; Okudo & Amahalu, 2021; Park et al., 2023; Tila & Augustine, 2019; Tingbani et al., 2020). Tingbani et al (2020) provided strong proof that more gender diversity leads to better greenhouse gas reporting in organizations. Similarly, Lahyani (2022) observed a positive link between disclosing carbon emissions, what stakeholders expect, and becoming more open, along with preserving a company's legitimacy in the context of greater board gender diversity. A number of studies prove that when gender diversity increases, companies are more likely to report their carbon emissions (Goud, 2022; Kılıç & Kuzey, 2019; Okudo & Amahalu, 2021; Park et al., 2023; Tila & Augustine, 2019). Accordingly, based on information from previous theories and literature, the following hypothesis arises:

Hypothesis 2: There is a Positive Association Between Gender Diversity on The Board of Directors and Carbon Emissions Disclosure.

2.3.3 Board Meeting and Carbon Emissions Disclosure

The discussion of carbon disclosure drivers in companies has shown that board meetings play a key role in judging a firm's effectiveness and its responsible management (Oyewo, 2023). It has been shown by research that having more meetings of the board improves both the way an organization performs and the clarity of its operations (Banerjee et al., 2021). The meetings are an important location through which the formulation of strategy,

resource allocation and conflict resolution become aligned hence making necessary the board leadership in the process of planning, decision-making and allocation of resources (Haigh & Shapiro, 2012). The increased frequency of meetings also signifies an increased focus on the duties to the environmental and societal stakeholders and, in many cases, it results in the development of stronger social responsibility frameworks and more visible disclosures related to carbon emissions (Goud, 2022).

Several theories offer valuable insights into the dynamics of board meetings. Specifically, the stakeholder theory upholds that the only way through which efficient and effective corporate governance can be accomplished is through frequent meetings of BoDs to carry out the duties with efficiency and effectiveness (Oyewo, 2023). By meeting regularly, the group spots organizational issues and can address them as soon as possible. They play a key role in dealing with issues and making decisions that impact the society and environment, for example, news about companies' carbon emissions (Goud, 2022). In addition, legitimacy theory points out that board meetings enable the organization to maintain its reputation in society by regularly checking and supporting what key stakeholders desire (Al-Qahtani & Elgharbawy, 2020; Hu & Loh, 2018). According to those in favor of agency theory, regular board meetings tend to lead to better environmental and social disclosures by corporations (Martín & Herrero, 2020). Evidence from research shows that there is a strong link between how often boards meet and how well sustainability details and social-environmental responsibility are disclosed by the company (Kumar et al., 2022).

Evidence based on practice indicates that properly organized board meetings are critical in supporting the execution of strategies meant to encourage improved performance in an organization (Goud, 2022). Several studies also report that the higher the frequency of board meetings conducted by the firm, the more likely it is to voluntarily disclose information with reference to social and environmental aspects (Al-Qahtani & Elgharbawy, 2020; Elsayih et al., 2021; Hu & Loh, 2018; Kumar et al., 2022; Martín & Herrero, 2020). Regarding carbon emissions disclosure, Elsayih et al (2021) found that directors who meet regularly often help to improve a company's efforts to fight global warming and to disclose their carbon emissions. On the other hand, Oyewo (2023) found a positive association between board meetings and carbon emissions disclosure. Contrarily, Goud (2022) reported a negative association between board meetings and

carbon disclosures, indicating that board meetings increase carbon disclosures and reduce carbon emissions. In this regard, as interpreted by relevant theories and literature, the following hypothesis arises:

Hypothesis 3: There is a Positive Association Between Board Meetings and Carbon Emissions Disclosure.

2.3.4 Board Size and Carbon Emissions Disclosure

The BoDs is essential for developing a company's sustainability strategies (Tila & Augustine, 2019). Its size is a key factor in ensuring effective oversight of business practices and environmental responsibilities (Karim et al., 2021). A properly sized board also strengthens corporate governance by facilitating close monitoring of executive management activities (Goud, 2022). Therefore, involving more directors on the board enhances the board's ability to monitor and deal with value-generating activities. Larger boards are positively associated with issues related to social and environmental responsibility and carbon emissions disclosure (Kılıç & Kuzey, 2019). In addition, there are more trends toward group dynamics and collective decision-making, so the larger the board size, the higher the board's efficiency. Given that board size is one of the leading governance mechanisms in companies, there is a link between board size and the company's narrative disclosure (Kumar et al., 2022).

Several relevant theories have explained the relationship between board size, environmental disclosure, and carbon emissions disclosures. According to agency theory, a larger board size is considered to be a better predictor because it will mitigate agency conflict and provide more information to stakeholders. Thus, information asymmetry is reduced (Karim et al., 2021; Kumar et al., 2022). Stakeholder theory suggests that a larger board is better able to meet stakeholder demands by disclosing more sustainability-related information in its reports (Ardillah, 2022). Resource dependence theory suggests that a larger number of directors can provide more comprehensive insights and provide more diverse perspectives on relevant issues facing the company. Consequently, boards may then include directors who are environmental experts and more focus on sustainability and social and environmental responsibility and disclosure (Taglialatela et al., 2023).

A company with a larger board generally follows global standards and practices that benefit the environment (Houqe & Khan, 2023; Mahmood et al., 2018) Many researchers have found that bigger boards usually perform better in protecting the environment (Kumar et al., 2022; Mahmood et al., 2018; Martín & Herrero, 2020; Taglialatela et al., 2023). Recently, scientists have been paying more attention to environmental issues by focusing greatly on carbon emissions. Goud (2022) found a negative association between board size, carbon disclosures, and emissions reduction. Thus, board size is positively associated with carbon emissions disclosure. Similarly, Houqe and Khan (2023) also found a positive association between board size and carbon audit quality through larger board members will have a greater chance of improving carbon quality, reducing it and disclosing it. Kılıç and Kuzey (2019) found a positive association between board size and carbon emissions disclosure. In addition, Tila and Augustine (2019) provided further empirical evidence and found a positive relationship between board size and carbon emissions disclosure. In this regard, as interpreted by the relevant theories and literature, the following hypothesis arises:

Hypothesis 4: There Is a Positive Association Between Board Size and The CED.

2.3.5 CEO Duality and Carbon Emissions Disclosure

The CEO plays a crucial role in making strategic decisions within the company. However, when the CEO also holds the position of Chairman of the Board, it results in a significant and onerous set of responsibilities that can have a detrimental impact on strategic environmental disclosure decisions (Majid et al., 2023; Oware & Awunyo-Vitor, 2021). Additionally, combining these two positions concentrates power in the hands of one individual, leading to increased agency issues and their subsequent effects on disclosures (Elsayih et al., 2021). In the context of addressing climate change, efforts to reduce and disclose carbon emissions require a focus on long-term outcomes. Thus, the goals of executives are reflected in achieving goals that can be achieved in the short term. Therefore, it negatively affects the adoption of initiatives to reduce carbon (Goud, 2022; Oyewo, 2023).

While the proposed initiatives do not require significant investments, directors are less willing to implement and disclose initiatives related to reducing emissions (Majid et al., 2023). Thus, the separation of the two functions increases the orientations towards social

and environmental responsibility, especially with regard to climate change phenomena, carbon emissions and their disclosure (Elsayih et al., 2021). Companies with dual CEOs on the BoDs may be considered to suffer from weak corporate governance (Giannarakis et al., 2017). In this regard, the agency theory assumes close monitoring of directors' decisions in light of protecting stakeholders and the existence of dual roles that may affect monitoring. In addition, the impact on the independence of the BoDs, consequently, the impact on the company's accountability and transparency (Oyewo, 2023). Therefore, the separation process creates protection for stakeholders and avoids ethical risks associated with exploitation and opportunistic behavior and also negatively affects environmental disclosures due to the lack of checks and balances related to preserving the environment (Goud, 2022). The stakeholder theory indicated a positive association between board independence and the level of disclosure (Elsayih et al., 2021). The resource dependence theory also indicated that the presence of an independent chairman of the BoDs brings expertise and improves the company's public image, and if the chairman is non-executive, the legitimacy and participation in sustainable development goals increases (Taglialatela et al., 2023). The legitimacy theory also indicates enhancing the satisfaction of stakeholders and society and maintaining legitimacy. Thus, in order to meet the interests, companies resort to more disclosures related to the environment and carbon emissions (Abbas et al., 2023). In contrast, CEO duality can reflect positively on the company through the speed of strategic decisions and strategic change in the organization, as well as the tendency to engage proactively in social and environmental issues despite the major challenges associated with climate change and carbon emissions (Elsayih et al., 2021).

Disclosing carbon emissions is a disputed matter for both investors and those making business decisions, because managers focus mostly on profit. As a result, managers could choose to support their own goals instead of those of the stakeholders (Abbas et al., 2023). So far, research has not formed clear conclusions on how CEO duality and sustainability are linked to environmental disclosures. The majority of scholarly works suggest that there is a negative relationship between CEO duality and how much a company discloses about its environmental impact (Goud, 2022; Martín & Herrero, 2020; Oware & Awunyo-Vitor, 2021; Oyewo, 2023). Conversely, certain studies have observed that CEO duality often goes with more disclosures related to the environment

(Elsayih et al., 2021; Giannarakis et al., 2017; Taglialatela et al., 2023). Regarding climate change and carbon emissions, Oyewo (2023) reported a positive association between CEO duality and carbon emissions. In contrast, Goud (2022) identified a significant negative correlation between CEO duality and corporate carbon emissions disclosures, while Giannarakis et al (2017) found a significant negative relationship between CEO duality and carbon emissions disclosure. In this regard, as interpreted by relevant theories and literature, the following hypothesis arises:

Hypothesis 5: There Is a Negative Association Between CEO Duality and CED.

2.3.6 Sustainability Committee and Carbon Emissions Disclosure

An effective governance structure oversees the BoDs and ideal performance (Liao et al., 2015; Mahmood et al., 2018; Tingbani et al., 2020). Having a sustainability committee in place is an indication that the organization takes the current risks of ecological and social instability explicitly and aims to develop a sustainable world and reduce carbon pollution (Boamah, 2022; Tingbani et al., 2020). These committees enable the board to have a firm refocus on sustainability goals and to use its associated initiatives in a competent manner (Cucari et al., 2018; Mahmood et al., 2018). There has been an uptick in companies establishing sustainability committees, illustrating their importance for proper governance (Oyewo, 2023). Literature shows these committees improve environmental disclosures, GHG reporting, and climate initiatives (Tingbani et al., 2020).

Sustainability committees are key to guarding the interests of concerned parties and mitigating risks linked to CSR, resulting in superior CSR outcomes and worth (Orazalin et al., 2024). Grounded in legitimacy theory, they aim to align competing stakeholder interests (Goud, 2022; Oyewo, 2023). By managing greenhouse gas information and establishing a formal structure, these committees work effectively toward reducing carbon emissions (Oyewo, 2023).

