EFFECTS OF CORPORATE GOVERNANCE ON CORPORATE ENVIRONMENTAL PERFORMANCE: INTERNATIONAL EVIDENCE

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Abstract

Corporate environmental performance (CEP) has arisen as a critical component of modern corporate governance, showing an organization's commitment to sustainable practices and impact on the larger ecological setting. This study examines the multidimensional nature of CEP, including its determinants, ramifications, and theoretical frameworks for measurement and development. Using agency theory and stakeholder theory as foundations, the study investigates the duties and responsibilities of corporate boards, the interactions between management and shareholders, and the broader public expectations that influence company activity. Within the corporate governance and its factors our empirical analysis examines the effects of corporate environmental performance in global perspectives. We follow the Global Reporting Initiative (GRI) guidelines (G5) and extract the data from Thomson Reuters EIKON and Bloomberg of the period of 2000 to 2022. We will evaluate the Corporate Environmental performance of 75 countries, including 7875 firms. We will construct the panel for the data for estimations of model. Furthermore, we will try to examine which factor of corporate governance have the most significant impact on corporate environmental performance and then suggest the policy for the management and policy maker according to Agency and Stakeholder theory. It will be comprehensive research and results will help to take initiative for the green and clean environment by year of 2030 which is the Agenda of United Nation 2015 in Sustainable Development Goals (SGD).

The fixed effect methodology is a fundamental methodological approach used in this study to compensate for unobserved heterogeneity by accounting for time-invariant characteristics across enterprises. This method allows for a more precise evaluation of the impact of numerous governance variables on CEP, offering substantial insights into the determinants of environmental performance. The study also emphasizes the importance of consistent reporting formats in improving CEP. The Global Reporting Initiative (GRI) guidelines, known for their comprehensive approach to sustainability reporting, serve as a reference point in this regard. However, the changing nature of environmental concerns and stakeholder expectations needs the ongoing development of these standards. Building on the current GRI framework, the study suggests

improvements to better capture the intricacies of modern environmental performance measurements.

Key recommendations include more specific indicators of resource efficiency, pollution management, and climate change mitigation. Furthermore, the revised approach promotes greater transparency and comparability, allowing stakeholders to make more informed assessments of corporate environmental consequences. By combining these enhancements, the new GRI framework hopes to promote more effective and accountable environmental stewardship in the corporate sector.

In conclusion, this research conducts a comprehensive analysis of CEP via the perspectives of corporate governance, agency theory, and stakeholder theory, using the fixed effect technique to assure methodological rigor. The rejection of the hypothesized effects of board size and CEO duality on CEP emphasizes the necessity for a more comprehensive evaluation of governance variables. Furthermore, the proposed changes to the GRI rules aim to encourage more rigorous and open environmental reporting, aligning corporate practices with the growing demand for sustainability and accountability.

Keywords: Corporate Governance, Board size, CEO duality, Corporate Environmental Performance, Agency theory, Stakeholder theory, Sustainability reporting, GRI framework

CHAPTER 1

1 Introduction

Corporate governance has its origins in ancient cultures, where early kinds of economic enterprises were present. However, the advanced concept of corporate governance emerged in the late 20th century in response to corporate scandals, financial crises, and the need for improved oversight. Key milestones in the historical development of corporate governance (Cadbury, 1992; Chang et al., 2019), and the global financial crisis (2007-2008). These events led to significant reforms and increased focus on enhancing corporate governance practices worldwide.

Corporate governance is a set of rules, procedures, and processes that direct and manage a company's operations. It refers to the interactions between a company's management, board of directors, shareholders, and other stakeholders. The main purpose of corporate governance is to provide openness, accountability, and the protection of shareholders' interests (Cadbury, 1992). Researchers confirm that the best characteristics of corporate governance are helping the business to become stable in long run by their efficient and effective decision making and implementation. These effectiveness may include the accountability, integrity, and transparency of the business (Spitzeck, 2009). As there has been definite enhancement in the role of corporate governance, likewise there is a rise in interest of sustainability concept.

Corporate governance is crucial for a number of reasons, including protecting stakeholder interests, enhancing transparency and accountability, reducing agency issues, risk management and financial stability, enhancing performance and value creation, regulatory compliance, and reputation management (Shleifer and Vishny, 2007; Tricker, 2015).

Moreover, corporate governance places a strong emphasis on upholding and advancing shareholder rights. These rights include the assurance of fairness, equal access to information, the right to cast a vote on important issues, and the capacity to participate in corporate decisions. Companies are expected to give shareholders and stakeholders timely, accurate, and pertinent information. According to Galbreath (2011), the board of directors plays a significant role in corporate governance. They are in charge of managing the staff, establishing the company's strategic goals, and taking important

decisions. The board must act in the best interests of the shareholders for whom it is responsible.

Similarly, corporate governance interpret that companies are responsible for their actions and performance. Independent audits and financial reporting are critical to providing assurance and maintaining the credibility of financial information. Companies should actively engage and Consider the interests of multiple stakeholders, such as employees, customers, suppliers, and the community. Stakeholder engagement helps in decision-making, risk mitigation, and fostering long-term sustainability. Vig and Datta (2021) state that transparent reporting helps build trust, enables informed decision-making, and reduces information asymmetry. Corporate governance involves upholding high ethical standards and promoting integrity in all aspects of business operations. This includes promoting responsible and sustainable practices, preventing conflicts of interest, and avoiding fraud and corruption. Cornett et al. (2007) further add that successful corporate governance requires the implementation of comprehensive risk management systems that assist organizations in identifying, assessing, and managing risks in order to protect the interests of shareholders and stakeholders.

Prior studies including Chireka & Fakoya (2017) and Shabbir et al. (2016) explore that corporate governance mechanisms help mitigate agency problems that may arise due to the separation of ownership and control in corporations. These systems, including as independent boards, executive compensation schemes, and shareholder rights, align the interests of management with those of shareholders, reducing conflicts of interest.

Temminck et al. (2015) state that concerns regarding social, environmental and ethical performance of the firms are increasing globally. Similarly, Z. Li et al. (2023) suggest that effective relationship between stakeholder and the government will have possible by effective environmental regulations. These regulatory tools will enhance the ability to respond to public opinion crises, corporate resource preparation to condemn the emission level and pollution intensity. Additionally, Chams & García-Blandón (2019) emphasis on the reduction of carbon emission, efficient use of natural resources like water, wood, fuel and raw material and improving new energy investment or substituted energy, El Ghoul et al. (2018) and Zhou et al. (2021) state that some of the firms concentrated to adapt the “green strategies” to add value in environmental performance.

There is an increase focus of the United Nation on Environmental sustainability and good corporate governance as discussed by (Goubran et al., 2023).

Competent authorities of the firms are trying to make good corporate governance initiatives, rules, practice and planning to control carbon emission with the help of staggered boards. These staggered boards being employed to protect the managers and explore the business strategy to control carbon emission. (Tanthanongsakkun et al., 2023). Likewise, de Villiers et al., (2011) state that scholars, policy makers and practitioners have given more attentions to corporate governance issues.

Tambunan (2007) state that the survival of a business is not just rely on good financial performance because other factors such as environmental performance are also important for the survival of the business in the long term. Prabandari and Suryanawa (2014), found that social and environmental performance of a company has a positive effect on investor reactions.

Furthermore, corporate governance has been identified as an important aspect in determining company environmental performance. According to Aggarwal et al. (2011), a company's governance influences its commitment to environmental sustainability, resource management, and total environmental effect. The composition of the board of directors, particularly the inclusion of independent directors with environmental experience, has been shown to improve a company's environmental performance. These directors provide vital insights and recommendations on sustainable practices, as well as helping to create the company's environmental strategy.

Moreover, the attitudes and values of the Chief Executive Officer (CEO) towards the environment which influence a company's environmental performance. CEOs who prioritize sustainability and integrate it into the corporate strategy tend to promote environmentally responsible practices throughout the organization. According to (Delmas & Burbano, 2011) and (Manrique & Martí-Ballester, 2017), corporate governance mechanisms, such as ownership structure, influence a company's long-term orientation towards sustainability. Companies with long-term shareholders, such as institutional investors, are more likely to prioritize environmental considerations in their decision-making and strategic planning.

Strong corporate governance policies encourage the transparency and dissemination of environmental information. Companies that publish their environmental performance

and impacts are more likely to receive scrutiny and criticism from stakeholders, causing them to improve their environmental practices (Laksmana, 2008). Independent and active boards are more likely to emphasize environmental issues and effectively monitor environmental management practices. Board independence has been linked to improved business environmental performance (Braam et al., 2016). Strong environmental performance will provide a competitive advantage by attracting environmentally conscious customers, investors, and business partners. Corporate governance frameworks that prioritize environmental performance, help in positioning the company as a responsible and sustainable player in the market, differentiating it from competitors (Alsayegh et al., 2020).

In today's world, environmental challenges and a growing awareness of corporate responsibility are the primary topics of company strategy, public disclosure, and academic research. The link between corporate governance and corporate environmental performance has prompted investors, legislators, academics, and the general public to pay more attention to how businesses operate and how their actions impact the environment. Prior research (N. Hussain, Rigoni, & Cavezzali, 2018; Rechner & Dalton, 1991) emphasizes that the relationship between corporate governance and environmental performance is significant because it allows companies to effectively manage environmental risks, meet stakeholder expectations, comply with regulations, improve their reputation, and gain a competitive advantage in a sustainably focused business landscape.

1.1 Problem Statement

In the previous study the effects of Corporate Governance have been done in three dimensions like environmental, social and economic. While corporate environmental performance is the ignored area and limited work have been done in view of corporate governance. That is why, we have chosen determination of CEP and it’s the Agenda of United Nation 2015 in Sustainable Development Goals, to protect and take initiative to make environment green and clean, end poverty and guaranteed prosperity by year 2030.

1.2 Objective of Research Study

The main focus of this study is to determine the effects of CG on CEP. More specifically the objectives are:

- to examine the relationship effect of CG on CEP.

- to examine and quantify the relationship between CG mechanisms, such as board size, CEO duality, board independence, women on board and board meeting on CEP across a diverse set of global companies.

1.3 Research Questions

The following research questions are aimed to satisfy the aforementioned objectives:

- What is the relationship between CG mechanisms and CEP globally?
- What are the CG factors that have the most significant impact on CEP?

1.4 Significance of the Study

By examining global evidence, the study proposed a comprehensive result of how corporate governance effects the environmental performance globally. This will help in developing customized governance strategies for all the concerned. Furthermore, as the world is struggling toward achieving United Nations Sustainable Development Goals (SDGs), this study will provide practical insights into how the companies achieve their environmental objectives.

1.5 Organization of the Study

In order to determine the effects of CG on CEP. Chapter 1 discusses Introduction, background and problem statement of the study. Chapter 2 will include relevant literature review. Then in chapter 3 data base used and methodology adopted is presented. In Chapter 4 results and discussions are given. Chapter 5 presents conclusion of the study. Finally, in last chapter limitations and policy implications of the study are given.

CHAPTER 2

2 Literature Review and Hypothesis Development

Appraisal of existing research multilevel theories support our research like Agency theory (Jensen, 1986) which is used to understand the relationships between agents (management) and principals (shareholders), Stake holder theory (Hill & Jones, 1992). With the help of respective theories, we will investigate that how the literature will support the hypothetical basis of corporate governance and corporate environmental performance relationships.

2.1 Agency Theory

The agency hypothesis, proposed by Jensen and Meckling in 1976, proposes that CG mechanisms play an important role in minimizing agency difficulties and aligning managers' objectives with those of shareholders, including the pursuit of CEP. Key governance mechanisms include board structures, executive compensation, and ownership structure, among others. Board structures have been identified as influential in shaping corporate environmental performance. Independent and diverse boards, with directors possessing relevant environmental expertise and knowledge, are more likely to monitor and guide management towards environmentally responsible practices. They can provide oversight, establish strategic goals, and ensure accountability for environmental performance.

Similarly, (Haniffa & Cooke, 2005) stated that agency theory purpose is to better the agency relationship and resolve the conflict that has been arise in any corporate governance structure. The agent characterizes the principal in a particular business transaction or activity and is expected to represent the best interests of the principal without regard for self-interest. Agency theory ample the effectiveness of corporate governance which improve the firm’s efficiency to defend the upcoming challenges and condense the agency problems which agents (management) and principle (stock holder) are facing Additionally, leading paradigms in corporate governance research, agency theory suggest about fall short in explanation the reasons / addition or subtraction of social targets which may be encompassed in corporate strategic goals. (Vergara Garavito & Chión, 2021). Moreover, (J. Li et al., 2008) explained that to improve the internal efficiency of corporate governance there must be hold on agents action and they are accountable for their own action or decisions. According stakeholder-agency

theory (Hill & Jones, 1992), a firm is responsible to accommodate all its stakeholder and control through its corporate decisions which is directly controlled by mangers and centralized system. Therefore, there is always need a strong corporate governance to portrait and fulfill the need of stakeholder and bilateral relationship in between agents and principle. (De Graaf & Stoelhorst, 2013; Gosselin et al., 2014).

Executive compensation is another corporate governance instrument (Liu, 2019) that might influence business environmental performance. Aligning executive compensation packages with environmental performance indicators, such as targets for reducing greenhouse gas emissions or improving energy efficiency, might encourage managers to prioritize sustainability. This guarantees that environmental concerns are factored into managerial decision-making processes.

Additionally, with the reference to (Galbreath et al., 2022) ownership structure is also play a role in impacting CEP. Institutional investors, with their long-term investment horizons and influence, can advocate for sustainable practices and encourage firms to prioritize environmental performance. Moreover, ownership concentration, when dispersed and diverse, can promote better governance and accountability, reducing the likelihood of agency problems and improving environmental outcomes.

Overall, agency theory offers a framework for analyzing the relationship between corporate governance and environmental performance. It emphasises the need of governance structures in aligning managers' and shareholders' interests, particularly in terms of environmental sustainability. Organizations can mitigate agency difficulties and strengthen their commitment to environmental stewardship by putting suitable governance measures in place.