The sustainability committee can be seen as an agent of the BoDs, with regard to environmental accountability and effective communication with external stakeholders (Liao et al., 2015). Indeed, the features of the sustainability committee in its role of promoting transparency and objectivity in financial accounting disclosures correspond to the features of the audit committee (Cucari et al., 2018). Being the key element leading

any global standards and guidelines to the companies' commitment to corporate social responsibility policies, as it is a great alteration in terms of raising the levels of trust, reputation, and employees' motivation, and as such position with the competitors in the area of relationship with stakeholders (Baraibar-Diez & Odriozola, 2019).

Corporate social responsibility literature highlights the presence of a sustainability committee on the BoDs. Such committees are vital for the increased credibility of a company regarding sustainability, social service and care for the environment (Cucari et al., 2018; Orazalin et al., 2024).

Several studies show that having sustainability committees greatly encourages organizations to adopt sustainable and CSR practices (Boamah, 2022; Cucari et al., 2018; Liao et al., 2015; Mahmood et al., 2018; Oyewo, 2023; Tila & Augustine, 2019). Companies with sustainability committees are found to reveal more details about their steps to protect the environment (Cucari et al., 2018; Haque, 2017; Mahmood et al., 2018; Martín & Herrero, 2020; Orazalin et al., 2024). In the context of climate change, research indicates that companies with sustainability committees are more likely to disclose greenhouse gas emissions (Liao et al., 2015; Tingbani et al., 2020). It has also been found that companies with these committees are more likely to report their carbon emissions (Haque, 2017; Kılıç & Kuzey, 2019; Okudo & Amahalu, 2021; Tila & Augustine, 2019). Conversely, there exists a negative relationship between the existence of a sustainability committee and the rate of carbon emissions, suggesting that these committees may contribute to emission mitigation efforts (Goud, 2022; Oyewo, 2023). In this regard, according to what has been interpreted by the relevant theories and literature, the following hypothesis arises:

Hypothesis 6: The Sustainability Committee Positively Moderates the Association Between Corporate Governance and CED.

Chapter Three

Research Methodology

3.1 The Sample of the Study and Data Collection

To evaluate the study hypotheses, our sample focus on European companies listed in the STOXX Europe 600 index, which includes 600 companies from 17 European countries: Spain, Norway, Austria, Germany, Denmark, Sweden, Luxembourg, France, Ireland, Belgium, Finland, Italy, the Netherlands, Poland, Switzerland, Portugal, and the United Kingdom. It is worth noting that the largest representation comes from the United Kingdom. Following our exclusion criteria, which eliminated 87 financial institutions due to their unique governance structures and regulatory frameworks that could introduce variability into the analysis, our sample consists of 4,617 observations across the 17 countries over nine years, from 2015-2023. The rationale behind selecting this European cohort stems from its leadership role in social responsibility and transparency (Dwekat et al., 2022) as well as the established regulatory landscape surrounding sustainable finance and reporting (Velte, 2021). This study spans from the year 2015 to the year 2023 because at this time, there is increasing attention on sustainability and sharing carbon information in Europe. The Paris Agreement which was created in 2015, brought a major change to the way the world approached climate policy. At this time, the Non-Financial Reporting Directive (NFRD) in 2017, the Sustainable Finance Disclosure Regulation (SFDR) in 2021 and the Corporate Sustainability Reporting Directive (CSRD) in 2022 were all adopted under the EU regulatory framework. While the frameworks are passed separately, they have steadily improved the scope, quality and compatibility of environmental disclosures by big publicly traded companies. Consequently, this period provides a crucial basis for assessing the impact of carbon-related transparency within the framework of the STOXX Europe 600 index.

The LSEG Workspace database was used to extract data, which combines voluntary carbon-emission reports from a wide range of companies. The independent and control variables relevant to our analysis were obtained from the same source. Notably, our study employed a panel-data structure, covering both cross-sectional and temporal variations, which represents a methodological approach different from previous studies, as they primarily relied on cross-sectional data.

3.2 Research Variables and Measurement

The dependent variable in this study is the disclosure of carbon emissions from gases released by companies, which contribute to the increase of carbon in the atmosphere and, consequently, global warming. This focus on disclosure arises from a growing interest in environmental pollution and the escalating calls from regulatory bodies and policymakers to establish mandatory standards that require more comprehensive disclosure of carbon emissions (Lahyani, 2022). These demands have intensified among stakeholders who seek greater transparency regarding corporate environmental impact (Abbasi et al., 2024).

Carbon emissions disclosure will be evaluated based on rank disclosures from 0 to 100 in the LSEG Workspace database, as (Abbasi et al., 2024) and (Lahyani, 2022). A higher score reflects a high quality of disclosures. Concurrently, this study centers on corporate governance as the independent variable, evaluated through specific characteristics of the BoDs. Key factors examined include the independence of board members, board diversity, particularly in terms of gender, the frequency of board meetings, the overall size of the board, and the presence of dual leadership roles, such as when the CEO also serves as the chair of the board. Additionally, this research explores the role of the sustainability committee as a moderating variable. This committee plays a crucial role in influencing the relationship between corporate governance practices and a firm's carbon disclosure initiatives. The study focuses on what influence the sustainability committee has on these dynamics to highlight the ways corporate governance supports more open and responsible environmental reporting.

In this study, control variables like company size, leverage and ROA were considered. The company size is estimated through the natural logarithm of overall assets because large firms are not only subjected to third-party pressures when it comes to revealing their environmental policies and practices (Al-Qahtani & Elgharbawy, 2020). Thus, it will be anticipated that larger players will levy more information regarding their carbon emissions in a voluntary manner (Abbasi et al., 2024). Corporate governance and the disclosures regarding the company size and the environment are all interrelated (Goud, 2022). The calculation of leverage ratio involves the sum of liabilities divided by the total sum of assets; the greater the financial leverage of the companies, the more the creditors would pressure the companies to undisclosed the data of environmental

disclosures in the transparent way (Liao et al., 2015). Lastly, the variable of return on assets (ROA) is used to measure underlying profitability, which has always had a positive inclination to voluntary disclosure in prior studies (Haque, 2017).

The table below represents the variables, measurement methods, and references used in this study.

Table 1
Study variables and measurements

Variable	Label	Measurement	Ref
Dependent			
Carbon Emissions Disclosure	CED	The scores range from 0 to 100, with higher scores indicating higher disclosures.	(Abbasi et al., 2024; Lahyani, 2022)
Independent			
Board Independence	B_Ind	Number of independent non-executive director on the board	(Al-Qahtani & Elgharbawy, 2020; Liao et al., 2015; Oyewo, 2023)
Board Gender	B_Gen	Percentage of female directors on the board	(Caby et al., 2024; Oyewo, 2023; Tingbani et al., 2020)
Board Meetings	B_Meet	Number of board meeting	(Al-Qahtani & Elgharbawy, 2020; Lahyani, 2022; Oyewo, 2023)
Board size	B_Size	Total number of firm board members.	(Abbasi et al., 2024; Goud, 2022; Liao et al., 2015)
CEO Duality	CEO_Du	A dummy variable coded 1 if a person holds a dual role, 0 otherwise.	(Goud, 2022; Oyewo, 2023; Tingbani et al., 2020)
Moderating Variable			
Sustainability committee	Sust_Com	A dummy variable coded 1 if there is an SC, 0 otherwise.	(Kılıç & Kuzey, 2019; Lahyani, 2022; Liao et al., 2015)
Control Variable			
Firm size	F_Size	Natural logarithm of Total Assets	(Abbasi et al., 2024; Al-Qahtani & Elgharbawy, 2020; Kılıç & Kuzey, 2019)
Leverage	Lev.	The ratio of total debt divided by total asset	(Abbasi et al., 2024; Liao et al., 2015; Oyewo, 2023)
Return On Assets	ROA	The ratio of Return divided by Total Assets.	(Goud, 2022; Haque, 2017; Oyewo, 2023)

3.3 Research Model

In order to explore the direct association of the board characteristics with the disclosure of carbon emissions, the first model was formed to include important governance variables which are board independence, gender diversity, board meetings, board size and CEO duality. Also, the control of factors like the size of the firm, leverage, and the value of returns on assets, were introduced. The goal of this model is to determine the

direct relationship between governance features and transparency in carbon disclosure by leaving out the other competing variables.

$$CED_{it} = \beta_0 + \beta_1 B_Ind_{it} + \beta_2 B_Gen_{it} + \beta_3 B_Meet_{it} + \beta_4 B_Size_{it} + \beta_5 CEO_Du_{it} + \beta_6 F_Size_{it} + \beta_7 Lev_{it} + \beta_8 ROA_{it} + \varepsilon_{it}$$

In the second model, which serves as the interaction model, the analysis was broadened by introducing the "sustainability committee" as a moderating variable. This allows for the examination of whether the presence of this committee enhances or diminishes the relationship between board characteristics and carbon emissions disclosure. The model incorporates two-way interactions between the sustainability committee and each of the board characteristics, including independence, diversity, meetings, board size, and CEO duality. It is posited that the existence of an effective sustainability committee may strengthen the influence of governance on environmental transparency.

$$CED_{it} = \beta_0 + \beta_1 B_Ind_{it} + \beta_2 B_Gen_{it} + \beta_3 B_Meet_{it} + \beta_4 B_Size_{it} + \beta_5 CEO_Du_{it} + \beta_6 Sust_Com_{it} + \beta_7 (B_Ind_{it} \times Sust_Com_{it}) + \beta_8 (B_Gen_{it} \times Sust_Com_{it}) + \beta_9 (B_Meet_{it} \times Sust_Com_{it}) + \beta_{10} (B_Size_{it} \times Sust_Com_{it}) + \beta_{11} (CEO_Du_{it} \times Sust_Com_{it}) + \beta_{12} F_Size_{it} + \beta_{13} Lev_{it} + \beta_{14} ROA_{it} + \varepsilon_{it}$$

where:

β_0 = Constant

CED: Carbon Emissions Disclosure

B_Ind: Board Independence

B_Gen: Board Gender

B_Meet: Board Meetings

B_Size: Board Size

CEO_Du: CEO Duality

Sust_Com: Sustainability Committee (moderating variable)