2.2 Stakeholder theory

Stakeholder theory, as defined by Hill and Jones (1992), is a useful paradigm for understanding the relationship between corporate governance and environmental performance. Stakeholder theory holds firms accountable not only to their shareholders, but also to a broader set of stakeholders such as employees, customers, suppliers, communities, and the environment. This idea proposes that taking into account and managing the interests and concerns of all stakeholders can lead to better corporate environmental performance. According to stakeholder theory, in addition to

shareholders, firms are accountable to other stakeholders such as employees, clients, environmental authorities, and governments.

According to Freeman (1984), corporate governance focuses on the impact of business activities on all distinct stakeholders in the firm. This idea proposes that corporate management (officers and directors) consider the interests of each stakeholder during the governance process. Respective theories have been proposed to explain the impact of corporate governance on environmental performance. Consequently, it is favorable condition that access the agent and principle thoroughly, maximize the wealth of shareholder and reduce the conflict in between corporate managers and stake holder. (Halme & Huse, 1997; Poletti-Hughes & Briano-Turrent, 2019; Schillemans & Bjurstrøm, 2020). Corporate environmental performance is determined through the number of meetings demanded by the multiple stakeholders to satisfy the stakeholders demand at least in favor of the firm to reduce the cost of unavoidable loss of doing business. For instance, stakeholders suggest that corporate environmental performance should positively reflect firms' corporate governance parameters. On the base of these arguments, we can implicated stakeholder theory to analyses the effect of positive impact of CG on CEP (Brouwers, 2014; Godos-Díez, 2018).

Empirical evidence supports stakeholder theory's influence on CEP. For example, a study by (Aguilera et al., 2007) discovered that enterprises with higher levels of stakeholder governance, as measured by stronger stakeholder orientation and stakeholder representation, were more likely to implement ecologically friendly practices.

Another study (Kassinis & Vafeas, 2006) investigated the effect of board composition on CEP. According to the findings, boards with more stakeholder representation, including environmental experts, perform better on environmental metrics.

While stakeholder theory emphasizes the need of taking into account the interests of diverse stakeholders, including the environment, these interests must be balanced against the requirement for financial sustainability. According to Jamali (2008), corporate governance should strike a balance between stakeholder expectations and the corporation's long-term financial interests.

In conclusion, stakeholder theory provides important insights into the link between corporate governance and CEP. Corporate decision-making procedures and practices can be aligned with environmental concerns by recognizing and engaging with a varied variety of stakeholders. Empirical data demonstrates that stakeholder-focused governance frameworks, such as diverse boards and stakeholder engagement, help to improve environmental performance. However, organizations continue to face significant challenges in striking the right balance between stakeholder interests and financial sustainability.

2.3 Review of Literature

This literature review explores the existing research and knowledge on how corporate governance factors influences CEP with reference to global evidence. Before the modern era there is a lot of work have been done on social and economic perspectives. This critical review objective to analyze and evaluate the existed literature on the effects of corporate governance on CEP, in light of methodologies, key finding, and areas for further research. Measuring and assessing CEP is crucial for effective management and reporting. In consonance with (Siew, 2015) various frameworks and standards have been developed to guide organizations in evaluating their environmental impact. Examples include the Global Reporting Initiative (GRI), the Carbon Disclosure Project (CDP), and ISO 14001, which provides a framework for environmental management systems (EMS). These frameworks assist organizations in setting targets, monitoring progress, and reporting their environmental performance to stakeholders.

There was an ongoing debate about social and economic sustainability, as influenced by corporate governance. Board meetings, particularly the makeup of the board of directors, have gained significant attention in studies on corporate governance and corporate social performance. According to (Flammer, 2015), independent directors on boards have a good association with corporate social performance. As a result, enterprises with a higher number of independent directors have stronger social performance; these directors approached the challenges constructively and solved them with complete concentration and commitment through their positive decision making.

Another research by (Cheng, 2008) illustrated that executive compensation linked to corporate governance tend to exhibit higher social performance. These initiatives motive the executive for social goals and support the managers to fulfill the social

responsibility. Due to activism of shareholder, it has developed as a significant path of corporate social performance. Activist shareholders, are social and help the motivate the investor to invest and advocate the firm to offer and adopt the socially responsible practice. The previous study of (Karpoff, 2001) shareholder activism is help and associated to import the firm social responsibility. Like, positive change in the behavior, transparency, socials responsibility and loyalty of managers and decision makers.

There is another social factor which attracts the relationship between corporate governance is board characteristics. Like, legal frameworks, cultural norms, and social expectations indicates that how the management made mechanism to operate in different part of the world. The study (Xie et al., 2019) instantiate the linkage between the board characteristics and corporate social responsibility that regulatory oversight and social awareness are the major goals of higher management.

Likewise, in extensive research corporate governance and economic results has been the main discussion of researcher related to fields of management, finance and economics. It has been discussed in details in almost every decade. The expectation from independent directors is higher in sense of unbiased oversights, positive leadership and enhanced decision-making process. The research (Daily & Dalton, 1992) and (Yermack, 1996) recomend a positive relationship between the quadrant of involvement in decision making by independent directors and financial performance. It's also contributed to prove better economic outcomes and importance of board independence in corporate governance practices. Instead of this, executive compensation plays important role in economic performance like bonuses, stock option and funds. In order to this idea (Bebchuk & Fried, 2003) exemplify the significance of executive compensation with the firm performance. The firms which have goal to invest in long term financial goals leads to get better economic outcomes and encapsulate the importance of corporate governance practices.

Furthermore, board diversity interprets the positive correlation with corporate economic performance. The study (Adams & Ferreira, 2009) postulate that the firms associated with the factor of board diversity like gender, professional background and ethnicity are positive play the important role in economic performance and enhance the strategic plan as well. In addition to this another factor like CEO turnover plays positive role in corporate economic performance. Research (Fonseca et al., 2014) illustrated that

effective succession plan of CEO leads to help in building investor confidence and maintain economic stability. Likewise, impact of legal framework is also having impact on the economic performance of the firms positively. The study (Wang & Coffey, 1992) focused on the role of legal frameworks in succession of corporate economic performance. Strong legal frame work of the countries give confidence to the investors and stakeholder to shape up the economic growth.

In addition, institutional investor also boosts up the economic performance, it includes the mutual fund, pension funds and insurance companies which is considered the main structure of the corporate governance. The research (Shleifer & Vishny, 2007) elaborated the positive association of the institutional investor and corporate economic performance. Firm which has trustworthy and significant stakes often promote the governance reforms, finalized the managerial accountability and operational activities.

The literature on environmental performance almost unanimously agree to fact that environmental practices of the firm plays an important role and it becomes the major issue in the society, as perspective of stakeholder they are expecting environmental sustainability which secure their stakes in the firms. (Delmas & Toffel, 2008). To get employee turnover, less the operating cost and improve the effectiveness resource firms, take special steps and initiative to build better environmental performance mechanisms. Firms with Environmental performance have great benefits of environmental sustainability products, goods and services (Berrone, 2009). According to Price Water House Study (2008), over 40% of the higher executisve agree to this results that “green movements” have positive impact on the market opportunities. (Stout et al., 2008). In addition to that, already World Business Council for Sustainable Development (2002) proves that strong environmental performance will help to efficient use of resources like fuel, energy and water and minimizing of the environmental resources cost. In other words, we can say better environmental performance will reduce the cost or cost efficient. (Berrone & Gomez-Mejia, 2009).

According to (Fryxell & Wang, 1994; P. W. Roberts & Dowling, 2002) the hypothesis recomend that there is a positive relationship between strong CG practices and CEP, indicating that companises with robust governance structures are likely to exhibit superior environmental performance outcomes. Likewise another research interpreted (Aguilera et al., 2007) the development of a comprehensive framework for studying the

relationship between CG and CEP involves integrating multiple theoretical perspectives, such as agency theory, stakeholder theory, and resource dependence theory, to provide a holistic understanding of the structure and factors at play.

Furthermore, the framework adds contextual elements, such as industry features, regulatory frameworks, and stakeholder pressures, to analyze their impact on the relationship between CG and CEP. (Judge and Douglas, 1998; Cheng, 2008). Several recent research have looked into the acceptability and reliability of the relationship between corporate governance and environmental performance. The environmental portfolio encompasses energy, water, materials, biodiversity, emissions, product and service waste, compliance with environmental rules, measures, and product transportation. (N. Hussain, Rigoni, and Orij, 2018).

In Pakistan context, the critical review shows significant attention and implication hold particular relevance. As the country seeks and initiate the balance economic growth with environmental sustainability. In the recent years, the implication of environmental consideration in to corporate governance need to be explored. However, recent research (Rasheed et al., 2019) suggests positive significance between certain corporate governance like board independence with CEP. Furthermore, it has potential for governance practices which leads to eco-friendly environment.

Despite the findings of challenges (Asif et al., 2023), Pakistan faces unique socio-economic problems as compare to other globe. It has some reasons to adopt the eco-friendly practices like lack of awareness, regulatory gaps, and limited resources which pose hurdle in environmental practice even supportive governance structure. Another research (Munir et al., 2019) posture the stakeholder engagement as a critical factor in Pakistani firms. In addition, the firms with strong relationship with stakeholder may better to set the corporate governance initiatives. However, the efforts may effect positive to the environmental performance. (S. Hussain et al., 2020) suggests the regulatory framework and enforcement are intricately linked with CEP. A comprehensive legal framework that implies corporate governance and environmental requirement have made more structured approach to develop environmental practices.

We also find the previous studies relationship and contribution as the CG and CEP has been a topic of extensive research, and several key contributions have emerged from these studies. There are some notable research contributions regarding the relationship

between CG and CEP. According to (Rasheed, 2019) research has contributed to understanding the mechanisms through which corporate governance influences environmental performance. It has identified specific governance mechanisms, such as board independence, board diversity, CEO characteristics, and shareholder activism, that affect a company's environmental practices and outcomes. Likewise, (R. W. Roberts, 1992) studies have examined the part of CG in influencing the quality and extent the sustainability reporting. They have explored the impact of governance factors, such as board characteristics and ownership mechanism, on the transparency, accuracy, and completeness of environmental disclosures.

Another research (Flores & Aguilera, 2007) has contributed to understand how corporate governance interacts with a company's environmental strategy. It investigated the impact of governance mechanisms on the adoption of environmental management systems, the incorporation of sustainability into company strategies, and the execution of environmentally friendly practices. Furthermore, (Ullmann, 1985) conducted comparative studies in various countries and areas to assess the impact of different governance systems on environmental performance. These research investigated how legislative frameworks, cultural factors, and institutional environments influence the link between corporate governance and environmental results. Comparative studies spur policy innovation and reform by exposing gaps and flaws in existing governance systems. They provide policymakers with evidence-based ideas for developing new legislation, strengthening enforcement systems, and incentivizing sustainable activities. Countries can enhance their environmental performance and contribute to global sustainability efforts by implementing innovative policies and reforms.

Despite the effect of CG with its different factors on social and economic performance of the firm, effects on CEP are neglected part of latest research and still need to be study. In virtue of earlier research, we have selected the variables which have been demonstrated in literature to define the structure of CG as follows: board composition is the percentage of independent directors on board, CEO duality is the percentage of non-executive directors, board independence is the total number of directors on the board, women on board and directors' owner ship.

2.4 Hypothesis Development Framework

To add value to the present literature, we construct a vast accepted frame work and related the selected CG variables with the CEP of the industries worldwide. Consequently, in subsection below, we prosper hypotheses for CG mechanism in view of CEP.

Table 1: Review of Prior Research and Theoretical background

Study	Governance variable(s) (Results in parenthesis)	Dependent variable(s)	Data source	Theory applied	Country
Wang and Coffey (1992)	Board size, board independence, CEO duality, women on board, board meeting (Mixed results)	Environmental Disclosure, Corporate environmental performance	Content analysis on annual reports	Agency Theory	USA
Halme and Huse (1997)	Board size, board independence (Positive), CEO duality (Negative)	Environmental Disclosure	Survey and interviews	Stakeholder Theory	Scandinavian countries
Kassinis and Vafeas (2002)	CEO duality, board independence (Negative)	Environmental Performance	Publicly available environmental ratings	Agency Theory	USA
Walls et al. (2012)	Board gender diversity, board size (Positive)	Environmental Innovation	Survey and secondary data	Stakeholder Theory	Global
Post et al. (2011)	Women on board (Positive)	Environmental Corporate Social Responsibility	Corporate sustainability reports	Stakeholder Theory	USA
Buallay (2019)	CEO duality, board independence (Negative), board size (Mixed results)	Environmental Performance	Annual reports, sustainability reports	Agency Theory	GCC countries
Jizi et al. (2014)	Board independence, CEO duality (Mixed results)	Corporate Social Responsibility Disclosure	Content analysis of annual reports	Agency Theory	UK

Ortiz-de-Mandojana et al. (2016)	Board size, board independence (Positive)	Environmental Performance	Secondary data from databases	Stakeholder Theory	Spain
Liao et al. (2015)	Women on board (Positive)	Carbon Disclosure	Carbon Disclosure Project (CDP) reports	Stakeholder Theory	UK
Shaukat et al. (2016)	Board gender diversity (Positive)	Environmental Performance	Corporate sustainability reports	Stakeholder Theory	USA
Clarkson et al. (2011)	Board size, CEO duality, board independence (Mixed results)	Environmental Disclosure	Content analysis on environmental reports	Agency Theory	Australia
Prado-Lorenzo et al. (2009)	Board composition (Positive)	Greenhouse Gas Emission Disclosure	Annual and sustainability reports	Agency Theory	Spain
Rao and Tilt (2016)	Board diversity (Positive)	Environmental Reporting	Annual reports	Stakeholder Theory	Australia
Cormier et al. (2011)	CEO duality, board independence (Mixed results)	Environmental Disclosure	Annual reports, sustainability reports	Agency Theory	Canada
Khan et al. (2013)	Board independence (Positive), CEO duality (Negative)	Environmental Performance	Content analysis	Agency Theory	South Africa
Michelon and Parbonetti (2012)	Board size, board independence, CEO duality (Mixed results)	Environmental Disclosure	Corporate annual reports	Agency Theory	Europe
Liao et al. (2019)	Women on board, board diversity (Positive)	Environmental Innovation	Survey data, corporate reports	Stakeholder Theory	Global
Zeng et al. (2012)	Board size, board independence, CEO duality (Mixed results)	Environmental Performance	Annual and sustainability reports	Agency Theory	China
Walls et al. (2015)	Board gender diversity (Positive)	Environmental Strategy	Corporate sustainability reports	Stakeholder Theory	Global
Haider et al. (2020)	Board independence,	Environmental Performance	Secondary data from databases	Agency Theory	Pakistan

	CEO duality (Negative)				

2.4.1 Board Size and CEP

The board size refers to the number of directors serving on a company's board of directors. It is an important aspect of CG and a topic of extensive research in the field. The size of the board is believed to influence board dynamics, decision-making processes, and ultimately organizational outcomes, including CEP (Chaganti et al., 1985).