F_Size: Firm Size

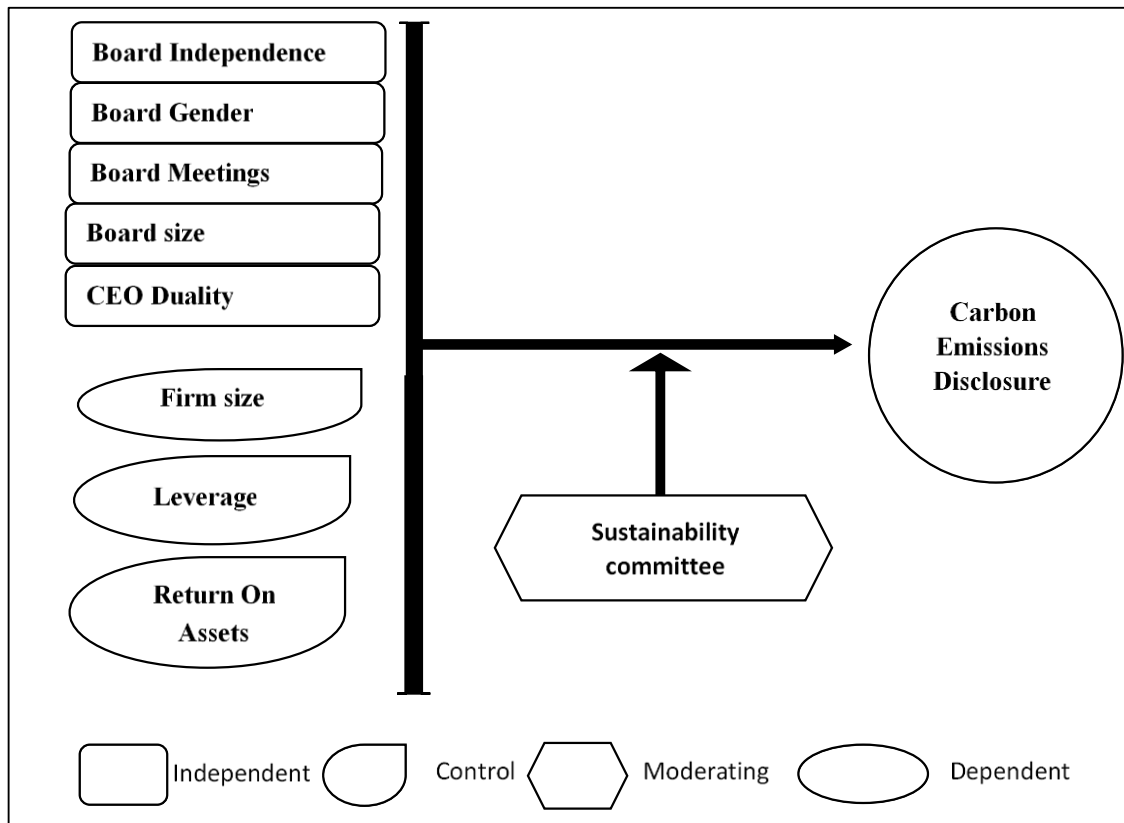
Lev: Leverage

ROA: Return on Assets

ε = Errors

The illustration provided below illustrates the relationship between the variables

Figure 1
Study Model



Chapter Four

Results and Discussion

4.1 Introduction

This study investigates the influence of corporate governance, specifically board characteristics such as independence, gender diversity, board meetings, board size, and CEO duality, on carbon emissions disclosure. Additionally, it explores the moderating role of sustainability committees. Focusing on European non-financial companies listed in the STOXX Europe 600 index from 2015 to 2023, the research employs STATA software to test hypotheses.

4.2 Descriptive Statistics

This section presents the descriptive statistics of the study's dependent variable (CED), as well as independent and control variables (B_Ind, B_Gen, B_Meet, B_Size, CEO_Du, F_Size, Lev, and ROA), and moderating variable (Sust_Com).

Table (2) exhibits descriptive statistics for these variables, showing each variable's mean, minimum, maximum and standard deviation.

Table 2
Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
CED	67.653	27.95	0	99.78
B_Ind	.60	.24	0	1
B_Gen	22.99	12.78	0	63.64
B_Meet	8.77	3.44	4	18
B_Size	10.89	3.76	4	17
CEO_Du	.244	.424	0	1
Sust_Com	.636	.481	0	1
F_Size	15.29	1.33	12.89	17.82
Lev	.205	.145	0.06	.501
ROA	0.067	5.65	-0.036	0.201

The results in Table 2 indicate a significant disparity in the extent of firms' commitment to the CED, ranging from 0 to 99.78. Several companies never disclose any data about carbon emissions, while others feed data on all the indicators. The average score on the CED was 67.7, and the standard deviation was 27.9. Resulting in approximately % 67.6 disclosure of carbon emissions data; this implies that companies upheld varying levels of transparency commitment, with considerable variation amongst firms. The findings

are consistent with a study by Luo & Tang (2014), which found that, on average, the CED rate among the sample of US, UK, and Australian companies is % 65.2. A survey by Liao et al. (2015) also showed an average disclosure rate of %62.3. Conversely, many studies in Asian contexts, including the studies conducted in China, Turkey, and South Korea by (Abbasi et al., 2024; Kılıç & Kuzey, 2019; Park et al., 2023), respectively, discovered an average disclosure rate that is considerably lower 25.7%, 14%, and 14%, respectively.

For corporate governance represented by board characteristics, board independence (B_Ind) was first assessed, measured by the number of independent non-executive directors on the board. The mean B_Ind was 0.60, signifying that 60% of the board members are independent. The scale varies between 0 and 1, thus capturing the heterogeneous governance structures: on the one hand, a group of firms have fully-independent boards, on the other, a group of firms have limited independence. Such variance reflects the different governance models and regulatory jurisdiction of the jurisdiction to be studied. Second, Board Gender (B_Gen) is measured by the percentage of female directors on the board. The average is 23 % female directors in the board, and the maximum is 63 % representation and the minimum is 0 %. The statistics show that even in some companies, the number of female directors is the majority of the board of directors, and yet in other company, the board is formed without the presence of women.

Nevertheless, the average percentage reflects the ongoing initiatives promoting gender diversity within corporate governance. Third, Board Meetings (B_Meet) was measured by the number of board meetings. On average, companies conducted approximately nine board meetings per year (mean = 8.77), with a standard deviation of 3.44. This indicates a variation in the frequency of meetings, with the maximum recorded at 18 and the minimum at 4. This variation can be attributed to companies' differing methods and purposes in organizing their meetings. Fourth, The Total number of firm board members measures, Board Size (B_Size). The average B_Size is approximately 11 members (mean = 10.89), with a standard deviation 3.76, indicating notable variation among board sizes. The maximum and minimum values observed are 17 and 4, respectively. This variation may stem from companies' differing policies when determining their board composition. Fifth is CEO Duality (CEO_Du), which is measured by whether the CEO also serves as Chairman of the Board. The average for CEO_Du stands at 24%, suggesting that 76% of

companies maintain a separation between the roles of CEO and Chairman, reflecting their governance efforts towards good governance practices. The standard deviation is 0.42, and the variance suggests that a significant majority of companies favor this separation. Finally, sustainability committees (Sust_Com) play a crucial role for many companies, with approximately 64% (mean = 0.646) having sustainability committees. This indicates a positive trend in recognizing sustainability as an important facet of corporate governance. The standard deviation of 0.48 highlights the variance among companies, suggesting that while the majority are committed to forming sustainability committees, some companies place less emphasis on this and adopt alternative approaches to managing sustainability-related issues.

Regarding control variables, firm size (F_Size) is represented by the logarithm of the firm's total assets. The sample's average firm size was 15.29, with a maximum of 17.82 and a minimum of 12.89. The standard deviation stands at 1.33, indicating that most companies in the sample are relatively large. This suggests that larger firms have a significant environmental impact and may experience greater pressure from investors to enhance transparency regarding their carbon emissions. The standard deviation also points to a moderate variation in company sizes, highlighting that the sample predominantly comprises medium to large firms with limited dispersion from the average.

Regarding financial leverage (LEV), on average, 20.5% of companies' financing is derived from debt, reflecting a moderate level of indebtedness. However, the range from 0.06 to 0.501 indicates a considerable maximum level that could adversely influence the cost of environmental disclosures. This could drive companies to prioritize avoiding financial risks over ecological concerns, resulting in limited disclosure.

Return on assets (ROA) reveals that, on average, companies achieve profits amounting to approximately 6.7% of their asset value, with the maximum and minimum ROA recorded at 0.201 and -0.036, respectively. This substantial variation in financial performance indicates that firms experiencing negative outcomes may deprioritize environmental disclosures due to financial pressures. Conversely, companies exhibiting strong financial performance are generally more inclined to invest in environmental projects and enhance their disclosures.

4.3 Correlation Analysis

This section presents the level of correlation between the study variables.

To test multicollinearity between the study variables and to ensure that there are no very strong correlations between the variables, Pearson's correlation coefficients were conducted for all variables.

The results in Table 3 below show a positive relationship between CED and all independent variables (B_Ind, B_Gen, B_Meet, B_Size) except for CEO_Du, where a negative relationship appeared, in addition to a positive relationship with the moderator variable (Sust_Com), and finally a positive relationship with the control variables (F_Size, Lev) except for ROA. The results show that the correlation coefficient between CED and B_Ind (0.091) is positive but weak; thus, the impact on carbon disclosure is limited. B_Gen, with a correlation coefficient of (0.267), expresses positivity and moderation; therefore, gender diversity in the BoDs contributes to more sustainable and transparent practices. With B_Meet, with a correlation coefficient of 0.072, it is positive but weak, and B_Size, with a correlation coefficient of 0.350, is positive and relatively strong. This may indicate that large companies enhance their ability to commit to transparency and environmental disclosures, and CEO_Du, with a correlation coefficient of (-0.170), the relationship is negative and weak. This may indicate that when the CEO combines his role as CEO and Chairman of the Board, environmental transparency decreases due to the concentration of power. Correlation coefficient Sust_Com shows a positive and strong relationship with a CED with (0.493), which reflects the importance of having sustainability committees that significantly improve carbon emission disclosure, and these committees represent a higher level of environmental transparency.

In addition, the correlations matrix below shows a strong correlation between B_Size and F_Size (0.530), indicating that larger companies tend to have larger and more diverse boards. F_Size is also positively and moderately correlated with Sust_Com, suggesting that larger companies tend to establish sustainability committees to improve their environmental management.

Generally, the relationships between the variables are moderate to low, with all correlations between the variables being less than 80%. Therefore, there is no multicollinearity between the analyzed variables, thus enhancing the credibility of the hypotheses to be tested and the accuracy of the result

Table 3*Correlations Matrix*

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
CED	1.000									
B_Ind	0.091	1.000								
B_Gen	0.267	0.180	1.000							
B_Meet	0.072	0.130	0.101	1.000						
B_Size	0.350	-0.328	0.096	-0.095	1.000					
CEO_Du	-0.170	0.131	-0.079	-0.013	-0.228	1.000				
Sust_Com	0.493	0.101	0.121	0.058	0.220	-0.095	1.000			
F_Size	0.551	0.046	0.171	-0.001	0.530	-0.141	0.342	1.000		
Lev	0.070	0.031	-0.004	0.079	0.097	0.008	0.066	0.256	1.000	
ROA	-0.082	0.048	-0.003	-0.095	-0.179	0.054	-0.088	-0.281	-0.192	1.000

4.3 Regression Results and Testing Hypotheses

Before analyzing the regression models, a Hausman test was conducted to ascertain whether a fixed-effects or random-effects regression model would be more suitable. The test yielded a p-value of less than 0.05, indicating that the fixed-effects model was the most appropriate choice for this analysis. The regression results can be found in Table 4. To validate our hypotheses and explore the relationship between board characteristics and carbon emissions disclosure, we utilized three analytical models to enhance the reliability and validity of our findings. Model 1 employs pooled least squares (OLS) regression, offering an initial overview of the connection between the independent variables and carbon disclosure without considering individual or time-related factors. Model 2 adopts a fixed-effects approach with yearly controls to account for temporal fluctuations that may affect carbon disclosure. Finally, Model 3 is the most detailed, applying a fixed-effects model and taking into account year, country and industry. The model tries to show how countries and various sectors react differently to regulations and the economy.

The findings from the regression analysis, detailed in Table 4, offer valuable insights into the corporate governance practices and carbon emissions disclosures of European companies listed on the STOXX Europe 600 index. Given the outcome of the Hausman test, the fixed-effects model was deemed the best option for this study. Additionally, a Breusch-Pagan Lagrange Multiplier test was performed to detect heteroscedasticity within the statistical model. The results indicated statistical significance, confirming the presence of this issue, which could impact the accuracy of the standard error estimates and statistical inferences. As a result, robust standard errors were employed to adjust the forecasts and ensure the reliability of the findings.

Moreover, we accounted for time-invariant differences across the years to control for temporal effects that may impact the sample, especially since the data spans from 2015 to 2023, which includes the period of the COVID-19 pandemic. Additionally, we considered differences between countries to reflect variations in regulations and laws related to sustainability, as the sample includes companies from 17 countries. We also accounted for industry-specific differences in policies and behaviors, particularly regarding environmental sensitivity. Integrating the year, country, and industry coefficients effectively captured any variations in the data over time and emphasized the influence of business and economic factors (Dwekat et al., 2022). While this model employs robust standard errors, it reveals some key findings.

Table 4
Regression results regarding corporate governance and CED

VARIABLES	(1) Pooled OLS CED	(2) Fixed Effect CED	(3) Fixed Effect CED
Independence	0.0457*** (0.0162)	0.0454*** (0.0163)	0.0472*** (0.0162)
Gender	0.293*** (0.0270)	0.282*** (0.0301)	0.297*** (0.0298)
Meetings	0.412*** (0.0997)	0.417*** (0.100)	0.611*** (0.104)
Board Size	0.558*** (0.114)	0.562*** (0.114)	0.713*** (0.115)
CEO Duality	-4.031*** (0.722)	-4.038*** (0.722)	-4.122*** (0.723)
Sus_Committee	21.15*** (0.970)	21.24*** (0.974)	20.61*** (0.976)
Size	8.578*** (0.335)	8.595*** (0.336)	8.352*** (0.338)
leverage	-10.32*** (2.576)	-10.39*** (2.577)	-8.736*** (2.706)
ROA	0.349*** (0.0648)	0.359*** (0.0650)	0.389*** (0.0651)
Year fe	No	Yes	Yes
Country fe	NO	No	Yes
Industry fe	NO	No	Yes
Constant	-101.1*** (4.508)	-102.5*** (4.632)	-95.47*** (4.812)
Observations	4,617	4,617	4,617
R-squared	0.350	0.450	0.471

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Hypothesis 1: There is a positive association between board independence and CED.

The results in Table 4 indicate a positive association (0.0472; $p < 0.01$) between board independence (B_Ind) and carbon emissions disclosure; therefore, our first hypothesis

(H1) is accepted. This finding suggests that a more independent board enhances the transparency of CED. This supports the agency theory perspective introduced by Jensen and Meckling (1976), holding that independent boards result in better monitoring of managers and thus better outcomes in terms of governance, accountability and environmental reporting. In addition, as explained by Deegan (2002), and via legitimacy theory, carbon emissions disclosure stems from external and legal pressures to work according to what society and regulations require. An independent board helps a company look reliable and creates a setting that encourages it to reveal information about the environment. Stakeholder theory Freeman (2010) justifies these findings through another angle; it argues that board independence helps in addressing the requirements of the different stakeholders (including investors, customers, society, and regulator) by increasing transparency in environmental reporting.

The results resonate with Kılıç & Kuzey (2019) conclusion that a higher number of independent board members correlates with an increased propensity to disclose carbon emissions. Independent directors maintain a future-oriented stance by focusing on sustainable growth and community values, which enhances legitimacy (Boamah, 2022; Oyewo, 2023). Furthermore, this aligns with Lahyani (2022) study in the French context, which also found a positive association between board independence and CED. Also, in their study in the UK, Liao et al. (2015) found that companies with higher independent representation report better environmental information and care about carbon reporting.

Hypothesis 2: There is a positive association between gender diversity on the board of directors and CED.

The results indicate a positive and significant association (0.297; $p < 0.01$) between gender diversity on the board (B_Gen) and carbon emissions disclosure (CED). Thus, our hypothesis (H2) is accepted, suggesting that organizations with a greater proportion of female board members are more likely to report on their carbon emissions. This outcome is consistent with stakeholder theory, as articulated by Freeman (2010), which states that all stakeholders, including environmental factors, must be considered. A diversity of gender on company boards brings a variety of ideas and women are widely seen as paying more attention to issues such as climate change. Because of this greater variety, boards may be more ready to provide open information about their carbon emissions.

Legitimacy theory further suggests that having women on boards gives companies prestige with the public and other stakeholders. Organizations usually decide to make their carbon emissions known so they appear better to people. Likewise, the above finding could be analyzed through agency theory Jensen & Meckling (1976) which implies that, the more female is represented on a board the better futile it is to resist managerial actions and alleviate conflict of interest among agents (managers) and principals (shareholders). As a result, Gender diversity in the board enhances the quality of governance and gives the management an indication to disclose carbon emission to curtail accountability risk. According to Gonzalez and Ramírez (2016) what companies in Spain disclose and how transparent they are is determined by pressure from society, the market and shareholders. The outcome is in accordance with research recently done in Indonesia, France and the United Kingdom by (Lahyani, 2022; Liao et al., 2015; Tila & Augustine, 2019) indicating that increased CED results when there are more women on a company's board. When companies add people of various genders to their leadership, they are more likely to publish their carbon emissions (Park et al., 2023). Additionally, Tingbani et al. (2020) offer evidence that shows making greenhouse gas emissions disclosures leads to more women being included on corporate boards. Similarly, showing that women sit on company boards is now crucial in making businesses tell the public about their environmental actions (Caby et al., 2024).

Hypothesis 3: There is a positive association between board meetings and CED.

The results indicate a positive and significant association (0.611; $p < 0.01$) between board meetings (B_Meet) and carbon emissions disclosure (CED). Thus, our hypothesis (H3) is accepted. It shows that boards that meet more often are likely to provide clearer information about their carbon emissions, showing a stronger dedication to environmental policies. It shows that the success of companies to be environmentally responsible depends on strong governance structures. The evidence also matches what agency theory and legitimacy theory say, stating that board meetings aid management in monitoring, resolving agency issues and helping to clarify environmental reporting. Another explanation is that companies increase their board meetings to share more environmental information because of pressure from the general public (Abbasi et al., 2024; Tingbani et al., 2020). Dienes and Velte (2016) further believe that ongoing meeting help an organization address the expectations of different groups and

earn their respect.

Furthermore, Oyewo (2023) points out that holding regular board meetings plays a vital role in dealing with organizational challenges and boosting their carbon emissions management. Liao et al. (2015), show that the greater the number of board meetings, the better information about carbon disclosure becomes. Additional research (Elsayih et al., 2021; Goud, 2022; Martín & Herrero, 2020; Oyewo, 2023) find that companies that hold more board meetings tend to reveal more sustainability, environmental and social responsibility details. More stakeholder is encouraging companies to be clear about their approaches and match society's expectations, so this trend is growing. Regular board meetings give the company a better chance of staying sustainable (Ardillah, 2022).

Hypothesis 4: there is a positive association between Board size and the CED.

The results indicate a positive and significant association (0.713; $p < 0.01$) between Board Size (B_SIZE) and carbon emissions disclosure (CED). Thus, our hypothesis (H4) is accepted. This finding suggests that companies with bigger boards are more likely to release details on their carbon emissions due to the key role the board holds in guiding the company's actions. Also, the number of board members plays a huge role in corporate governance. The findings confirmed agency theory which indicates that an effective way to avoid management problems and increase transparency is to use a large BoDs, even with environmental disclosures (Tila & Augustine, 2019).

According to stakeholder theory, large boards with various members are more able to respond to the needs of different stakeholders, leading companies to speak more openly about environmental topics (Lahyani, 2022). The results can also be aligned with Legitimacy Theory because increased board size would assist the company to improve its legitimacy aspect among society and other stakeholders. Organisations that comply with environmental releasing are seen to be more reputable and socially responsible Deegan (2002). The findings align with prior literature (Kılıç & Kuzey, 2019; Tila & Augustine, 2019). Research conducted in different contexts, including Turkey and Indonesia, further supports the positive relationship between board size and carbon emissions disclosure. Remarkably, Goud (2022) provides the results according to which bigger boards are likely to produce more open reporting of carbon emissions, which was supported by empirical information on the Indian businesses. A comparable and positive

connection develops between the board size and narrative disclosures in the study of Karim et al. (2021). Numerous studies, such as those by (Ardillah, 2022; Goud, 2022; Mahmood et al., 2018; Tagliatalata et al., 2023) have consistently provided empirical evidence across various contexts and periods that underscore the positive relationship between board size and sustainable disclosure. As the BoDS guides the organization in achieving its overall goals and manages the related accomplishment of those end results, it takes an essential role in the further implementation of sustainability-related, and, more precisely, carbon emissions, reporting (Goud, 2022).

Hypothesis 5: There is a negative association between CEO duality and CED.

The results indicate a negative and significant association (-4.122; $p < 0.01$) between CEO Duality and carbon emissions disclosure (CED). Thus, our hypothesis (H5) is accepted. This suggests that firms with a CEO Duality are less likely to disclose carbon emissions, and this result supports the hypothesis related to board independence that was previously interpreted as a positive association between board independence and carbon emissions disclosure; thus, the results are expected. The results underline the importance of effective corporate governance, highlighting the necessity for independence and avoiding overlap in the chairperson and CEO roles. These findings align with agency theory, posing that CEO duality weakens control, heightening conflicts of interest and diminishing transparency. CEO duality in terms of the Stakeholder Theory diminishes responsiveness of the board to needs of different stakeholders, such as investors, customers, society, and regulators, in the context of the environmental disclosure, which has an adverse effect on transparency of the company on carbon emissions Khairunnisa et al. (2024). Additionally, they resonate with legitimacy theory, as a lack of an independent governance structure can lead to reduced responsiveness to societal expectations concerning environmental transparency, ultimately calling the organization's legitimacy into question (Goud, 2022; Oyewo, 2023). In a study by Giannarakis et al. (2017), companies with CEO duality exhibit weak corporate governance due to insufficient independence.