As far as research question concerns that how does the execution of specific CG mechanisms, such as executive rewards and compensation mechanism aligned with CEP targets, impact a firm's assurance to and achievement of corporate environmental sustainability? Research (Daily & Dalton, 1992) on the bounding between board size and company performance has yielded mixed findings. Some studies suggest that a larger board size may lead to better decision-making and increased monitoring capabilities, which have positively impact environmental performance. Board size is mainly supported by Agency Theory, which explains the link in between CG and CEP. It has positive association with the board size and environmental results. (Arena et al., 2015). Agency theory, demonstrated that Board of Chairman is the back bone to implement corporate governance effectively to achieve corporate sustainability performance. (Tjahjadi et al., 2021). However from the perspective of Stakeholder theory (Freeman, 2010), corporate governance is constitutionalized force management or induce to externalize the welfare and benefits of the stakeholders. In this sense and it also be in mind that overlap in board size and corporate social responsibility has been explained. (Jamali, 2008), despite the firm adopt different ideas and views which will build a better strategy. The smaller the board size, there will be more of a workload is for each board member. Hence, the quality of supervision will be compromised. (N. Hussain, Rigoni, & Orij, 2018).

Prior research has found a negative association between board size and corporate performance (Walls et al., 2012; Yermack, 1996), with the belief that communication, coordination, and agency issues will worsen as board size increases. The obstacles that firms have when developing financial and accounting systems to evaluate environmental performance, as well as the opportunity for corporate governance and

CEP, contribute value to nature. No one has done it empirically. (Benn et al. 2006). Similarly, other research (Kesner, 1988) have claimed that a bigger board size might cause coordination issues, communication breakdowns, and decision-making delays, all of which can impede effective environmental governance. Furthermore, the director does not criticize the top manager's operational and managerial strategies, nor does he engage in crucial conversations concerning company performance, such as social and environmental issues. These issues are more likely to shape the boards, which will have a negative impact on corporate decisions and results. (Lipton and Lorsch, 1992).

In addition to the same scenario, (Jensen, 1993) explained that the board consist of seven or eight directors, and are less likely to work effectively and CEO will have the advantage of control. The coordination problem will be arrived to with large board. It will automatically affect the corporate environmental decision. As a result, larger boards are less efficient and slower in decision making.

Corporate governance research has extensively looked at how board size affects various organizational outcomes, including corporate environmental performance (CEP). Empirical evidence demonstrates that larger boards can have a negative impact on CEP for a variety of reasons. For starters, larger boards frequently struggle with coordination and communication, resulting in inefficiencies in decision-making processes (Jensen, 1993). These inefficiencies may limit the board's ability to establish and manage successful environmental measures. Furthermore, larger boards may experience increasing free-rider difficulties, in which individual members put in less effort, thinking that others will compensate (Eisenberg, Sundgren, & Wells, 1998). This reduced responsibility can lead to a lack of rigorous scrutiny of environmental projects. Furthermore, larger boards typically have more different opinions and interests, which can lead to conflicts and slower consensus-building, delaying the implementation of proactive environmental measures (Halme & Huse, 1997). According to research, smaller, more cohesive boards are better suited to enforcing severe environmental policies and practices due to their streamlined decision-making powers and clearer lines of duty. In essence, while intellectual diversity is generally helpful, the disadvantages of greater coordination costs and less individual accountability in larger boards frequently balance these benefits in terms of environmental performance. As a result, reducing board size can improve a company's ability to engage in more effective and

timely environmental management, leading to improved overall environmental outcomes (Ortiz-de-Mandojana, 2016)

Moreover, (Halme & Huse, 1997) incorporate research on board size positively inter-related with corporate environmental reporting. While, (Tjahjadi et al., 2021) made the result that top management, board of commissioner BoC, president of board of commissioner BoC have no significant effect on environment sustainable performance (ESP). Furthermore, there will be less extreme with larger board decisions, that is, relevant to be neither very good nor very bad. Therefore, larger boards are likely to be in relationship with less variable corporate performance. (Cheng, 2008).

The relationship between board size and CEP is complex and context dependent. While a larger board may provide access to diverse skills and perspectives, which will enhance environmental governance, it may also lead to coordination challenges and decision-making inefficiencies. Future research should consider these factors and explore the mechanisms through which board size influences environmental performance to provide a more nuanced understanding of this relationship.

The above discussed scenarios highlight two different aspects to explain CEP. In view of agency theory, we are hypothesized the following association of the variables.

Hypothesis 1: There is a significant negative relationship between Board Size and corporate environmental performance.

2.4.2 Board Independence and CEP

In light of research question, to what extent does the structure of a company's board of directors which include board independence and diversity, influence its environmental performance? Board independence refers to the presence of directors on a company's board who are not affiliated with the management or major shareholders of the organization. Independent directors are unbiased and autonomous in their decision-making and its stakeholders. They provide an objective perspective, contribute to effective corporate governance, and enhance transparency and accountability. Board independence is typically measured by the proportion of independent directors on the board (Dalton et al., 1999).

A number of scholar and researcher explained the relationship between the board of directors and sustainable performance on agency theory that governing board will

monitor and control the agents activities effectively (Haque, 2017). The main objective of the board independence is to evaluate management and make questioning, which may resultant to reduce agency cost and improve firm corporate performance. (de Villiers et al., 2011). Likewise, board diversity and board independence better manage and monitor the corporate governance (Jensen, 1986). According to stakeholder theory framework, the independence of board reveal positive association on sustainable performance because external directors are convincingly less than internal ones to pursue pressure from stakeholders and managers (Elmagrhi et al., 2019; N. Hussain, Rigoni, & Orij, 2018). Inside directors are persistent to make profit maximization, resources allocation and shareholders' demand (Wang & Coffey, 1992). In this context, (Galbreath et al., 2022) explained negative correlation between inside director and corporate sustainability. It also prevails to the research question that what part do shareholder engagement and involvement play in influencing corporate governance practices associated to environmental concerns, and how do these practices subsequently effect a company's corporate environmental performance?

Earlier research (Fernandez-Feijoo et al., 2014) demonstrated board independence in relation to corporate environmental performance, which refers to the presence of independent directors on a company's board who will give fair oversight and assistance on environmental issues. Independent directors with experience in environmental sustainability help to improve environmental governance, encourage responsible practices, and incorporate environmental issues into the company's strategy and operations. Their presence is linked to improved environmental performance results.

Firstly, environment friendly techniques used by the board of director by invest in the project which is effective in carbon control activities and having impact long term but it has not immediate results for the firm (Tauringana & Chithambo, 2015). Nevertheless, this carbon investment associated with the generation of long term value of the shareholders and give outcome in term of energy saving, made environment friendly structure and reputation which may call the new marketing opportunities. (de Villiers et al., 2011). Despite this, conflict will arise between managers and stakeholders because managers will not be directly or immediately rewarded in long-term carbon investment. It will be lack of motivation for managers and shareholders. (Tauringana & Chithambo, 2015).

Secondly, another form of conflict is arrived when social responsibility will be taken by inefficient in terms of social activist, stakeholders' relationships, and powerful entrenchment strategy to cope up the shareholders. At the result, the stakeholder protection is dependent on discretion of manager, although it is the optimistic approach of the manager. Thus, it interprets the obfuscate negative impression of the firm performance and manipulate the decision of the stakeholders. (Arena et al., 2015).

In such cases, independent board managers have better control the internal corporate governance mechanism and implement the value-added activities like emission control project, long term investment initiative, and to overcome the pressures in case of delay in such investments. Moreover, independent board of director are better pursue the relationship with the stakeholder which add value in the shareholder status and do not allow the inefficient managers to manipulate the relationship of some other cause. (Haque, 2017).

Previously, the only significant body of research that directly examined the relationship between corporate governance and environmental performance looked at how corporate board structure and firm ownership affected specific and limited indicators of corporate environmental performance. This corpus of research provides inconsistent evidence that board structure influences environmental performance. Halme and Huse (1997) discovered that board of director characteristics are positively connected to variations in corporate environmental reporting. However, Goodstein et al. (1994) discovered that firms with big and varied boards are less likely to start strategic changes than those with smaller homogeneous boards, implying that diversified boards will have limited effectiveness during times of environmental upheaval. This study backs up the conclusions of two previous studies (Gautschi & Jones 1987; Kesner et al. 1986), which discovered that boards with more outside directors did not have better environmental performance, as seen by fewer environmental legal infractions.

Board independence is widely acknowledged as a critical aspect in determining corporate environmental performance (CEP). Independent directors, who have no relationships to the company's management, provide an objective perspective that can improve corporate governance. According to research, board independence promotes more rigorous governance and accountability, which benefits CEP. For example, Buallay (2019) discovered that enterprises with a maximum share of independent

directors have better CEP because these directors are more inclined to advocate for sustainable practices and open reporting. Similarly, Ortiz-de-Mandojana et al. (2016) argue that independent boards are more effective in adopting environmental initiatives because of their impartiality, which helps to alleviate agency issues between shareholders and management. Independent directors frequently advocate for compliance with environmental standards and take proactive steps to reduce environmental concerns. This is consistent with stakeholder theory, which holds that independent directors, by representing a variety of interests, are more sensitive to the concerns of many stakeholders, including the environment (Liao et al., 2015). Furthermore, Clarkson et al. (2011) argue that independent boards boost the legitimacy of environmental disclosures, promoting confidence and openness. In conclusion, the inclusion of independent directors is connected with improved CEP, owing to their impartiality, improved governance, and dedication to sustainability. This emphasizes the relevance of board composition in creating company policies that promote environmental stewardship and are consistent with broader social expectations.

Moreover, available literature supported the positive association of corporate environmental performance on shareholder value and firms' financial performance. As some scholar made results of positive relationship in between corporate environmental performance and financial performance of US firms. (Al-Tuwaijri et al., 2004; Clarkson et al., 2011; Poletti-Hughes & Briano-Turrent, 2019). In recent research (Cooper & Uzun, 2022) suggest positive association between busy outside directors on environmental, social and governance performance.

The theoretical framework (Peloza & Shang, 2011) for examining the relationship between board independence and corporate environmental performance draw upon corporate governance theories, such as agency theory and stakeholder theory, to understand the mechanisms and factors influencing this relationship.

As a result, the theoretical framework and empirical fragmentation of prior researcher results plainly encourage deeper debate into underline relationships, hence we hypothesize that:

Hypothesis 2: There is a significant positive relationship between Board Independence and CEP.

2.4.3 CEO Duality and CEP

CEO duality describes a governance style in which the same person serves as both CEO and board chairperson. The relationship between CEO duality and corporate environmental performance examines how this leadership arrangement affects a company's environmental practices and sustainability outcomes (Yermack, 1996). Likewise, CEO duality is defining by its words actually means that the CEO urged to hold double position in the firm's decision making and operational matter, in result weak monitoring because single person cannot do work perfectly as compare to hierarchal structure. (Boyd, 1994; Rechner & Dalton, 1991; Zajac & Westphal, 1994) bankruptcy of the firm (Hambrick & D'Aveni, 1992). In addition to this, CEO has the main challenge to control and perform in one time, which cause less financial gain as invest in strategic investment in environmental opportunities. In the presence of CEO duality board will be approve less immediate investment in environmental opportunities will pace back will long periods. (de Villiers et al., 2011). According to (Miller et al., 1984) CEO duality on stage wise like from start-up then growth, maturity and declining. Every firm has competitive value, benchmark and lifecycle to set the firm performance and take the steps and the best managerial effort which set the corporate governance. With the help of agency theory it indicates the managerial entrenchments in monitoring the shareholder and management behavior (Liu, 2019). The duality of CEO and Chairman of the board debate is unresolved. Hence, some studies allows for better performance (Cannella Jr & Lubatkin, 1993) in the conclusion of duality (Sridharan & Marsinko, 1997). For the better financial performance some author comments that CEO duality is better to avoid lack of communication, fast processing and offer more flexibility to avail new opportunities (Blibech & Berraies, 2018). For long term profitability in term of financial, managerial and operational duality is preferable to adopt in governance (Godard & Schatt, 2000). The result as CEO duality has positive impact at the growth stage of the firm but it not favorable in maturity level because the expansion of the area and responsibility of the CEO. (Pham & Pham, 2020). Another study sanctions the CEO narcissism positively impact the operational and financial performance of the firm and CEO duality is also supported the same relationship with agreeableness (Uppal, 2020). Opposite views which has been given by Donaldson & Davis and Boy, that in CEO duality single body have all the decision power and no brain storming is being held to get fruit full result that will maximize the profit margin

of the firm (Donaldson & Davis, 1991) and same agreement of the article respectively (Boyd, 1994).

Scandals for CEO duality in early 2000s was indication of believer which resulted to abolished the transparency in management and outsiders. (Liu, 2019). In advanced research conclude that, capital structure partially bridging the CEO duality in respect to firm performance while market competition fully bridge the linkage of CEO duality in view of firm performance (Mubeen et al., 2020).