Giannarakis et al. (2017) highlighted the negative correlation between CEO duality and carbon emissions disclosure. Additionally, A study conducted by Al-Qahtani & Elgharbawy (2020) identified a negative relationship between CEO duality and environmental disclosures, while another indicated no statistically significant link

between CEO duality and carbon emissions disclosure. Both (Oware & Awunyo-Vitor, 2021; Oyewo, 2023) assert that CEO duality negatively impacts environmental disclosures due to a potential lack of checks and balances on environmental pollution. Because of their independence, independent directors support an independent board, and their presence might be diminished by duality at the top. According to agency theory, the situation demonstrates a deficiency in corporate governance because it allows managers to prioritize personal gains and short-term achievements over the well-being and future sustainability of the environment (Hu & Loh, 2018). Consequently, the findings presented are consistent with previous literature.

Control Variables and CED.

The research findings offer valuable insights into the relationship between control variables namely firm size, leverage, and return on assets (ROA) and the disclosure of carbon emissions. Each of these variables is statistically significant in influencing carbon emissions reporting.

The finding is that larger companies tend to reveal more detailed information about their carbon emissions. It is likely that regulation and pressure from society promote this trend, along with the superior abilities of bigger companies to invest in sustainability and fully disclose their emissions. This is in line with the results found by Akhiroh and Kiswanto (2016) who proved that firm size is highly significant for deciding emission reporting. Additionally, Gonzalez and Ramírez (2016) discovered that bigger firms are more likely to publish their carbon reports in Spain.

Conversely, firms with a lot of debt often do not give as much information about their emissions as those with less debt. Perhaps this occurs because highly leveraged companies care more about their financial achievements and quick gains than about reporting on the environment Prasetyo & Mimba (2021), who identified a negative association between leverage and carbon emissions disclosure, while Haque (2017) also reported no significant relationship.

Finally, ROA and carbon emissions disclosure are positively related which implies that firms with higher earnings often report on their environmental activity, especially in terms of carbon emissions. This aligns with the findings of Datt et al. (2019), who identified a positive connection between ROA and emissions disclosure. Similar results were reported by Prasetyo & Mimba (2021), confirming the important link between

profitability and transparent environmental reporting.

4.4 The Effect of Moderation: Sustainability Commitment

This section explores the link between corporate governance and carbon emissions disclosure (CED), considering the role that sustainability committees play as moderators, as listed in Table 5. This analysis tries to show whether the existence of a sustainability committee positively or negatively affects how corporate governance affects CED. The model takes into account year, country, and sector influences, which reduces the bias due to unobserved factors.

Table 5

Regression results regarding corporate governance and CED: Sustainability Committee as moderating variable

VARIABLES	Emission Score
Sus_com	33.13*** (4.840)
Independence	0.0325 (0.0317)
Sus_com*indep	0.0277 (0.0360)
gender	0.435*** (0.0653)
Sus_com*gender	0.216*** (0.0683)
Meetings	0.714*** (0.249)
Sus_com*meetings	0.662** (0.263)
Boardsize	1.486*** (0.266)
Sus_com*boardsize	0.768*** (0.279)
CEO Duality	-6.411*** (2.024)
Sus_com*CEOD	7.761*** (2.097)
F_SIZE	8.531*** (0.355)
leverage	-8.762*** (2.674)
ROA	0.407*** (0.0655)
Year fe	Yes
Country fe	Yes
Industry fe	Yes
Constant	-102.5*** (7.269)
Observations	4,617
R-squared	0.510

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The findings presented in Table 4 reveal significant statistical relationships between the independent variables and the control variables (B_Ind, B_Gen, B_Meet, B_Size, CEO_Du, F_Size, Lev, and ROA) concerning CED. Furthermore, Table 5 incorporates the moderating variable (Sust_Com) to show the impact of the sustainability committee on the relationships between the independent and control variables regarding CED.

The results presented in Table 5 reveal a positive and significant correlation (33.13; $p < 0.01$) between the existence of a sustainability committee (Sust_Com) and carbon emissions disclosure (CED). thereby indicating that organizations with a sustainability committee are likely to have a higher level of CED, their findings have justified that the use of sustainability committees is an enabler to strengthening of environmental disclosure practices and transparency and employing sustainable-disclosure practices. In consonance with such findings, Mahmood et al. (2018) note that firms that have a sustainability committee tend to create better sustainability reports. Using the legitimacy theory, in terms of the Agency Theory, sustainability committees enhance monitoring and control over the management and eliminates agency conflicts and leads to increased accuracy and reliability in environmental reporting (Tingbani et al., 2020). By Stakeholder Theory, though, the existence of these committees shows that there are expectations of a range of stakeholders such as investors, customers, society and regulators, and that the organization is working to meet their expectations through open environmental practices (Cucari et al., 2018). Oyewo (2023) provides the argument that organizations consider forming special committees on sustainability to promote their reputations and remain compliant with the existing norms in both the legal and societal systems. In addition, sustainability committees are important in the way companies balance their governance structures and carbon disclosure requirements (Kılıç & Kuzey, 2019). As noted by Tingbani et al. (2020) having a sustainability committee in a company indicates that the business is committed to caring for the environment and climate.

Board independence was found to have a positive and important link with carbon emissions disclosure in the direct relationship test shown in Table 4. The results in Table 5 reveal that, after adding the sustainability committee to the analysis, board independence does not affect carbon emissions disclosure as expected. Also, the link between having a sustainability committee and board independence (Sus_com /indep) did not have a significant effect, so the sustainability committee does not appear to

impact the effect of board independence on carbon emissions disclosure. The sustainability committee may be viewed as an internal control which means that independent directors may fail to have as large an impact on the way companies disclose environmental issues (Mahmood et al., 2018). Even though board members may still be actively involved, firms generally make sustainability committees responsible for developing and carrying out strategies for environmental disclosure (Oyewo, 2023; Shaukat et al., 2016). In addition, Elsayih et al. (2021) also stated that a sustainability committee can lead the way in sharing information about carbon emissions by supporting environmental actions. It might explain the reasons for the committee's success in uniting board independence and the carbon emissions reporting.

The findings presented in Table 5 indicate a significant positive relationship between board gender diversity and carbon emissions disclosure (0.435; $p < 0.01$). The introduction of the sustainability committee as a moderating variable (Sus_com / Gender) further strengthened this association (0.216; $p < 0.01$). It means that having a sustainability committee strengthens how well gender diversity supports disclosing carbon emissions data. The presence of this committee helps people learn about the company's sustainability disclosures by making many details accessible (Haque, 2017). According to, Mahmood et al. (2018), companies with both gender diversity on their boards and sustainability committees pays more attention to sustainability. Because of this, companies' CSR efforts can create positive results for shareholders (Tila & Augustine, 2019). Also, embracing gender diversity can greatly improve how a business is organized. Evidence in the literature points to better climate and social responsibility in companies that promote gender diversity. Because of this, the significance of gender diversity and functioning committees for sustainability becomes more apparent in the topic of carbon emissions (Tingbani et al., 2020).

Regarding board meetings, the results in Table 5 showed a positive and significant correlation between the number of board meetings and carbon emissions disclosure (0.435; $p < 0.01$). Including the sustainability committee as a moderator variable (Sus_com / meetings) strengthened this relationship (0.662; $p < 0.05$). Therefore, having more meetings on the board gives professionals extra opportunities to discuss environmental strategy which leads to more disclosure. Moreover, having a sustainability committee makes the meetings more positive which helps the company be more

transparent about sustainability and demonstrate better sustainable disclosures (Ardillah, 2022). The outcomes match the main points of legitimacy theory which asserts that organizations want to satisfy stakeholders and appear legitimate. Sustainability committees are established to devise, monitor, and implement initiatives aimed at environmental sustainability. An increase in the frequency of board meetings facilitates continuous evaluation, which, in turn, improves the attainment of sustainability goals and strengthens organizational legitimacy (Elsayih et al., 2021) It is also in line with agency theory because regular company meetings help to watch over any questionable actions of board members. By carefully monitoring, there is less mismatch of information and fewer problems because of the managers' agency. Because of these meetings, stakeholder responsibilities are considered more which helps improve environmental and social reporting (Oyewo, 2023).

Regarding board size, the results in Table 5 showed a positive and significant correlation between board size and carbon emissions disclosure (1.486; $p < 0.01$). Including the sustainability committee as a moderator variable (Sus_com / Size) strengthened this relationship (0.768; $p < 0.01$). There is a link between having a larger board and better environmental disclosure practices. Big boards are more common among companies with improved governance which leads to fewer issues with agency conflicts and a higher probability of sharing information about carbon emissions (Kumar et al., 2022). Sustainability committees contribute further to this positive effect (Kılıç & Kuzey, 2019; Tila & Augustine, 2019). Agency theory argues that a bigger board shares more detailed information with shareholders about the company, including its environmental records which decreases information asymmetry (Goud, 2022; Tila & Augustine, 2019).

Finally, regarding CEO duality, the results in Table 5 show a negative and significant association between CEO duality and carbon emissions disclosure (-6.411; $p < 0.01$). When the sustainability committee was included as a moderator variable (Sus_com / CEO duality), this effect reversed and became positive and significant (0.768; $p < 0.01$). The interaction between CEO duality and the sustainability committee (Sus_com / CEO duality) was statistically significant (7.761; $p < 0.01$). Therefore, sustainability committees can mitigate the negative effects of leadership duality and enhance accountability. In the absence of a sustainability committee, CEO duality has a negative effect on carbon emissions disclosure, indicating insufficient board oversight. However,

when a sustainability committee is present, this negative effect turns positive, which in turn reduces the concentration of power and enhances oversight effectiveness, thus reducing the impact of CEO duality on environmental disclosures. Furthermore, the presence of a sustainability committee within a company reflects a commitment to addressing environmental issues and climate change (Tingbani et al., 2020). Mahmood et al. (2018) also highlighted the importance of sustainability committees, providing evidence that their presence is positively associated with greenhouse gas emissions disclosure. These findings provide theoretical support for the impact of corporate governance on environmental disclosure, particularly with regard to carbon emissions, highlighting the essential role of the sustainability committee as a moderating variable.

The results support the critical role of sustainability committees in strengthening the relationship between corporate governance, represented by board characteristics such as gender diversity, board size, board meetings, and CEO duality, and carbon emissions disclosure. Even so, there was no statistically significant impact on board independence. Therefore, H6 was partially accepted, as the sustainability committee positively impacted most independent variables, with the exception of board independence. These findings agree with agency, legitimacy and stakeholder theories which point to the key role of governance in making companies more transparent on environmental issues.

Table 6
Summary of Hypotheses

	Hypothesis	Fixed Effect CED	Fixed Effect Role of Sust_Com
H1	There is a positive association between board independence and CED.	Accepted	Rejected
H2	There is a positive association between gender diversity on the board of directors and CED.	Accepted	Accepted
H3	There is a positive association between board meetings and CED.	Accepted	Accepted
H4	there is a positive association between Board size and the CED.	Accepted	Accepted
H5	There is a negative association between CEO duality and CED.	Accepted	Accepted
H6	The sustainability committee positively moderates the association between corporate governance and CED.	Partially supported	

4.5 Implications for the European Context

Our empirical study focuses on European Union governance arrangements and sustainability disclosures and in particular in STOXX 600, comprising 17 European countries (not including financial institutions) and providing a comparative perspective on national and supranational governance structures. The research indicates that the companies that have sustainability committees and boards that demonstrate greater independent oversight make stronger carbon disclosures as compared to those companies that do not have such governance characteristics. The findings bring into focus the strength of regulatory intervention by the EU and the diffusion of common governance practices to enhance transparency on sustainability, though crooked national standards (European Commission, 2021).

The results also reveal that board characteristics, such as board independence, gender diversity, frequency of meetings, and board size are associated with increased carbon disclosures, a phenomenon of increased policy importance as recent EU legislation, including the Green Deal or the Corporate Sustainability Reporting Directive, demonstrates (The European Green Deal, 2019; European Commission, 2021). An independently operating sustainability committee has been labeled as a critical governance tool that can enhance the level of effectiveness of board oversight, eliminating dual-CEO systems and, thereby, promoting more active environmental disclosure (Kılıç & Kuzey, 2019).

The salience of gender diversity and independent oversight, in turn, is also supported by EU regulatory instruments, notably Directive 2022/2381 on gender balance, whose increased salience also occurs due to the inclusion of sustainability committees (*European Parliament and Council*, 2022). Particularly, bigger companies exhibit a comparative advantage of using these forms of governance in order to satisfy the disclosure requirements of EU that are gradually becoming more rigid (Lending & Vähämaa, 2017; Velte, 2021). Consistent with EU attempts to standardize sustainability reporting among different member states, this form of governance innovations does not just dovetail with a wider set of ESG policies but it additionally supports disclosures measurements within the block (European Securities and Markets Authority, 2023; European Commission, 2021).

Chapter Five

Conclusion and Recommendations

5.1 Conclusion

As the pressure by different stakeholders to be increasingly accountable against one another rises, sustainability reporting has emerged as a crucial element of the current business climate. Companies must show that they are trying to stop the pollution and emissions. In this regard, carbon emissions are also assuming central role in the decision process, as it is becoming more and more known about the climate woes and the impact of global warming. Voluntary and mandatory carbon disclosure has found its way into the corporate and country agenda of environmental governance increasingly as the consequence of new climate laws in an effort to control corporate carbon emissions directly. Global warming has become an economic and political necessity across the world. There is a notion that a heightened awareness of carbon emissions of various actors would result in a more sustainable choice. This scenario explains the importance of corporate governance and board structures in intensifying carbon disclosure. To maintain an effective oversight of environmental disclosures and to meet the stakeholders' expectations, and keep up with ever tightening international regulatory changes, good governance mechanisms are a critical role in this situation. In this research, our focus is on studying the effect of corporate governance by the board characteristics on Carbon emission disclosures (CED).

The present study makes several notable contributions to the current literature on carbon disclosure. First, opens a gap in current literature to explore the governance mechanisms by which board diversity contributes to improving transparency in carbon disclosure, as it aids companies to align their operations with global environmental and climate goals. Secondly, it provides a comprehensive analysis of the interaction between corporate governance, represented by board characteristics and activities, and carbon disclosure, expanding previous research—which has focused on traditional attributes such as firm size, firm age, profitability, leverage, and limited board characteristics such as independence, size, or gender diversity—by examining the effects of several additional variables (such as independence, gender diversity, board meetings, CEO duality, and board size) and the sustainability committee as a moderating variable. Finally, the study

is aimed to extend its focus on an extended sample of 513 European companies from 17 countries, covering 4,617 firm-year observations during 2015 to 2023. using data from the Asset4- LSEG Workspace database and measuring the relation between board characteristics and carbon emissions disclosure using longitudinal panel data techniques with control variables (company size, leverage and return on assets).

In conclusion, this study provides evidence on the relationship between corporate governance, particularly through board diversity, and carbon emissions disclosure. The findings reveal a significant positive impact of factors such as board independence, gender diversity, frequency of meetings, and board size on carbon emissions disclosure. These elements can enhance transparency, reduce agency costs, and address information asymmetries, thereby better meeting stakeholder needs. It appears that companies will disclose more details of their sustainability and emissions when they have an independent board, more women on the board, more meetings and a bigger board as a whole. In addition, the research shows that having a diverse board helps a company handle sustainability reporting within the organization. At the same time, having the CEO serve as chairman of the board was found to be associated with less of a tendency to disclose carbon emissions information. Regarding the moderating role of the Sustainability Committee, the findings indicate that the committee's effectiveness is bolstered by factors such as gender diversity, meeting frequency, board size, and CEO duality in relation to carbon emissions disclosure. However, contrary to what was expected, the Sustainability Committee did not significantly influence the relationship between board independence and the disclosure of carbon emissions.

These findings have valuable theoretical and practical implications. Our results contribute to legitimacy theory and stakeholder theory because board diversity and carbon emissions disclosure are essential tools for enhancing corporate resources by identifying how boards with independence, women, increased oversight and transparency, frequent meetings, and large board sizes can improve diversity of perspectives and informed corporate decision-making and disclosure, thus meeting the expectations of different stakeholders. Furthermore, our results substantiate agency theory, revealing that both board diversity and carbon emissions disclosure play a crucial role in mitigating the conflict of interest between management and shareholders. This is particularly evident in the impact of CEO independence and the efficacy of corporate

sustainability committees, which collectively reduce agency dilemmas, information asymmetries, and collusion. Consequently, these dynamics facilitate more thorough reporting on sustainability and environmental matters.

In interpreting the results of this study, several limitations should be acknowledged, as they highlight important areas for future research. First, there was a lack of previous literature supporting the study's hypotheses on the impact of corporate governance represented by board diversity on carbon emissions disclosure, in particular the lack of previous studies examining the moderating role of the sustainability committee between board diversity and carbon emissions disclosure. Second, the study period (2015–2023) includes some exceptional economic situations such as the COVID-19 pandemic, which may have had a direct impact on the treatment of sustainability reporting and the actual level of environmental disclosure, especially carbon emissions disclosure. In addition, the period included frequent regulatory interventions in setting guidelines and regulatory restrictions related to climate change and clean energy reporting in addition to carbon emissions disclosure. Third, while this study focused exclusively on companies listed on the STOXX.

Europe 600 index from 17 European countries, future research could use a broader multinational sample, including companies from diverse regions such as Asia, America and Africa, to enhance the reliability and generalizability of the results. Fourth, the study relied on the LSEG Workspace database, which is widely recognized for its high-quality data. However, the use of range scores to measure carbon emissions disclosures may introduce measurement errors, leading to over- or underestimation of corporate measures. Future research would benefit from developing a specific index to better capture the extent and quality of disclosures, taking into account relevant economic, social, and environmental dimensions. Finally, this study was limited by its focus on specific board characteristics (independence, gender, CEO duality, size, and sustainability committee as a moderator), without considering additional board characteristics that could provide a more comprehensive view of the relationship between corporate governance represented by board diversity and carbon emissions disclosures. Future studies should explore a broader range of demographic factors, such as age, nationality, education level, and background experience, as well as board activities such as attendance rates. Furthermore, examining other corporate governance factors,

including audit committees, internal control systems, institutional pressures, government and corporate ownership, regulatory and supervisory authorities, etc., would deepen the understanding of how corporate governance affects sustainability reporting practices, particularly carbon emissions disclosure.

5.2 Recommendations

1. Companies should strengthen governance mechanisms to align their strategies with environmental sustainability policies, particularly with regard to carbon emissions disclosure. This should particularly focus on enhancing transparency and accountability, as effective governance helps reduce agency costs and address information asymmetries between companies and stakeholders.
2. Business organizations must aim to develop better sustainability committees and capable boards that are both diverse and competent to enhance carbon emissions disclosure. This plays a key role in efficient environment monitoring and organizational accommodation.
3. Enhancing the regulatory frameworks is critical in enhancing disclosure of carbon emissions. Studies have revealed that the characteristics of boards improve the disclosure; however, these are influenced by the regulatory regime. Policy-makers must develop policies that combine sustainability objectives and describe monitoring process of environmental legislation. The building of mechanisms which promote voluntary reporting of emissions by the companies can adapt binding laws with the voluntary reporting sanctions.
4. Companies should follow international guidelines to enhance their environmental disclosure. To become clearer about their carbon data, companies should refer to guidelines set by the Global Reporting Initiative (GRI), the United Nations Global Compact (UNGC), and the Task Force on Climate-related Financial Disclosure (TCFD). Furthermore, many companies use assessment metrics that may lack precision, highlighting the need for better quantitative and qualitative indicators that take into account the economic and regulatory context of each sector.
5. Independent and diverse boards promote voluntary carbon disclosure, highlighting the role of stakeholders and investors in monitoring environmental performance. Investors should adopt a sustainable investment approach that evaluates

environmental, social, and governance criteria and encourages companies to transparently disclose their emissions reduction strategies.

6. The study found that gender diversity, board independence, meeting frequency, and board size positively impact carbon disclosure, while CEO duality negatively impacts transparency. Companies should restructure boards to enhance their independence and address dual leadership to enhance accountability in environmental reporting.
7. The firms must enable sustainability committees to improve on carbon disclosure. Such committees are essential in enhancing the associations between the board characteristics (including gender diversity and board size) and environmental transparency. Such committees also minimize the effects of CEO overlap, which ensures excellent governance and environmental responsibility.
8. Promote government policies to support environmental governance. Governments should not only implement regulations but also create an enabling environment for companies to adopt sustainable practices. Policies should encourage voluntary disclosure and innovation in carbon reduction.
9. Encouraging the cooperation between organizations, governmental and international organizations can become one of the most important ways to improve the global approaches to sustainability and boost the practice of carbon disclosure. This type of collaboration should be marked with the development of a unified data-sharing platform, its direct promotion, the development of dedicated strategic collaborations, based on the best international practices, increasing environmental reporting and solidifying promises to reduce carbon emissions.