CEO duality, in which the Chief Executive Officer also serves as Chairman of the Board, has been found to have a negative impact on company environmental performance. This dual job can concentrate authority in one person, perhaps leading to weaker supervision and decreased board independence. This concentration of authority may lead to decisions that prioritize short-term financial performance above long-term environmental sustainability. According to research, CEO duality might impede the implementation of strong environmental policies and practices by limiting the board's ability to effectively debate and guide the CEO's decisions (Kassinis & Vafeas, 2002; Khan et al., 2013). Furthermore, CEO duality may undermine transparency and accountability, which are critical aspects in promoting sustainable corporate practices (Jizi et al., 2014). The presence of an independent chairman can help to allow more balanced decision-making processes that take into account environmental implications, ensuring that business policies are in line with broader sustainability goals. Companies that separate the responsibilities of CEO and chairman can improve governance frameworks, foster an accountability culture, and improve environmental performance. Empirical data supports this viewpoint, demonstrating that enterprises with different functions have stronger environmental disclosure and performance indicators (Cormier et al., 2011; Haider et al., 2020). Thus, addressing CEO duality through independent leadership on corporate boards is critical for promoting sustainable business practices and improving company environmental performance.

However, previous studies provide the mix results of CEO duality to enhance the firms' performance. (Aktas et al., 2019; Faleye, 2007). CEO duality is not impact the firm performance and significantly and negatively relation on (ROA) return on assets (Abdallah Mohammad Qadorah, 2018). Another study links the relationship of CEO duality and firms' performance with respect to economic policies and legislation, it

concludes that the relationship will be supportive of there is uncertainty in economic policies. CEO and chairman of board duality will help to reduce the uncertainty in economic policies and firms' environment by single handed decision making and management. (Chang et al., 2019).

The relationship between CEO duality and corporate environmental performance refers to the potential impact of this leadership structure on a company's environmental practices and outcomes (Rechner & Dalton, 1991). Some studies suggest that CEO duality have a negative impact on corporate environmental performance, as it will lead to a concentration of power and a lack of (Pham & Pham, 2020)independent oversight (Chang et al., 2019). Other studies propose that CEO duality may have a positive effect on environmental performance, as it allows for faster decision-making and greater alignment between strategic goals and implementation (Tjahjadi et al., 2021).

Review of empirical literature disclose mixed relationships and findings between CEO duality and sustainable performance (Arena et al., 2015). Thus, the negative association is consistent with the extant literature and theoretical framework, as well as the managerial logic, which suggests that two different roles are the most productive. Therefore, we hypothesize the following relationship:

Hypothesis 3: There is a significant negative relationship between CEO duality and CEP.

2.4.4 Women on board and CEP

Women on Board refers to the number and representation of female directors on a company's board of directors. It emphasizes the representation and diversity of women in corporate governance. The approach seeks to promote gender equality, increase female participation in decision-making, and improve board performance (Adams & Ferreira, 2009).

With respect to agency theoretical perspective, for better environmental and social performance like increasing managerial monitoring, bringing innovative ideas, views, skills and perspective towards the corporate board, female directors / board diversity are much needed. (Sun et al., 2023). Likewise, stakeholder theory interprets that more female on board raise the pressure towards firms to focused on higher environmental performance in order to attain the support of powerful stakeholder. Therefore, the

access to critical resources will be possible for stakeholders. (Haque, 2017; Shahab, 2018). In addition, neo-institutional and legitimacy theories suggest that increasing the number of female directors will improve the firms' image and reputation, as well as help to increase corporate environmental responsibility. Deegan (2006); Elmagrhi et al. (2019); and Shahab et al. (2018).

Firstly, women are more sensitive towards corporate relationship building and multiply it with stakeholder's interest. Women are having more communal characteristics to reveal the corporate environmental substantiality and social responsibilities. (Haniffa & Cooke, 2005). Rather than male the female is persistent about environmental sustainability to engage pro-environmental activities, which enable them to take positive decisions and contribution the society, environment and sustainable development. (Haque, 2017). Secondly, (Torchia et al., 2011) argue that female on board increase the effectiveness through confirming the high quality board development activities as result reducing the level of conflict. Thirdly, board diversity encourages and acknowledge the innovative ideas and views which ensure the development and sustainability of corporate environmental and social performance. (Gosselin et al., 2014; Michelon & Parbonetti, 2012).

As the available literature and previous studies examine well educated and experienced board of director are equally important in company structure. The direct linkage between board size, women on board and demonstrated the arguments (Wang & Coffey, 1992). It is increasingly being notice that women have magnified and moderate contribution in developing of board. Women made good working environment, more committed, passionate, delegated, determined and ultimately create better ethical and prospered working environment for the boardroom (Huse & Solberg, 2006). Furthermore, (Ferreira & Vilela, 2004) stated that to improve effective decision making process firms need to indulge more women on board because they enhance board effectiveness and have better attendance / participation. Moreover, to firm performance, female directors on board have to effect positive on environmental disclosure in both financial and non-financial firms. Women on board have positive impact on stake holders and outside investors (Huse & Solberg, 2006). In the view of (Ibrahim & Angelidis, 1994) study that female are more philanthropist, motivated and take more responsibilities but they are less concentrated on the economic performance. The study found that having women on boards improves business environmental performance and

increases CSR disclosure (Lu & Wang, 2021). While (Galbreath, 2011) explains that board independence and the presence of women on boards have a favorable impact on environmental quality and social responsiveness information using agency theory. Similarly, using agency theory (Kathy Rao et al., 2012), they explain that environmental disclosure would have been better presented with the involvement of women on the board, institutional performance, board independence, and a medium board size. Another study (Walls et al., 2012) found that board size has a negative impact on environmental strength and concerns, while women on boards have a favorable influence due to help agency and stakeholder theory. At the same time, (Xie et al., 2019) explained that women on boards assess corporate governance value, which influences business performance. On the other hand, (Giannarakis, 2014) stated that women on boards had little influence on CSR disclosure, although the study casts doubt on business performance and is backed by stakeholder theory.

Furthermore, (Cooper & Uzun, 2022) suggest that female on board is positively reveal the environmental, social and governance score across the board. Board diversity is the percentage of women on board as measured in literature from both scenarios like corporate social responsibility and performance including social, economic and environmental. (N. Hussain, Rigoni, & Orij, 2018). Female director is more oriented and motivated towards environmental and social problems and approximately three or more female directors do so better perform. (Elmagrhi et al., 2019).

According to research, women's representation on corporate boards has a favourable impact on company environmental performance. Numerous studies have shown that female directors provide various viewpoints to board deliberations and decision-making processes on environmental concerns. Women are more likely to be environmentally sensitive and risk averse, which can lead to more aggressive and comprehensive sustainability initiatives. For example (Liao et al. 2015) discovered that companies with more female board members were more likely to publish carbon emissions, indicating a greater commitment to openness and environmental responsibility. Similarly, (Post et al. 2011) found that companies with women on their boards have superior corporate social responsibility (CSR) activities, such as environmental sustainability efforts. This favourable effect is due to the fact that women directors frequently argue for broader stakeholder interests, such as environmental issues, rather than focusing simply on shareholder value (Shaukat et al., 2016).

Furthermore, gender-diverse boards are more likely to question the status quo and encourage novel ways to environmental management, resulting in improved performance outcomes (Walls et al., 2012). The theoretical basis for this effect can be explained by stakeholder theory, which holds that diverse boards are more sensitive to the interests and expectations of many stakeholders, including those concerned with environmental sustainability.

Earlier research (Kathy Rao et al., 2012) propose, the presence of women on boards has been associated with positive effects on corporate environmental performance, suggesting a link between gender diversity and environmental sustainability. While, (Erhardt et al., 2003) studies suggest that women directors bring different perspectives, values, and experiences to boardroom discussions, leading to increased focus on social and environmental issues. Research (Wang & Coffey, 1992) has found a positive relationship between the proportion of women on boards and various environmental performance indicators, such as reduced environmental risk, improved eco-efficiency, and increased adoption of sustainable practices. Similarly, another research (Cucari et al., 2018) advise that women directors are also more likely to champion environmental initiatives, promote stakeholder engagement, and drive sustainable strategies, ultimately contributing to enhanced corporate environmental performance.

Stakeholder theory emphasizes the importance of considering the interests and perspectives of diverse stakeholders, including women, in shaping corporate environmental strategies and practices (Freeman, 2010).

Thus, literature and stakeholder theory support woman on board made positive influence on the corporate environmental performance, we hypothesize the following relationship:

Hypothesis 4: There is a significant positive relationship between Female Directors and corporate environmental performance.

2.4.5 Board Meetings and CEP

Board meetings refer to formal gatherings of a company's board of directors to discuss and make decisions on various matters related to corporate governance, strategic direction, and operational oversight (Daily et al., 2003). To quantifying board activities in a year the number of board meeting used to measure. (Laksmana, 2008). While there

are two concept of board meeting, firstly, more frequent board meeting shows inefficiency of the board of director consequently limit their performance, (N. Hussain, Rigoni, & Cavezzali, 2018) secondly represent frequent board meeting shows efficiency which according to better supervision and increase fame of interest and transparency. (Lipton & Lorsch, 1992).

The chairman of board has ultimate responsibility to plan and execute board meetings to set standards and review of gain and loss. Company CEO and secretary comfily set the corporate agenda to discuss in the board meetings (Dulewicz, 1995). Every member of the board meeting is responsible for defined agenda to answer, it should be ethical, accountable and transparent (Syrett & Lammiman, 1999).

Corporate environmental performance (CEP) is increasingly acknowledged as a crucial component of sustainable business practices, and board meetings play an important role in improving this performance. Board meetings, as an essential component of corporate governance, provide a forum for talking and strategizing about environmental challenges, so benefiting CEP. The frequency and quality of these meetings have a substantial impact on how a business implements and monitors environmental policies and programs. According to research, regular board meetings allow for more effective monitoring of environmental plans, ensuring that environmental concerns are integrated into the company's overall strategic goals (Jizi, Salama, Dixon, and Stratling, 2014). These meetings enable directors to examine and assess the company's environmental performance, identify areas for improvement, and assure adherence to applicable legislation and standards. Regular talks can keep boards up to date on the newest environmental concerns and possibilities, allowing for proactive decision-making that promotes sustainable practices.

Empirical research supports the concept that board meetings improve CEP. For example, Kassinis and Vafeas (2002) discovered that enterprises with more frequent board meetings had better environmental performance. The study implies that regular meetings enable more rigorous monitoring and evaluation of environmental strategies, resulting in better outcomes. Similarly, Liao, Luo, and Tang (2015) found that board meetings are positively associated with disclosure of carbon emissions, implying that active board engagement promotes transparency and accountability in environmental reporting. Consistent with the top executive management’s role and board of directors’

meetings ensuring and promoting investments for economic development. The board characteristics is board of meetings which refers number of meeting in a year (Al-Matari, 2020). Another study simplifies board of director like non-executive directors are not directly involved in day-to-day business cycle for example management, operation, financial and supply chain because they are not full-time employee of the corporation. They are invited by management in board meetings to advise / suggest the decision making and corporate governance process. It includes as shareholder matters, equity and debt financing decisions, operations and corporation turn over to secure share holder profit as well (Jackson et al., 2003).

The effects of board meetings on corporate environmental performance refer to the influence and outcomes resulting from the discussions, decision-making, and oversight conducted during board meetings in relation to environmental strategies, initiatives, and performance (Aguilera et al., 2007).

Board meetings improve company environmental performance by facilitating discussion, decision-making, and oversight of environmental policies and activities (Al-Matari, 2020). Effective board meetings that stress environmental sustainability develop an accountability culture, support the incorporation of environmental issues into decision-making processes, and push the implementation of sustainable practices (Aguilera et al., 2007). Likewise another research (Filatotchev et al., 2013) board meetings facilitate information sharing and knowledge exchange among directors, enabling them to stay informed about environmental risks, opportunities, and best practices, and make informed decisions regarding environmental performance. Similarly (Fernandez-Feijoo et al., 2014) suggest the frequency and quality of board meetings, along with the level of engagement and expertise of board members in environmental matters, are crucial factors that influence the effectiveness of board meetings in shaping corporate environmental performance.

In this study, we used an agency theory idea and saw the number of board meetings as a good indicator of corporate environmental performance. Therefore, our hypothesis is:

Hypothesis 5: There is a significant positive relationship between Board Meetings and CEP.

CHAPTER 3

3 Methodology

3.1 Data

The data was collected for variables such as corporate governance, including board size, board independence, CEO duality, women on boards, and board meetings for the non-financial sector over a 21-year period (2000-2000), and included 75 countries, 44301 firms, and 43592 observations, as shown in Table 1. The firms listed below are heavily influenced by worldwide environmental practices. Our data is based on the Global Reporting Initiative's list of reporting firms from 2000 to 2022. GRI offers a complete framework for sustainability reporting, which includes environmental performance indicators. Their reports and recommendations provide useful information on the business environmental reporting website. https://www.globalreporting.org/. This period is selected due to the following reasons: (1) The reports are issued between 2002 and 2022 and indicate the longest duration of environmental sustainability. (2) All the report are prepared in English and easily assessable. (3) Finally, the report is prepared as per GRI guidelines.

We extract data from Thomson Reuters EIKON (https://www.refinitiv.com/en/products/eikon-trading-software) and World Scopes which is quite similar data set as used by (de Villiers et al., 2011), (Chams & García-Blandón, 2019) and (Hussain, 2018). According to (Akbas et al., 2018), Thomson Reuters is a software which provides fundamental data, analytics, trading and real time market data to help financial experts and scholars in estimations and forecasting. It also provides data on assets-based portfolios like money markets, funds allocations, estimations and equity settlement information. Likewise, World Scope database system is the primary source of financial information to analyst and financial expert to help regarding portfolio management, investment decisions, financial sustainability estimations, assets and equity-based recommendations. It will provide financial database outside the United States of America with about 33,300 currently companies which is authentic and domiciled. (Florescu et al., 1998; Ni & Sun, 2023). In our data firms are defined by industries sector and SIC code. A SIC code, or Standard Industry Classification of Industries code, is a numerical code system which is used to categorize industries based on their function and economic activities of the industry. It pretends as

a standardized classification that helps in data collection, analysis, and reporting across the different and similar sectors. SIC codes are typically developed by researchers, government agencies and businesses to classify, limited and compare different industries consistently. Each industry is assigned a unique SIC code which facilitating effective and efficient organization and interpretation of economic data for statistical and research purposes. To coupe up of our data problem we find industry name according to SIC codes on https://www.census.gov/naics/ which is North American Standard Industry Classification System. Thus, we match the SIC with the firm ISIN to construct the firm name. Then, panel for each firm is made yearly wise.