List of Abbreviations

Abbreviations	Stand for
CED	Carbon emission disclosure
BoDs	Board of Directors
CESD	Corporate Environmental Sustainability Disclosure
CDP	Carbon Disclosure Project
CSR	Corporate Social Responsibility
SDGs	Sustainable Development Goals
SFDR	Sustainable Finance Disclosure Regulation
CSRD	Corporate Sustainability Reporting Directive
NFRD	Non-Financial Reporting Directive

References

- Abbas, A., Zhang, G., Bilal, & Chengang, Y. (2023). Firm governance structures, earnings management, and carbon emission disclosures in Chinese high-polluting firms. *Business Ethics, the Environment and Responsibility*, 32(4), 1470–1489. <https://doi.org/10.1111/beer.12582>
- Abbasi, K., Alam, A., Borhan Uddin Bhuiyan, M., & Tariqul Islam, M. (2024). Does female director expertise on audit committees matter for carbon disclosures? Evidence from the United Kingdom. *Journal of International Accounting, Auditing and Taxation*, 55. <https://doi.org/10.1016/j.intaccudtax.2024.100618>
- Akhiroh, T., & Kiswanto. (2016). The Determinant Of Carbon Emission Disclosures History. *AAJ*, 5(4). <http://journal.unnes.ac.id/sju/index.php/aaj>
- Al-Qahtani, M., & Elgharbawy, A. (2020). The effect of board diversity on disclosure and management of greenhouse gas information: evidence from the United Kingdom. *Journal of Enterprise Information Management*, 33(6), 1557–1579. <https://doi.org/10.1108/JEIM-08-2019-0247>
- Álvarez, I., Segura, L., & Ferrero, J. (2014). Carbon emission reduction: The impact on the financial and operational performance of international companies. *Journal of Cleaner Production*, 1(11), 149–159. <https://doi.org/10.1016/j.jclepro.2014.08.047>
- Ardillah, K. (2022). The Impact of Characteristics, Independence, Diversity, and Activities of the Board of Director on the Sustainable Development Goals Disclosure. *Dinasti International Journal of Education Management And Social Science*, 4(2), 210–222. <https://doi.org/10.31933/dijemss.v4i2>
- Bae Choi, B., Lee, D., & Psaros, J. (2013). An analysis of Australian company carbon emission disclosures. *Pacific Accounting Review*, 25(1), 58–79. <https://doi.org/10.1108/01140581311318968>
- Banerjee, S., Aamir Khan, M., & Iftikhar ul Husnain, M. (2021). Searching appropriate system boundary for accounting India's emission inventory for the responsibility to reduce carbon emissions. *Journal of Environmental Management*, 295, 112907. <https://doi.org/10.1016/J.JENVMAN.2021.112907>

- Baraiibar-Diez, E., & Odriozola, M. (2019). CSR committees and their effect on ESG performance in UK, France, Germany, and Spain. *Sustainability (Switzerland)*, *11*(18). <https://doi.org/10.3390/su11185077>
- Binh, N., & Lee, H.-C. (2024). Unveiling the Impacts of Corporate Environmental, Social, and Governance Disclosure. *Sustainability (Switzerland)*, *16*(6). <https://doi.org/10.3390/su16062459>
- Boamah, E. O. (2022). Mandatory carbon disclosure and green committees. *Economics Letters*, *219*. <https://doi.org/10.1016/j.econlet.2022.110767>
- Borghei, Z. (2021). Carbon disclosure: a systematic literature review. *Accounting and Finance*, *61*(4), 5255–5280. <https://doi.org/10.1111/acfi.12757>
- Budiharta, P., & Kacaribu, H. (2020). The Influence of Board of Directors, Managerial Ownership, and Audit Committee on Carbon Emission Disclosure: A Study of Non-Financial Companies Listed on BEI. *Review of Integrative Business and Economics Research*, *9*(3), 75–87. https://sibresearch.org/uploads/3/4/0/9/34097180/riber_9-s3_06_h19-121_75-87.pdf
- Caby, J., Coron, C., & Ziane, Y. (2024). How does gender diversity in top management teams affect carbon disclosure and its quality: Evidence from the technological industry. *Technological Forecasting and Social Change*, *199*. <https://doi.org/10.1016/j.techfore.2023.123077>
- Corporate sustainability reporting - European Commission*. (2019). Retrieved May 25, 2025, from https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en
- Cucari, N., Esposito De Falco, S., & Orlando, B. (2018). Diversity of Board of Directors and Environmental Social Governance: Evidence from Italian Listed Companies. *Corporate Social Responsibility and Environmental Management*, *25*(3), 250–266. <https://doi.org/10.1002/csr.1452>

- Datt, R. R., Luo, L., & Tang, Q. (2019). Corporate voluntary carbon disclosure strategy and carbon performance in the USA. *Accounting Research Journal*, 32(3), 417–435. <https://doi.org/10.1108/ARJ-02-2017-0031>
- Deegan, C. (2002). “Introduction: The legitimising effect of social and environmental disclosures – a theoretical foundation.” *Accounting, Auditing & Accountability Journal*, 15(3), 282–311. <https://doi.org/10.1108/09513570210435852>
- Dienes, D., & Velte, P. (2016). The Impact of Supervisory Board Composition on CSR Reporting. Evidence from the German Two-Tier System. *Sustainability 2016, Vol. 8, Page 63*, 8(1), 63. <https://doi.org/10.3390/SU8010063>
- Dowling, J., & Pfeffer, J. (1975). Organizational Legitimacy: Social Values and Organizational Behavior. *The Pacific Sociological Review*, 18(1), 122–136. <https://doi.org/10.2307/1388226>
- Dwekat, A., Meqbel, R., Seguí-Mas, E., & Tormo-Carbó, G. (2022). The role of the audit committee in enhancing the credibility of CSR disclosure: Evidence from STOXX Europe 600 members. *Business Ethics, Environment and Responsibility*, 31(3), 718–740. <https://doi.org/10.1111/beer.12439>
- Elsayih, J., Datt, R., & Tang, Q. (2021). Corporate governance and carbon emissions performance: empirical evidence from Australia. *Australasian Journal of Environmental Management*, 28(4), 433–459. <https://doi.org/10.1080/14486563.2021.1989066>
- ESMA report on trends, risks and vulnerabilities No 1 2023*. (2023). Retrieved May 25, 2025, from <https://www.esma.europa.eu/document/esma-report-trends-risks-and-vulnerabilities-no-1-2023>
- European Parliament and Council*. (2022). <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022L2381>
- Freeman, R. E. (2010). *Strategic Management: A Stakeholder Approach*. Cambridge University Press. <https://doi.org/10.1017/CBO9781139192675>

- Frias-Aceituno, J. V., Rodriguez-Ariza, L., & Garcia-Sanchez, I. M. (2013). The Role of the Board in the Dissemination of Integrated Corporate Social Reporting. *Corporate Social Responsibility and Environmental Management*, 20(4), 219–233. <https://doi.org/10.1002/csr.1294>
- Galbreath, J. (2010). Corporate governance practices that address climate change: An exploratory study. *Business Strategy and the Environment*, 19(5), 335–350. <https://doi.org/10.1002/bse.648>
- 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(6), 784–803. <https://doi.org/10.1108/IJLMA-05-2016-0049>
- Gonenc, H., & Krasnikova, A. V. (2022). Board Gender Diversity and Voluntary Carbon Emission Disclosure. *Sustainability (Switzerland)*, 14(21). <https://doi.org/10.3390/su142114418>
- Gonzalez, J., & Ramírez, C. (2016). Voluntary carbon disclosure by Spanish companies: an empirical analysis. *International Journal of Climate Change Strategies and Management*, 8(1), 57–79. <https://doi.org/10.1108/IJCCSM-09-2014-0114>
- Goud, N. (2022). Corporate governance: Does it matter management of carbon emission performance? An empirical analyses of Indian companies. *Journal of Cleaner Production*, 379. <https://doi.org/10.1016/j.jclepro.2022.134485>
- Gray, R., Kouhy, R., & Lavers, S. (1995). CSR: a review of the literature 47 Corporate social and environmental reporting A review of the literature and a longitudinal study of UK disclosure. *Accounting, Auditing & Accountability Journal*, 8(2), 47–77. <https://doi.org/https://doi.org/10.1108/09513579510146996>
- Haigh, M., & Shapiro, M. (2012). Carbon reporting: Does it matter? *Accounting, Auditing and Accountability Journal*, 25(1), 105–125. <https://doi.org/10.1108/09513571211191761/FULL/XML>

- Haque, F. (2017). The effects of board characteristics and sustainable compensation policy on carbon performance of UK firms. *British Accounting Review*, 49(3), 347–364. <https://doi.org/10.1016/j.bar.2017.01.001>
- He, P., Shen, H., Zhang, Y., & Ren, J. (2019). External pressure, corporate governance, and voluntary carbon disclosure: Evidence from China. *Sustainability (Switzerland)*, 11(10). <https://doi.org/10.3390/su11102901>
- Houqe, M., & Khan, H. (2023). What determines the quality of carbon reporting? A system-oriented theories and corporate governance perspective. *Business Strategy and the Environment*, 32(6), 3197–3216. <https://doi.org/10.1002/bse.3295>
- Hu, M., & Loh, L. (2018). Board governance and sustainability disclosure: A cross-sectional study of Singapore-listed companies. *Sustainability (Switzerland)*, 10(7). <https://doi.org/10.3390/su10072578>
- Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4), 305–360. [https://doi.org/10.1016/0304-405X\(76\)90026-X](https://doi.org/10.1016/0304-405X(76)90026-X)
- Karim, A. E., Albitar, K., & Elmarzouky, M. (2021). A novel measure of corporate carbon emission disclosure, the effect of capital expenditures and corporate governance. *Journal of Environmental Management*, 290. <https://doi.org/10.1016/j.jenvman.2021.112581>
- Khairunnisa, A., Astuti, C. D., & Hussein, M. A. (2024). The Influence of Board Diversity and Environmental Committees on Carbon Emission Disclosures in Southeast Asian Corporations. *Journal of Green Economy and Low-Carbon Development*, 3(1), 26–35. <https://doi.org/10.56578/jgelcd030103>
- Khaq, N., Sasongko, N., & Triyono, D. (2022). The Effect of Earning Management on Carbon Emmision Disclosure with Corporate Governance as a Moderation Variable. *In International Conference on Economics and Business Studies (ICOEBS 2022)*, 218, 128–144. <https://doi.org/10.2991/aeblr.k.220602.018>