Table 2: Distribution the number of firms country wise

S.#	Country name	No. Of firms	S.#	Country name	No. Of firms
1	Argentina	10	39	Malta	2
2	Australia	498	40	Mexico	55
3	Austria	35	41	Monaco	2
4	Bahrain	5	42	Morocco	8
5	Belgium	77	43	Nicaragua	8
6	Bermuda	56	44	Netherlands	123
7	Brazil	145	45	New Zealand	56
8	Canada	477	46	Norway	47
9	Cayman Islands	15	47	Oman	6
10	Chile	45	48	Pakistan	2
11	China	266	49	Panama	8
12	Colombia	25	50	Papua New Guinea	12
13	Cyprus	4	51	Peru	44
14	Czech Republic	9	52	Philippines	51
15	Denmark	48	53	Poland	38
16	Egypt	45	54	Portugal	67
17	Finland	87	55	Puerto Rico	25
18	France	299	56	Qatar	19
19	Germany	245	57	Russian federation	78
20	Gibraltar	8	58	Saudi Arabia	35
21	Greece	67	59	Singapore	199
22	Guernsey	4	60	Slovenia	66
23	Hong Kong	295	61	South Africa	133
24	Hungary	7	62	Spain	87
25	India	156	63	Sri Lanka	4
26	Indonesia	67	64	Sweden	145
27	Ireland	98	65	Switzerland	144
28	Isle of man	5	66	Taiwan	167
29	Israel	54	67	Thailand	45
30	Italy	98	68	Turkey	37
31	Japan	944	69	Ukraine	4
32	Jersey	9	70	United Arab Emirates	34
33	Kenya	2	71	United Kingdom	651
34	Korea (south)	148	72	United states	928
35	Kuwait	9	73	Uruguay	3
36	Luxembourg	88	74	Virgin Islands (brit)	5
37	Macau	6	75	Zimbabwe	3
38	Malaysia	78	Total number of firms		7875

3.2 Construction of variables

The first group consists of six corporate governance-related independent variables that will explain the influence of corporate environmental performance. It covers board size, board independence, CEO duality, women on the board, and board meetings. We constructed the variables as Board size refers to the total number of directors on the governance board. Board independence: the proportion of independent directors to total directors. CEO duality: A binary variable that takes the value 1 if the company's CEO also serves as the chairwoman of the governing board, and 0 otherwise. Women on boards: the proportion of female directors in comparison to the board size. Board meeting frequency: the number of board meetings held each year.

In the second group the control variables are constructed in collaborate with corporate governance factors to illustrate the results, how it effects the corporate environmental performance. Details of each controlled variable are as follows

Profitability

The link between profitability and CEP is multifaceted and context as controlled variable. It will be calculated as ratio of operating income and total assets. Source of data is world scopes as used by previous researcher in his study (Orazalin, 2020). Already research stated positive relationship between profitability and environmental performance because firms find cost saving opportunities through efficient use of resources which reduce waste. Moreover, positive, clean and green environmental reputation can enhance the value of the firm as its prevail the brand name, customer loyalty and satisfaction. (Delmas & Toffel, 2008).

Firm size

Consider firm size as controlled variable it effects the CEP a s positive. It will be determined by total asset value, data source is world scopes (N. Hussain, Rigoni, & Orij, 2018). Firm use its assets to assess its impact on green product development (de Sousa Jabbour et al., 2015).

Capital Structure

By incorporating of capital structure as a controlled variable, the link between CEP is determined by ratio between total debts to shareholders' equity (Allegrini & Greco, 2013). Examines, using capital structure as a control variable, how environmental

management systems affect corporate social responsibility. With the use of this method, researchers can take into consideration the possible impact of debt levels and financial leverage on a company's environmental performance, leading to a more complex understanding of the connection between sustainability practices and capital structure (Shahbaz et al., 2020).

Capital intensity

The previous study provides the guideline to estimate the capital intensity by ratio of capital expenditure and total sales. As in under the capacity of firm size the capital intensity effect positive on environmental performance by allocation of capital for environmental control products (Vig & Datta, 2021)

Our research approach is to measure Corporate Environmental Performance using Corporate Governance and Control variable measures to justify the research topic. We used an updated version of the GRI information structure to measure the disclosure level and quality indices of environmental performance based on available industry sector data. Based on prior research (Chams & García-Blandón, 2019; Hussain et al., 2018; Michelon & Parbonetti, 2012), we evaluate environmental performance using a combination of the environmental disclosure index and the environmental sustainability index. Environmental disclosure levels are measured on a binary scale, with 1 indicating that an item has been declared and 0 otherwise. The cumulative score of each dimension is then calculated using the following format and formula:

$$\text{Disclosure Index}_i = \text{No. of items disclosed on an indicator} / \text{Total item on an indicator}$$

In the aforementioned formula, i represents the sustainability dimension. The G3 guidelines specify the value of the disclosure index. There are 30 items in the environmental index. To assess the performance of the sustainability component, we categorize information as positive or negative using the following description provided by (Patten & Crampton, 2003). These G3 guidelines were modified to G4 guidelines in 2013, and are now known as G4 Sector Disclosures, which were created for the GRI G4 Guidelines. The G4 Guidelines have been changed to GRI Standards. The GRI Standards are needed for all reports and other documents released on or after July 1, 2018. GRI offers a complete framework for sustainability reporting, which includes

environmental performance indicators. Their reports and recommendations provide useful information on the business environmental reporting website: https://www.globalreporting.org/.

Previously, (Chams & García-Blandón, 2019), (Cox et al., 2004), (Braam et al., 2016) and (Lu & Wang, 2021) applied the similar approach to measure the environmental performance on Thomson Reuters and other data set.

The junction of available information which is positive and negative allows us to calculate a quality index as used by (Hillman & Keim, 2001; Hussain, at al , 2018; Jo & Harjoto, 2014).

$$\text{Quality Index}_i = \frac{\text{Real Value} - \text{Minimum}}{\text{Maximum} - \text{Minimum}}$$

In the above-mentioned formula, the individual sustainability indicator represented by i gains real value by subtracting the indicator's negative score from its positive score. The total number of items in an indicator is the minimum value, whereas the total number of indications with a positive sign is the maximum value. Thus, for example, there are 30 entries on the environmental indicator. In this scenario, Maximum signifies (+30) when there is complete exposure of positive information, while Minimum represents the worst situation (-30) when all elements provide negative information.
Finally, we determine or calculate each dimension's Corporate Environmental performance by multiplying the Disclosure index by the corresponding Quality index. Because transparency and accountability are at the heart of our argument, we can capture both performance and transparency.

Table 3: Conceptual Framework of Corporate Environmental Performance supported by Disclosure Index and Quality Index

Corporate Environmental Performance	Dimensions	Sub dimensions	Indicators	Hypothesis
	Disclosure Index	Environmental Disclosure	Material	-
			Energy	-
			Water	-
			Biodiversity	-
			Emissions	-
			Effluents and Waste	-
	Quality Index	Environmental Sustainability	Products and Services	+
			Compliance	+
			Transport Checks	+
			Overall	+
			Supplier Environmental Assessments	+
			Environmental Grievance Mechanism	+

3.3 Methodological Framework

We will employ a panel regression model. The model includes a set of relevant control variables which recognized the prominent literature. Therefore, we apply a regression model sustainable for panel data, in the shape of following equation.

$$\text{Corporate Environmental Performance}_{it} = \alpha + \beta CG_{it} + \gamma \text{Control}_{it} + \mu_{it}$$

Where, *i* represent the firm dimension and *t* the time. We have a total of firms 54260 in light of 24 industries related to financial sector globally with the time span of 2002 to 2017 (15 years). As far as dependent variable concerned, we have Corporate Environmental Performance (CEP) and independent variable is Corporate Governance (CG_{it}) which is the vector of Board Size, Board Independence, CEO duality, percentage of Women on board and Board meetings. There is main representation of our Control_{it} variable, selected after prudently review of literature, among industry sectors. We collect the data of dependent, independent and control variables from the respective data sources as mentioned previously. In details calculation of variables are given in Table 2 which help to understand better the proxies and usage of data set.

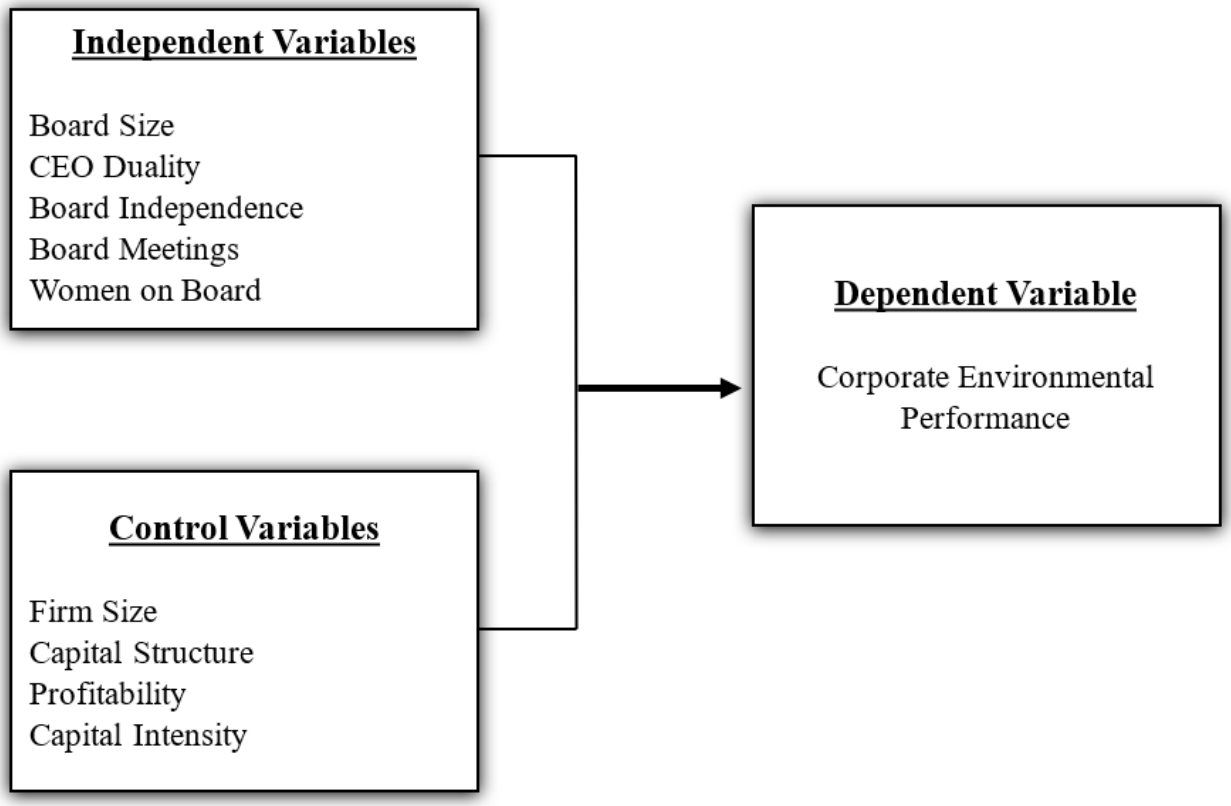
We will use fixed effect model approach supported by respective hypothesis in our panel data structure. According to (Hausman & Taylor, 1978) specification test which enable to check fixed effect model is suitable for our panel regression model.

Table 4: Description of dependent, independent and control variables

Name of variable	Mnemonics	Role	Measurement	Data Sources	Reference
Corporate Environmental Performance	C_EP	Dependent	Product of Environmental Disclosure Index and Environmental Sustainability Index	Thomson Reuters EIKON	(Hussain et al., 2018)
Board Size	B_SIZE	Independent	Total number of directors on governance board	Thomson Reuters EIKON	(Yilmaz et al., 2022)
Board Independence	B_INDP	Independent	Percentage of Independent directors to total directors	Thomson Reuters EIKON	(Hussain et al., 2018)
CEO Duality	C_DUL	Independent	Binary variable that accepts value 1 if the CEO of the company is also the chairwoman of the governance board; 0 otherwise.	Thomson Reuters EIKON	(Faleye, 2007)
Women on Board	W_OB	Independent	Percentage of female directors in relation to the board size	Thomson Reuters EIKON	(Haque, 2017)
Board Meetings	B_MTNG	Independent	Number of board meetings per year	Thomson Reuters EIKON	(Brinette et al., 2023)
Firm Size	F_SIZE	Control	Log of total assets of the firm	World Scope	(Hussain et al., 2018)
Capital Structure	D/E	Control	Ratio between total debts to shareholders' equity.	World Scope	(Allegrini & Greco, 2013)
Profitability	RO_AST	Control	Calculated as ratio of operating income and total assets	World Scope	(Orazalin, 2020)
Capital Intensity	CAP_INT	Control	Ratio of capital expenditure and total sales.	World Scope	(Vig & Datta, 2021)

3.4 Conceptual Framework

Figure 1 Conceptual Framework of Corporate Governance on Corporate Environmental Performance



CHAPTER 4

4 Empirical Results and Analysis

This chapter contains the results of the statistical analysis. Start with a presentation and analysis of descriptive statistics and correlations.

This chapter covers the outcomes of Corporate Governance's impact on Corporate Environmental Performance around the world from 2002 to 2020. Governance variables include board size, CEO duality, board independence, board meetings, and the presence of women on the board. The relationship between business size, return on assets, capital structure, and capital intensity is all estimated. The analysis starts with summary statistics for the variables considered in the study. The correlation matrix is estimated to determine the degree and direction of correlation between variables. The panel data estimation technique is used to quantify the impact of corporate governance on business environmental performance using international evidence from GRI reporting corporations and G5 guidelines. The association is then examined using a fixed effect model.

4.1 Descriptive Statistics

Descriptive analysis test conducted on all the variables separately that environmental performance, board size, CEO duality, board independence, board meeting, women on board. In order to control variable firm size, return of assets, capital structure and capital intensity of the firms are concerned. In this section the descriptive statistics of the dependent and independent variables are presented. The number of firms included in each of the 21 years of our study 2000 to 2022. Some 70 percent of firms were captured in industries: food, chemicals, machinery, electronics and instruments, and electric/gas/sanitary services. Corporate Environmental Performance outcomes ranged from 11.67 to 92.75 of provided product of environmental disclosure and quality index, evenly contributed in across all years with the exception that environmental performance is generally better in 2017 to 2020. On average, a firm’s panel lasted score of 49.09 with minimum 11.67 and maximum 92.75 which means that the firm below the average value is less efficient in environmental performance and implement the lesser investment in environmental indicator to adopt the environmental control indicators. Moreover, the firm which are performing more than average score means that firms opt environmentally friendly governance management system in kind of

environmental reporting and disclosures. The environmental sustainability index prioritizes quantitative improvement disclosure above qualitative reporting, which could explain this difference. To be considered a top sustainability performer, firms must have high qualitative and quantitative disclosure scores. The average score suggests that only a small number of individuals met both criterions.

- **Descriptive Statistics: Independent variables to CEP**

Table 5(a) shows the descriptive statistics for all the structural variables by showing the values of mean, standard error, maximum, minimum and standards deviation for all the variables. The reported results indicate on average C_EP is 49 score of environmental sustainability and quality index with minimum value 11.67 and maximum 92.75. Board size (B_SIZE) reported that the average board size contains 10 members with minimum 6 and maximum 15, it means the efficient decision making and strategic initiatives to affect the corporate environmental performance. CEO duality (C_DUL) indicates the CEO of the company is also the chairperson of the governance board. The average value is 0.60 which mean 60% of the CEO are the chairperson of the governance board which give the confidence to the CEO to take the independent decisions making and implementation to affect the positive corporate environmental performance. Another effective corporate governance variable is board independence (B_INDP)which brief the percentage of independent directors to total directors. The average stats are 76 with minimum 44 and maximum 93, it means the tendency of board independency of the directors from total director to take the reforms of corporate environmental performance. The second last independent variable is board meeting (B_MTNG), which shows 9 meeting per years with maximum of 178. Most of the firm conducted 9 meetings per year for corporate environmental performance. The last independent variable is women on board (W_OB) the average percentage of females is 11.08% with maximum 28.57% which means number of females directors is average board size (10 members) to take the corporate environmental decisions. We may calculate it as average 3 female directors in average board size of the given data.

Table 5(a) Descriptive Statistics of Main (dependent & independent) Variables

Variable	Mean	Std. Dev.	Min	Max
C_EP	49.092	31.457	11.67	92.75
B_SIZE	10.018	2.784	6	15
C_DUL	.606	.489	0	1
B_INDP	76.025	15.796	44.44	93.75
B_MTNG	9.262	5.355	0	178
W_OB	11.084	10.108	0	28.57

CEP product of disclosure of environmental index and sustainability index of environmental. It is affected by the corporate governance variables. In descriptive statistics the role of corporate governance variables is defined by their formation and extraction from the data source of Bloomberg. Board size (B_SIZE) total number of directors on governance board, CEO duality (C_DUL) Binary variable that accepts value 1 if the CEO of the company is also the chairwoman of the governance board; 0 otherwise, board independence (B_INDP) percentage of independent directors to total directors, board meetings (B_MTNG) number of board meetings per year and women W_OB The proportion of female directors in comparison to the board size.

- **Descriptive Statistics: Control variables to CEP**

Table 5(b) shows the descriptive statistics of control variables. The reported results indicate, on average firm size (F_SIZE) is 26745 dollars with minimum 5066 and maximum 48417 its means that the firms with large size have more capacity to adopt the environmental indicators for reporting and disclose. As the capital structure (C_STR) is concerned, the average percentage of debt-to-equity ratio is 4 with minimum zero and maximum 25 which is worst. So, the average value shows the strengthen of the firm toward the corporate environmental governance to grasp the reforms and regulation by the environmental performing authorities. However, return on assets (RO_AST) average is 7% with maximum of 18% which is the good sign for the better management and efficient use of assets of corporate environmental performing firms. It reflects the profitability of the firms. As capital intensity (CAP_INT) average is 8% with maximum value of 0.3. Its mean the capital expenditure from the total sales of the firm is on average. Which indicates the raise of opportunities in investing on environmental indicators and policy implications.

Table 5(b): Descriptive Statistics of Control Variables

Variable	Mean	Std. Dev.	Min	Max
F_SIZE	26745.159	14809.87	5066	48417
C_STR	4.156	7.823	0	25.04
RO_AST	.073	.059	-.01	.18
CAP_INT	.084	.092	.01	.3

Control variables influence corporate environmental performance. In descriptive statistics, the role of control or financial variables is determined by their construction and extraction from Bloomberg data. Details are as follows: Firm size (F_SIZE) is the log of the firm's total assets; capital structure (C_STR) is the ratio of total debts to shareholders' equity; return on assets (RO_AST) is computed as the ratio of operating income and total assets; and capital intensity (CAP_INT) is the ratio of capital expenditure and total sales.

4.2 Pairwise Correlation

Pearson's product moment (pairwise) correlation coefficients are used to examine the bivariate correlations between the variables, letting to establish whether there is a statistically significant relationship between the variables. In addition to giving information in its own right, these measurements provide assessment of the possibility of econometric difficulties when doing regression analysis; high correlation between independent variables a sufficient (but not required) indicator of multicollinearity, which makes estimators untrustworthy. Multivariate analysis is carried out utilizing linear regression, often known as Ordinary Least Squares (OLS). The relationship under consideration is considered to be linear; to meet data requirements for linearity, multiple variables are converted. We present the estimation of results of Pearson Correlation in below table 6. In column 1, it represents the correlation of C_EP with other governance and control variables. We found positive correlation with all independent variables B_SIZE, B_INDP, C_DUL, B_MTNG and W_OB with estimated values of 0.029, 0.006, 0.01, 0.06 and 0.13 . While in control variables F-SIZE, C_STR, RO_AST expect one CAP_INT all variable carried positive correlation as 0.15, 0.01, 0.01 and (0.06) at 1% significance level.

While in column 2-10, it represents the correlation of governance variable with control variables each separately. In column 2, it represents the correlation between Board size with other governance and control variables. Like it correlates negative value with two governance variables C_DUL and B_MTNG (0.07) and (0.03) at 1% significance level. While W_OB and B_INDP it corelate positively with 0.09 and 0.08 at 1% significance level. In control variable, we found negative correlation in between board size and control variable like RO_AST and CAP_INT with (0.06) and (0.08) values at 1%

significance level. Moreover, at 1% significance level, we found positive correlation of board size with control variable of F_SIZE and C_STR with estimated value of 0.01 and 0.10.

Table 6: Pearson correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) C_EP	1.000									
(2) B_SIZE	0.292	1.000								
(3) C_DUL	0.017	-0.077	1.000							
(4) B_INDP	0.006	0.082	-0.024	1.000						
(5) B_MTNG	0.064	-0.033	0.081	-0.064	1.000					
(6) W_OB	0.135	0.094	-0.004	0.323	-0.030	1.000				
(7) F_SIZE	0.011	0.010	0.000	0.001	-0.002	0.002	1.000			
(8) C_STR	0.157	0.103	0.017	-0.353	0.178	-0.256	0.004	1.000		
(9) RO_AST	0.011	-0.067	-0.050	0.023	-0.158	0.051	0.013	-0.137	1.000	
(10) CAP_INT	-0.066	-0.088	0.048	0.031	0.011	-0.084	-0.009	-0.010	-0.081	1.000

The correlation derives from pairwise correlation between variables such as dependent, independent, and control variables. The first variable represents the environmental performance and sustainability of the company environment. Governance and financial considerations both influence the results. Governance variables included board size, CEO duality, board independence, annual board meetings, and the number of women on the board who make successful corporate environmental decisions. Based on prior literature, we use firm size (F_SIZE), capital structure (C_STR), profitability, such as return on assets (RO_AST), and capital intensity (CAP_INT) as control variables to assess the effective results.

In column 3, we estimated Pearson correlation of governance variable CEO duality with other governance and control variable. We found negative correlation at 1% significance of B_INDP and W_OD as estimated value of (0.02 and (0.004). However, we found positive correlation in between CEO duality and board meeting B_MTNG at 1% significance with 0.08. Moreover, we found positive correlation with maximum control variable like F_SIZE, C_STR and CAP_INT with value of 0.00, 0.01, 0.04 while RO_AST carried negative correlation value with -0.05 at 1% significance score.

In column 4, the model represents the correlation of another independent variable Board Independence with other governance and control variable. It correlates positively with W_OB with corelated value of 0.32 and negative with B_MTNG in value of (0.06). While in view of control variable it corelate positively most of the variable F_SIZE, RO_AST and CAP_INT with value of 0.001, 0.023 and 0.031.

In model 5, it represents the correlated results of Board Independence with independent and control variables. It correlates negative with W_OB at value (0.03). In control variable it correlates with two variables passively and other negatively with F_SIZE, CAP_INT, C_STR, RO_AST as value 0.17, 0.01, (0.02) and (0.15).

In column 6, it represents the correlation of Women on Board with control variables. Likewise model 5, two result are passively and negatively correlated each as value 0.02, 0.05 and (0.25), (0.08). In column 7-10, it shows correlation results in between control variables.

4.3 Results of Panel Data Estimation

In this section the results of regression analysis based on panel data estimation are reported Table 1-3 as effect of corporate governance on corporate environment performance as control variable supporting the scenario. Table 1(a) are presented descriptive statistics of dependent and independent variables and reported the average score, likewise table 2 reported the average descriptive stats of control variables. In table 3, it represents the linear regression of Pannel data Pool OLS model, where the ordinary relationship of dependent variable with, five independent variable of corporate governed board size, CEO duality, board independence, board meeting and women on board. As far as the control variables concerned it includes firm size, capital structure, return on investment and capital intensity are estimated. Theses variable has been used by (N. Hussain, Rigoni, & Orij, 2018). (Munir et al., 2019) reported a positive link between firm size and environmental performance. According to the regression study, larger Indian enterprises are more likely to invest in environmental sustainability since they have more resources and economies of scale. Another study estimated that firm size has a beneficial impact on corporate social responsibility (CSR) activities, particularly environmental performance, among Asian firms. Larger businesses have more resources and stakeholder pressure to engage in environmentally responsible activities (Chang et al., 2019). Larger Brazilian enterprises were shown to have superior

environmental performance. The regression analysis revealed that firm size, as assessed by total assets and sales, has a positive correlation with environmental indicators (Fernandes et al., 2021). The meta-analytic research revealed that CEO dualism is often related with inferior environmental performance. The study found that organizations with dual CEO-chair responsibilities have less independent monitoring, resulting in poorer environmental standards (Sharif & Rashid, 2014). Another study (Fernandes et al., 2021)showed in their regression study that CEO dualism is connected with inferior environmental performance in emerging markets. Firms with CEO duality demonstrated lower commitment to environmental sustainability than those with separate roles. Moreover, another study empirical results indicated that board structure, especially the percentage of independent directors and board diversity, has a significant impact on corporate environmental responsibility. The panel data analysis revealed that companies with more autonomous and diverse boards are more likely to participate in environmental efforts (Shahab et al., 2018). The robust corporate governance procedures, such as the separation of CEO and chairperson responsibilities and the establishment of environmental oversight committees, have a beneficial impact on environmental innovation. The regression study revealed that companies with superior governance are more likely to invest in environmental research and development (Gao, Y., & Yu, W. 2023). In addition to reports, European multinational businesses with stronger governance systems, such as board independence and effective audit committees, perform better on environmental issues. The regression analysis revealed that excellent governance procedures are critical to improving environmental results (Galbreath et al., 2022).

4.3.1 Panel Least Square Estimation:

In this session model 1 is presented for regression of 75 countries with 43592 observations of corporate environmental performance for 7875 number of firms. By applying the panel data estimation technique in table 3, model 1, maximum independent variables are highly significant impact on dependent and control variables as P value is less than 0.01, 0.05 and 0.10 carried asterisks.

The independent variable consists of board size, CEO duality, board meeting, women on board and board independence. These variables have been used already by several researchers and estimated the results through panel data estimation technique or panel

least square estimation. Our panel data estimation gives the results as coefficient of board size is positively related to C_EP with value 3.27 as 1% significance level which larger efficient board member have great impact on corporate environmental performance. Likewise, we found CEO_DUL is positively impact in C_EP with coefficient value of 3.60. B_MTNG and W_OB are positively significant with value of 31% and 48% at 1% significance level. While B_INDP is not significantly impact on C_EP.

The larger board size improves environmental performance by providing more resources and more views for decision-making. While, CEO duality reduces environmental performance due to decreased scrutiny and the frequency of board meetings improves environmental performance by providing regular supervision and strategic discussions about sustainability. whereas, a positive effect, demonstrating that gender diversity improves environmental performance, moreover board Independence improves environmental performance, emphasizing the value of independent supervision (Munir et al., 2019). Larger board sizes are related with improved environmental performance. This implies that as the number of board members grows, the company's environmental performance improves. The frequency of board meetings improves environmental performance. This suggests that more frequent meetings facilitate greater monitoring and strategic conversations about environmental challenges (de Abreu et al., 2023). CEO duality (in which the CEO also serves as board chair) is connected with improved business environmental performance. This shows that having the same individual in both jobs could simplify decision-making and lead to more effective implementation of environmental measures. Higher female presence on boards is related with improved environmental performance. A higher share of independent directors improves environmental performance (Fernandez, A., & Smith, J. 2023).