- Kılıç, M., & Kuzey, C. (2019). The effect of corporate governance on carbon emission disclosures: Evidence from Turkey. *International Journal of Climate Change Strategies and Management*, 11(1), 35–53. <https://doi.org/10.1108/IJCCSM-07-2017-0144>
- Kumar, K., Kumari, R., Nandy, M., Sarim, M., & Kumar, R. (2022). Do ownership structures and governance attributes matter for corporate sustainability reporting? An examination in the Indian context. *Management of Environmental Quality: An International Journal*, 33(5), 1077–1096. <https://doi.org/10.1108/MEQ-08-2021-0196>
- Lahyani, F. (2022). Corporate board diversity and carbon disclosure: evidence from France. *Accounting Research Journal*, 35(6), 721–736. <https://doi.org/10.1108/ARJ-12-2021-0350>
- Lending, C. C., & Vähämaa, E. (2017). European board structure and director expertise: The impact of quotas. *Research in International Business and Finance*, 39, 486–501. <https://doi.org/10.1016/j.ribaf.2016.09.004>
- Liao, L., Luo, L., & Tang, Q. (2015). Gender diversity, board independence, environmental committee and greenhouse gas disclosure. *British Accounting Review*, 47(4), 409–424. <https://doi.org/10.1016/j.bar.2014.01.002>
- Luo, L., & Tang, Q. (2014). Does voluntary carbon disclosure reflect underlying carbon performance? *Journal of Contemporary Accounting and Economics*, 10(3), 191–205. <https://doi.org/10.1016/j.jcae.2014.08.003>
- Mahmood, Z., Kouser, R., Ali, W., Ahmad, Z., & Salman, T. (2018). Does corporate governance affect sustainability disclosure? A mixed methods study. *Sustainability (Switzerland)*, 10(1). <https://doi.org/10.3390/su10010207>
- Majid, J., Che Adam, N., Ab Rahim, N., & Razak, R. (2023). CEO power, regulatory pressures, and carbon emissions: An emerging market perspective. *Cogent Business and Management*, 10(3). <https://doi.org/10.1080/23311975.2023.2276555>

- Martín, J., & Herrero, B. (2020). Do board characteristics affect environmental performance? A study of EU firms. *Corporate Social Responsibility and Environmental Management*, 27(1), 74–94. <https://doi.org/10.1002/csr.1775>
- Mensah, J. (2019). Sustainable development: Meaning, history, principles, pillars, and implications for human action: Literature review. *Cogent Social Sciences*, 5(1). <https://doi.org/10.1080/23311886.2019.1653531>
- Narsa Goud, N. (2022). Corporate governance: Does it matter management of carbon emission performance? An empirical analyses of Indian companies. *Journal of Cleaner Production*, 379. <https://doi.org/10.1016/j.jclepro.2022.134485>
- Nuber, C., & Velte, P. (2021). Board gender diversity and carbon emissions: European evidence on curvilinear relationships and critical mass. *Business Strategy and the Environment*, 30(4), 1958–1992. <https://doi.org/10.1002/bse.2727>
- Okudo, A., & Amahalu, N. (2021). Corporate Governance and Carbon Disclosure Practices of Quoted Manufacturing Firms in Nigeria. *Article in International Journal of Contemporary Research and Review*, 12(7), 20420–20433. <https://doi.org/https://doi.org/http://ijcrr.info/index.php/ijcrr/article/view/908/897>
- Orazalin, N., Kuzey, C., Uyar, A., & Karaman, A. (2024). Does CSR contribute to the financial sector's financial stability? The moderating role of a sustainability committee. *Journal of Applied Accounting Research*, 25(1), 105–125. <https://doi.org/10.1108/JAAR-12-2022-0329>
- Oware, K., & Awunyo-Vitor, D. (2021). CEO characteristics and environmental disclosure of listed firms in an emerging economy: Does sustainability reporting format matter? *Business Strategy and Development*, 4(4), 399–410. <https://doi.org/10.1002/bsd2.166>
- Oyewo, B. (2023). Corporate governance and carbon emissions performance: International evidence on curvilinear relationships. *Journal of Environmental Management*, 334. <https://doi.org/10.1016/j.jenvman.2023.117474>

- Park, J., Lee, J., & Shin, J. (2023). Corporate governance, compensation mechanisms, and voluntary disclosure of carbon emissions: Evidence from Korea. *Journal of Contemporary Accounting and Economics*, 19(3).<https://doi.org/10.1016/j.jcae.2023.100361>
- Pattberg, P. (2017). The emergence of carbon disclosure: Exploring the role of governance entrepreneurs. *Environment and Planning C: Politics and Space*, 35(8), 1437–1455. <https://doi.org/10.1177/2399654417723341>
- Prado-Lorenzo, J. M., Rodríguez-Domínguez, L., Gallego-Álvarez, I., & García-Sánchez, I. M. (2009). Factors influencing the disclosure of greenhouse gas emissions in companies world-wide. *Management Decision*, 47(7), 1133–1157. <https://doi.org/10.1108/00251740910978340>
- Prasetyo, P., & Mimba, N. P. (2021). The Effect of Good Corporate Governance, Company Size, and Profitability on Carbon Emission Disclosure. *International Journal of Scientific and Research Publications (IJSRP)*, 11(6), 781–786. <https://doi.org/10.29322/ijsrp.11.06.2021.p114101>
- Shaukat, A., Qiu, Y., & Trojanowski, G. (2016). Board Attributes, Corporate Social Responsibility Strategy, and Corporate Environmental and Social Performance. *Journal of Business Ethics*, 135(3), 569–585. <https://doi.org/10.1007/s10551-014-2460-9>
- Simamora, R., Safrida, & Elviani, S. (2022). Carbon emission disclosure in Indonesia: Viewed from the aspect of board of directors, managerial ownership, and audit committee. *Journal of Contemporary Accounting*, 4(1), 1–9. <https://doi.org/10.20885/jca.vol4.iss1.art1>
- Stechemesser, K., & Guenther, E. (2012). Carbon accounting: a systematic literature review. *Journal of Cleaner Production*, 36, 17–38. <https://doi.org/10.1016/J.JCLEPRO.2012.02.021>
- Suchman, M. (1995). Managing Legitimacy: Strategic and Institutional Approaches. *Academy of Management Review*, 20(3), 571–610. <https://doi.org/10.5465/amr.1995.9508080331>

- Tagliatalata, J., Pirazzi Maffiola, K., Barontini, R., & Testa, F. (2023). Board of Directors' characteristics and environmental SDGs adoption: an international study. *Corporate Social Responsibility and Environmental Management*, 30(5), 2490–2506. <https://doi.org/10.1002/csr.2499>
- The European Green Deal - European Commission.* (2021). https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en
- Thomas, C. (2015). *Naturalizing Sustainability Discourse: Paradigm, Practices and Pedagogy of Thoreau, Leopold, Carson and Wilson* [Arizona State University]. <https://www.proquest.com/openview/fc09d90eeec6524483766ae5145b4e54/1?pq-origsite=gscholar&cbl=18750>
- Tila, S., & Augustine, Y. (2019). The Effect of Corporate Governance, Green Strategy and Carbon Risk Management Toward Carbon Emission Disclosure (Listed Company in and Out on Calculation Indeks Sri Kehati in IDX Periode 2016-2017). *European Journal of Business and Management*, 11(23). <https://doi.org/10.7176/EJBM>
- 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(6), 2194–2210. <https://doi.org/10.1002/bse.2495>
- UN Climate Change Annual Report 2018.* (2018). <https://unfccc.int/sites/default/files/resource/UN-Climate-Change-Annual-Report-2018.pdf>
- Velte, P. (2021). Environmental performance, carbon performance and earnings management: Empirical evidence for the European capital market. *Corporate Social Responsibility and Environmental Management*, 28(1), 42–53. <https://doi.org/10.1002/csr.2030>

Wang, D., Huang, Y., Guo, M., Lu, Z., Xue, S., & Xu, Y. (2023). Time dynamics in the effect of carbon information disclosure on corporate value. *Journal of Cleaner Production*, 425, 138858. <https://doi.org/10.1016/J.JCLEPRO.2023.138858>

Zhen, Z., & Lu, B. (2024). The impact of green finance on corporate carbon disclosure: Financial regulation as a moderator. *Finance Research Letters*, 63(105273). <https://doi.org/10.1016/j.frl.2024.105273>



جامعة النجاح الوطنية
كلية الدراسات العليا

حوكمة الشركات والإفصاح عن انبعاثات الكربون: الدور المعدل للجنة الاستدامة

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قدمت هذه الرسالة استكمالاً لمتطلبات الحصول على درجة الماجستير في المحاسبة، من كلية الدراسات العليا، في جامعة النجاح الوطنية، نابلس-فلسطين.

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الملخص

تستكشف هذه الدراسة كيف تؤثر آليات حوكمة الشركات، وخاصة خصائص مجلس الإدارة، على الإفصاح عن انبعاثات الكربون (CED). ونظرًا لمطالب أصحاب المصلحة بالشفافية والضغط التنظيمية التي تؤكد على المساءلة البيئية، تلعب هياكل الحوكمة دورًا حاسمًا في تعزيز الأداء البيئي. وتوسع الدراسة إلى فهم كيف تؤثر عوامل مثل استقلال مجلس الإدارة (Independence) والتنوع بين الجنسين (Gender) وحجم المجلس (Size) واجتماعات المجلس (Meeting) وازدواجية الرئيس التنفيذي (CEO Duality) ووجود لجنة للاستدامة (Sustainability Committee) على الإفصاح عن انبعاثات الكربون. وأجري التحليل باستخدام عينة من 513 شركة مأخوذة من مؤشر STOXX Europe 600، وتمتد إلى 17 دولة. وتشتمل على 4617 ملاحظة سنوية للشركة تم جمعها من عام 2015 إلى عام 2023، تم الحصول على البيانات من قاعدة بيانات "Asset4- LSEG Workspace". أظهرت النتائج أن استقلالية مجلس الإدارة، والتنوع بين الجنسين، واجتماعات المجلس، وحجمه، لها تأثير إيجابي على الإفصاح عن انبعاثات الكربون، وتؤكد أن مجالس الإدارة النشطة ذات التنوع المحدد تُسهم في تحقيق الشفافية التي تتجاوز الامتثال القانوني. في المقابل، ترتبط ازدواجية الرئيس التنفيذي بعلاقة سلبية مع الإفصاح، مما يشير إلى أن ترسيخ القيادة قد يعيق جهود الشفافية.

بالإضافة إلى ذلك، يبدو أن وجود لجنة الاستدامة يُعدّل بشكل كبير تأثير العديد من خصائص مجلس الإدارة، باستثناء استقلالية المجلس، مما يُبرز دورها المعقّد في تحسين الإفصاح عن انبعاثات الكربون. وتُبرز الدراسة دلالات عملية لأطر الحوكمة بهدف التوافق مع التغيّرات في توقّعات الاستدامة والمتطلبات التنظيمية.

الكلمات المفتاحية: الإفصاح عن انبعاثات الكربون (CED)، تنوع مجلس الإدارة، حوكمة الشركات، لجنة الاستدامة، أوروبا.