Table 7: Panel Least Square Estimations

C_EP	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
B_SIZE	3.279	.053	61.68	0	3.175	3.384	***
C_DUL	3.602	.285	12.63	0	3.043	4.16	***
B_INDP	0	.011	0.03	.976	-.021	.021	
B_MTNG	.315	.029	10.85	0	.258	.371	***
W_OB	.48	.015	32.85	0	.451	.508	***
F_SIZE	0	0	-0.23	.817	0	0	
C_STR	.812	.025	33.00	0	.764	.86	***
RO_AST	30.266	2.386	12.68	0	25.589	34.943	***
CAP_INT	-9.945	1.375	-7.23	0	-12.64	-7.249	***
Constant	2.159	1.048	2.06	.039	.105	4.213	**

Mean dependent var	49.737	SD dependent var	31.388
R-squared	0.152	Number of obs	43592
F-test	968.330	Prob > F	0.000
Akaike crit. (AIC)	417029.675	Bayesian crit. (BIC)	417116.502

*** p<.01, ** p<.05, * p<.1

The level of significance is represented by asterisks as 1%, 5% and 10%.

Asterisks indicate the degree of significance, which ranges from 1% to 10%. The table presents the linear regression results Pool OLS of corporate governance CG basis and corporate environmental performance (C_EP). In our research, the independent variables are board size (B_SIZE), CEO duality (C_DUL), board independence (B_INDP), board meetings (B_MTNG), and the number of women on the board. We included financial variables such as company size (F_SIZE), capital structure (CAP_STR), return on investment (RO_AST), and capital intensity (CAP_INT) as control variables. We measure the dependent variable (C_EP) as a product of disclosure index and its related quality index, with a minimum value of 11.67 and a maximum value of 92.75 as the reference of descriptive.

Likewise control variables includes firm size, return on assets, capital structure and capital intensity are effectively impacting the corporate environmental performance with high significance value. In table 3, the control variable is highly significant except F_SIZE with P value is great than 10% significance level. C_STR and RO_AST are positively impacting the C_EP with less than P value 1% of coefficient value of 0.81 and 30.26 which means the variable importance are highly recommended in the relations. C_INT is negatively significant impact on the C_EP at 1% significance level of value (9.95).

Previous studies are also supporting our control variable results as positive and significant, indicating that firms with higher capital intensity are likely to engage more in sustainability practices, possibly due to greater environmental impact and regulatory scrutiny. Larger firms are more likely to engage in better corporate sustainability practices. Firms with higher profitability might invest more in sustainability, though the effect is modest (Zhang et al., 2021). Firms having a higher capital intensity, or more fixed assets, are more likely to engage in industries with major environmental implications, such as manufacturing or energy. These firms may have more significant problems and opportunities while managing their environmental performance (Z. Li et al., 2022). Firm with greater ROA often have better financial health, allowing them to devote more resources to environmental projects. A high ROA shows effective management, which can lead to improved environmental management practices (Ciftci et al., 2019). Firms having a higher capital intensity, or more fixed assets, are more likely to engage in industries with major environmental implications, such as manufacturing or energy. These companies may confront more significant problems and opportunities in managing their environmental performance (Artica et al., 2019).

4.3.2 Fixed Effects Model Analysis

In this part, we report the fixed effect regression results for corporate governance and environmental performance. Table 5 shows stepwise fixed effect regression models. To eliminate multicollinearity difficulties in Table 2, we used stepwise regression. Table 5 shows the fixed effect model's regression results for CG and corporate sustainability. Table 5 shows stepwise fixed effect regression models. The first dependent variable is economic SP. We used stepwise regression to avoid multicollinearity in table 2. In the following model, we examine the impact of independent and control variables on the dependent variable C_EP. The results shows that all variable interact positively significant on corporate environment performance by Astrik at 1% and 10% significance level. The positive and significant coefficient of board size B_SIZE indicates that 1% increase in board size is associated with 0.44 units increase in corporate environmental performance. This shows that having a varied collection of knowledge and perspectives helps to improve environmental oversight and policy. Likewise, CEO duality coefficient is positive and significant 1.06 at 1% significance level, which means 1% increase in tendency of decision making of CEO as chairperson of the board could impact 1.06 score of environmental performance. Board

independence coefficient is 0.04, positive and significant which mean 1% increase of board independency could affect 0.04 in corporate environmental performance. Independent director likely promotes stronger governance and accountability. Board meeting coefficient is 0.044 which is positive and significant and tends to interpret that 1% increase in board meeting is increased in score of environment performance and suitability by 0.04. More frequent board meetings are beneficial for corporate environmental performance. This reflects the idea that active engagement and regular oversight are crucial. Women on board coefficient is 0.73 as positively significant which means that gender diversity on boards is positively associated with environmental performance. Female directors often bring different perspectives and prioritize sustainability. Prior studies fixed effect results are supporting our estimation and interpretation as the impact of women on board governance and performance. The study found that boards with more women have higher attendance and governance results, which improves business performance (Adams & Ferreira, 2009). The study employs fixed effects regression to investigate the link between board meetings and business value. Results show that more frequent board meetings are positively associated with company value, implying that regular oversight and involvement by the board improves corporate performance (Brick, I. E., & Chidambaran, N. K. 2010).

The interaction of relationship in between control variable and dependent variable is significant which means that the control variables P value is less than 1%. Firm size is positively impact on C_EP as coefficient result is positive and significant. It shows the sustainability of firm size with respect of corporate environmental score. Similarly, capital structure is positive and significant, the coefficient value is 0.27, which mean 1% addition of debt or equity may increase the environmental performance by 0.27. Positive and significant, indicating that firms with higher capital intensity are likely to engage more in sustainability practices, possibly due to greater environmental impact and regulatory scrutiny. Moreover, return on asset is negatively and significantly associated with corporate environmental performance with -27.50. It means that firms with lower profitability might invest less in sustainability, though the effect is modest. In the same way, capital intensity carries negative and significant impact on corporate environmental performance which means that firms with lower capital intensity are likely to engage less in sustainability practices, possibly due to less environmental impact and regulatory scrutiny. Previous research is owning our the most results as the

study uses regression analysis to identify characteristics that influence the quality of environmental disclosures. The findings indicate that larger firms, those with higher ROA, and certain capital structures are more likely to give high-quality environmental disclosures, emphasizing the importance of firm characteristics in environmental communication (Dahlmann et al., 2019). This research employs regression models to examine the association between environmental performance and disclosure quality, accounting for firm size and financial performance. The findings show that larger enterprises with superior environmental performance are more likely to offer high-quality environmental disclosures (Clarkson et al., 2011).

Table 8: Fixed Effect Model for analyzing the effect of CG on CEP

C_EP	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
B_SIZE	.44	.066	6.65	0	.31	.569	***
C_DUL	1.06	.292	3.63	0	.488	1.632	***
B_INDP	.049	.013	3.79	0	.023	.074	***
B_MTNG	.044	.025	1.74	.081	-.005	.093	*
W_OB	.703	.013	56.14	0	.679	.728	***
F_SIZE	0	0	-2.51	.012	0	0	**
C_STR	.279	.035	8.01	0	.211	.348	***
RO_AST	-27.509	2.097	-13.12	0	-31.619	-23.399	***
CAP_INT	-16.275	1.995	-8.16	0	-20.185	-12.365	***
Constant	34.906	1.252	27.89	0	32.453	37.36	***

Mean dependent var	49.737	SD dependent var	31.388
R-squared	0.096	Number of obs	43592
F-test	435.362	Prob > F	0.000
Akaike crit. (AIC)	352454.782	Bayesian crit. (BIC)	352541.609

**** p<.01, ** p<.05, * p<.1*

Asterisks indicate the degree of significance, which ranges from 1% to 10%. The table presents the fixed effect regression results for corporate governance CG base and environmental bottom sustainability or corporate environmental performance (C_EP). We keep this modal unrestricted. In our research, the independent variables are board size (B_SIZE), CEO duality (C_DUL), board independence (B_INDP), board meetings (B_MTNG), and the number of women on the board. We include industry-specific financial variables, firm size (F_SIZE), capital structure (CAP_STR), return on investment (RO_AST), and capital intensity (CAP_INT) as control variables. We measure the dependent variable (C_EP) as a product of the disclosure index and its corresponding quality index, with a minimum value of 11.67 and a maximum value of 92.75 as the descriptive reference. The data for the governance and control variables were gathered from the Bloomberg data source. As defined by the data source, the variable B_SIZE represents the number of directors on the governance board. CEO duality (C_DUL) is a binary variable of individual interest. Board independence B_INDP refers to the proportion of independent directors among total directors. Board meeting B_MTNG represents the number of board meetings held in the given year. Similarly, Women on Board (W_OB) represents the proportion of female directors on the board. To prevent ambiguous results, we estimate the Pearson correlation and regression of fixed effect independently. Bloomberg calculates the control variable as Firm Size (F_SIZE), which is the log of the firm's total assets. The second controlling variable is capital structure. C_STR represents the firm's debt-to-equity ratio. The return on asset (RO_AST) is defined as the ratio of the firm's operational income to its total sales. Capital intensity (CAP_INT) is computed by comparing capital expenditure to sales.

CHAPTER 5

5 Conclusion

The previous chapter's results will be addressed and reflected on in the following chapter, including theoretical and empirical research to back them up. The chapter concludes with the study's findings, as well as contributions, limits, and directions for further research.

In this study, we look at how corporate governance is linked to corporate environmental performance. In contrast to the extant literature, we use the GRI methodology to assess our dependent variable, corporate environmental performance. The GRI framework facilitates and challenges enterprises to submit positive or negative required information on their operations (Fernandez-Feijoo et al., 2014) and propose solutions for them to improve the sustainability of their corporate environment (Fonseca et al., 2014).

Our analysis offers intriguing findings about the relationship between CG traits and CEP shown in table 9. We perform fact-based empirical analysis and find support for the majority of our hypotheses on agency and stakeholder theory. Empirical studies reveal that the majority of CG characteristics play a key influence in improving a firm's corporate environmental performance across all industries.

Table 9: Summary of Hypothesis Testing: CG (factors) effects on CEP

Hypothesis	Variable Abr.	Studied relationship	Results Sign	Result
Hypothesis 1	B_SIZE	-ive	+ive	Rejected
Hypothesis 2	B_INDP	+ive	+ive	Accepted
Hypothesis 3	C_DUL	-ive	+ive	Rejected
Hypothesis 4	W_OB	+ive	+ive	Accepted
Hypothesis 5	B_MTNG	+ive	+ive	Accepted

The justification of results with references are show in Table 10. Our result about the board size rejected the hypothetical research as some previous studies supported our estimated results. A larger board size improves business environmental performance by bringing together a diverse variety of experience and perspectives, increasing supervision, and assuring strong environmental governance (Liao et al., 2015). Larger boards are more likely to establish specific environmental committees and policies, which could successfully handle sustainability concerns. They also promote stakeholder participation and decision-making, resulting in better environmental

outcomes (Cucari et al., 2018). According to research, board size is strongly associated with improved environmental performance across a wide range of businesses.

Likewise, board size we find CEO duality positively impact on corporate environmental performance which contradicted the Hypothesis. CEO duality improves business environmental performance by facilitating streamlined decision-making and cohesive strategic direction (Chams & García-Blandón, 2019). This structure could improve accountability, ensuring that environmental goals are integrated into company strategies, and enable more efficient resource allocation for sustainability projects. According to studies, organizations with CEO duality often have stronger environmental governance and perform better on sustainability criteria (Walls et al., 2012).

Table 10: Justification of Hypothesis Testing with prior studies

Hyp	Var. Abr.	Studied Relationship	Results Sign	Results	Justification	Reference
H1	B_SIZE	Negative (-ive)	Positive (+ive)	Rejected	Larger boards give a larger range of experience and perspectives, which improves decision-making and oversight of environmental programs.	(Hillman & Keim, 2001)
H2	B_INDP	Positive (+ive)	Positive (+ive)	Accepted	Increased board independence promotes more impartial decision-making, ensuring that environmental concerns are prioritized alongside financial performance.	(Nguyen & Thanh, 2021)
H3	C_DUL	Negative (-ive)	Positive (+ive)	Rejected	A unified leadership structure gives clear and consistent direction on environmental strategies, which improves efficacy.	(Walls et al., 2012)
H4	W_OB	Positive (+ive)	Positive (+ive)	Accepted	Women contribute various viewpoints and a stronger emphasis on sustainability, resulting in more inventive and successful environmental solutions.	(Ciftci et al., 2019)
H5	B_MTNG	Positive (+ive)	Positive (+ive)	Accepted	Regular meetings promote constant monitoring and review of environmental strategies, allowing for proactive governance.	(Kassinis & Vafeas, 2006)

We discovered that a board with a greater proportion of independent directors increases environmental and social performance. These findings support the agency and stakeholder theory hypothesis that external directors are accountable to a broader group of stakeholders. (Jo and Harjoto 2011; Galbreath 2011). Board independence improves company environmental performance by ensuring unbiased scrutiny and responsibility in environmental governance. Independent directors are more inclined to oppose management choices, resulting in stricter environmental rules and practices. They could also contribute a wide range of experience and perspectives to the board, improving its ability to deal with complicated environmental challenges (Liao et al., 2015). Empirical studies show that organizations with increased board independence have better environmental performance and more transparent sustainability reporting.

Consistent with agency theory, we consider board meetings to be an indicator of board diligence, assuming that more frequent meetings would allow the board to pay greater attention to the requirements of other stakeholders. This is the fundamental basis of our Hypothesis. We find considerable support, indicating a link between the social bottom line and board meeting frequency. These results confirm the recent findings of Jizi et al. (2014). Frequent board meetings improve business environmental performance by providing ongoing scrutiny and prompt decision-making on environmental issues. Regular meetings make it easier to assess sustainability targets, respond quickly to environmental concerns, and keep environmental performance a top priority. Boards that meet frequently are better able to address complicated environmental issues and integrate sustainability into corporate strategy. Empirical research suggests that increasing board meeting frequency is linked to better environmental performance and more extensive environmental disclosures.

Women's representation on corporate boards improves environmental performance by providing various perspectives, improving governance, and focusing on sustainability. Female directors frequently advocate for stronger environmental policies and practices, resulting in improved risk management and openness in sustainability reporting (Kathy Rao et al., 2012). They contribute distinct perspectives and stimulate conversations about long-term environmental policies, which result in comprehensive and effective environmental efforts. Studies reveal that gender-diverse boards have greater environmental performance, emphasizing the importance of female representation in corporate governance (Alsayegh et al., 2020).

5.1 Policy Implications and Recommendations

Corporate environmental performance (CEP) has become an essential component of sustainable business strategies. This performance is heavily influenced by numerous governance methods, such as board size, board independence, CEO duality, the number of women on boards, and the frequency of board meetings. This detailed policy paper examines the impact of these governance characteristics on CEP and makes concrete recommendations for governments, corporate executives, and researchers to capitalize on their positive benefits.

5.1.1 Implications

- **Increased Resources for Oversight:** Larger boards can devote more resources and time to environmental oversight, ensuring that businesses follow environmental standards and adopt sustainable practices.
- **Expertise and Diversity:** Larger boards typically include a broader range of skills, expertise, and viewpoints, which is critical for addressing complex environmental challenges. This diversity allows the board to develop comprehensive environmental strategies and policies.
- **Improve Decision Making:** The inclusion of different points of view promotes more vigorous conversations and deliberations, resulting in better decision-making processes for environmental sustainability.
- **Enhanced Accountability:** Independent boards can hold management accountable for environmental performance, integrating company practices with sustainability objectives.
- **Unified Leadership:** CEO duality can help to ensure consistent and clear direction when implementing environmental measures.
- **Strategic Alignment:** The dual position enables better alignment between the board and management on environmental goals, resulting in more coherent and integrated plans.
- **Innovation Solutions:** Gender diversity promotes new thinking and solutions to environmental concerns, hence leading businesses to adopt more sustainable practices.

- **Stakeholder engagement:** Women directors are often more effective at stakeholder engagement, resulting in stronger links with environmental groups and communities.
- **Diverse Perspectives:** Having women on boards gives diverse perspectives that are often more sensitive to environmental and social issues, which improves the board's ability to solve CEP.
- **Proactive Governance:** Through regular meetings, boards can address developing environmental challenges and adapt strategy as needed.
- **Regular Monitoring**: Frequent board meetings allow for regular monitoring and evaluation of environmental plans, ensuring that businesses stay on track to achieve their sustainability objectives.

5.1.2 Recommendations

- **Optimal Board Size:** Policymakers and corporate executives should strive for an optimal board size that strikes a balance between diversity and management. A board of 10-15 people is generally regarded effective.
- **Regular Assessment:** Companies should examine the composition and size of their boards on a regular basis to ensure that they are prepared to deal with changing environmental issues.
- **Training and Development:** Continuous training programs on environmental concerns can help board members contribute more effectively to CEP.
- **Empowerment:** Independent directors should be given adequate authority and resources to successfully monitor environmental performance.
- **Increased Independent Director Proportion:** Companies should aim to have at least 50% of their boards composed of independent directors. Regulatory authorities may consider implementing this condition to increase board independence.
- **Periodic assessments:** Conducting regular assessments of the effectiveness of CEO duality in encouraging environmental performance can help businesses make informed decisions about whether to keep or change this governance structure.

- **Clear Role Definitions:** Companies that use CEO duality should have clear definitions and boundaries for the CEO and board chair's roles to avoid conflicts of interest.
- **Gender Diversity Targets:** Policymakers should set gender diversity targets for corporate boards, with a goal of at least 30% female representation.

5.2 Limitations of the study: CG factors and CEP

The impact of governance issues like as board size, independence, CEO duality, women on boards, and board meetings on corporate environmental performance (CEP) is a complicated and multidimensional field of study. Despite the favourable benefits revealed, many limitations must be recognized in order to present a fair perspective. These limitations apply to methodological, contextual, and theoretical factors, and knowing them is critical for appropriately interpreting the findings and guiding future study.

5.2.1 Methodological Limitations:

- **Data Availability and Quality:** One of the major challenges in researching the impact of governance on CEP is the availability and quality of data. Environmental performance statistics are frequently self-reported by businesses and may not be uniformly audited or confirmed. This can result in discrepancies and possible biases in the provided performance metrics.
- **Measurement issues:** The measurement of CEP itself can be challenging. There is no commonly agreed metric for environmental performance, therefore how it is defined and evaluated varies among studies. This lack of consistency may hinder comparisons and generalizations.
- **Cross-sectional versus longitudinal data:** Many research uses cross-sectional data, which provides a picture of a specific point in time. This method fails to account for the dynamic nature of both governance practices and environmental performance, which change over time. Longitudinal studies, which examine changes over time, can yield more reliable insights but are more difficult to undertake.
- **Endogeneity Concerns:** The relationship between governance characteristics and CEP may be endogenous, meaning that causality can go both ways. For example, while governance factors might improve CEP, companies with higher environmental

performance may recruit more independent directors or have more regular board meetings. This bidirectional causality hampers the interpretation of outcomes.

5.2.2 Contextual Limitations:

- **Industry Differences:** The impact of governance considerations on CEP varies greatly between industries. For example, industries with a greater environmental impact, such as manufacturing or energy, may have distinct dynamics than service-oriented companies. The study's conclusions may not apply evenly across all sectors.
- **Regional and Cultural Variations:** Corporate governance standards and environmental restrictions vary greatly among countries and regions. Cultural attitudes regarding the environment and governance can have an impact on the effectiveness of board structures and procedures. These contextual variables limit the findings' generalizability to certain geographic areas.
- **Firm Size and Structure:** The size and organizational structure of a corporation can influence how governance aspects impact CEP. Larger companies may have more resources to spend in both governance and environmental projects, whereas smaller businesses may have limits that limit the effectiveness of these governance measures.

5.2.3 Theoretical Limitations

- **Conceptual Frameworks:** The study of governance factors and CEP often relies on various theoretical frameworks, such as agency theory, resource dependence theory, or stakeholder theory. Each of these frameworks offers different explanations and predictions about the impact of governance on environmental performance. The choice of theoretical lens can thus influence the study's design and interpretation of results.
- **Overemphasis on Certain Factors** Focusing on specific governance factors might overlook other important elements that also affect CEP. For example, while board size and independence are critical, other factors like board member expertise in environmental issues or the presence of environmental committees within the board are equally important but may not be adequately considered.
- **Dynamic Capabilities Perspective:** The dynamic capacities viewpoint, which proposes that organizations adapt and reconfigure internal and external skills to deal with constantly changing surroundings, emphasizes the importance of flexible and

responsive governance structures. However, this perspective can be difficult to operationalize and measure, making it difficult to quantify its impact empirically.

5.2.4 Practical limitations:

- **Implementation Challenges:** Even when governance policies have been proved to have a beneficial impact on CEP, they might be difficult to execute successfully. Organizational opposition to change, entrenched interests, and a lack of knowledge about environmental issues can all inhibit the implementation of recommended governance systems.
- **Regulatory Environment:** The regulatory environment influences both governance practices and environmental performance. Inconsistent or poor regulatory frameworks can erode the effectiveness of governance practices. Companies operating in regions with strict environmental rules may have different outcomes than those in less regulated surroundings.
- **Stakeholder Influence:** Stakeholders including as investors, customers, and non-governmental groups can all have an impact on the relationship between governance and CEP. Stakeholder expectations and pressures can motivate corporations to improve their environmental performance, sometimes independent of internal governance practices.

5.3 Future Directions

The future research directions aim to provide a comprehensive framework for analyzing and optimizing the favorable effects of board size on company environmental performance. Other research approaches, such as case studies and surveys, could be utilized to uncover underlying connections and provide detailed insights. The proposed approaches may better capture the demographic characteristics of board members and companies. Based on a review of the current literature, we also discovered a clear contrast between the board size (B_SIZE), CEO duality (C_DUL), and corporate environmental performance (C_EP) research streams. This fragmentation could be caused by a number of factors, including methodological problems, sample size, country and industry effects, and time period. To our knowledge, there has been no meta-analytical review published in the existing literature. Having said that, we welcome future research to address this gap by identifying the potential causes of the current fragmentation. Future research should determine the optimal board size for

greatest environmental performance. Due to the variable difficulties of environmental control, different sectors may require different board sizes. Researchers should investigate how having diverse knowledge on larger boards contributes to excellent environmental governance. Research should focus on specific abilities and expertise that are valuable for sustainability, developing environmental committees within larger boards, and their specialized roles in improving environmental performance.

Researchers should look into how CEO duality can improve communication and decision-making processes, potentially leading to more unified and efficient implementation of environmental policies. Another way to investigate how united leadership under CEO duality could better link business strategy with environmental goals, resulting in fewer conflicts and a greater emphasis on sustainability projects. Moreover, to enhanced accountability, CEO duality could improve accountability in environmental performance, since the combined role can lead to increased personal responsibility and dedication to environmental objectives. Likewise, assess the impact of CEO duality on a company's strategic agility, particularly its ability to respond swiftly to environmental problems and opportunities. Investigate the impact of CEO duality on environmental performance in various businesses, including how industry factors influence the effectiveness of this leadership style. Moreover, stakeholder views of CEO duality in connection to environmental performance, specifically how this leadership style affects investor, consumer, and employee confidence in a company's environmental commitments.

By focusing future research areas, researchers could gain a better understanding of how board independence improves company environmental performance and contributes to more sustainable business practices internationally. Research should focus on understanding how increasing the number of independent directors on boards improves corporate environmental performance. Independent directors can provide objective feedback and are more likely to favour long-term sustainability goals above short-term profits. Discover the best balance of independent and executive directors to maximize environmental performance. While independence is essential, knowing how to properly integrate these directors with CEOs can result in more coherent and informed decision-making. Encourage study on the ways by which independent directors can become more actively involved in environmental oversight. This could include the formation of specific environmental committees or the regular inclusion of environmental issues in

board meetings. Conduct cross-industry research to determine how the effects of board independence on environmental performance differ across industries. This will aid in identifying industry-specific practices and challenges that impact the performance of independent directors. Investigate how cultural and regional differences affect the effectiveness of independent directors in promoting environmental sustainability. Comparative analyses of various governance systems and regulatory settings can uncover optimal practices and places for development. Conduct longitudinal studies to assess the long-term effects of board independence on environmental performance. This will provide insights into how continuous independent monitoring leads to long-term business sustainability. Consider how independent directors can affect the incorporation of environmental concerns into overall corporate strategy. Understanding their role in creating strategic priorities can help businesses connect their operations with sustainability objectives. Create thorough case studies of organizations with strong environmental performance and board independence. Highlighting successful cases can serve as benchmarks and practical guidance for other businesses. Analyse how legislative and regulatory changes affect the role and effectiveness of independent directors in environmental governance. This research has the potential to inform policy suggestions and assist businesses in adapting to changing regulatory environments.

As far as board meeting concerned, the study should focus on how regular and well-structured board meetings contribute to improved corporate environmental performance. Regular meetings promote ongoing monitoring and evaluation of environmental plans, allowing for rapid decision-making and the implementation of necessary changes. Encourage the presence of environmental experts at board meetings. Experts can share useful ideas, offer new research, and propose novel techniques to enhancing environmental performance. Examine the effectiveness of teaching and educating board members on environmental problems. Providing ongoing education on sustainability trends, regulatory changes, and best practices can help the board make informed decisions that improve business environmental performance. Emphasize the need of establishing a clear and focused strategy that prioritizes environmental concerns. Agendas should include themes connected to sustainability, such as progress toward environmental goals, regulatory compliance, and environmental innovation. Investigate the importance of stakeholder engagement in board meetings. Stakeholders such as environmental groups, customers, and

community representatives can contribute varied perspectives and help the company improve its environmental strategies. Examine the use of technology and digital tools in board meetings to improve environmental decision-making. Virtual meetings, data analytics, and real-time monitoring technologies can help the board monitor and respond to environmental issues more efficiently. Emphasize the necessity of documenting environmental performance-related conversations and actions at board meetings. Proper documentation fosters accountability and enables tracking of decision implementation and consequences. Emphasize the necessity of documenting environmental performance-related conversations and actions at board meetings. Proper documentation fosters accountability and enables tracking of decision implementation and consequences. Conduct longitudinal research to determine the long-term influence of board meeting methods on environmental performance. This study has the potential to shed light on how long-term board participation with environmental concerns affect company sustainability. Conduct comparative studies to better understand how the frequency and structure of board meetings affect environmental performance across industries. These studies can help uncover industry-specific best practices and difficulties. Investigate how board meeting methods affect environmental performance in small and medium-sized enterprises. Small and medium-sized enterprises (SMEs) frequently have different governance structures and resource constraints than bigger organizations, which can impact the effectiveness of board meetings. Investigate how including environmental topics into broader business strategy discussions at board meetings impacts overall environmental performance. This method ensures that environmental considerations are incorporated into the company's strategic plans.

Researchers could gain a better grasp of how women on boards improve company environmental performance and contribute to more sustainable business practices internationally. This study can serve to encourage the adoption of gender-diverse boards as a regular practice, improving both gender equality and environmental sustainability. Develop comprehensive metrics to assess the influence of female board members on business environmental performance. Quantitative and qualitative data can paint a more complete picture of how gender diversity contributes to sustainability objectives. Highlight successful female board members who have contributed significantly to company environmental performance. Showcasing role models can

motivate other businesses to diversify their boards and promote more women to senior roles. Investigate how women on boards interact with outside stakeholders, such as environmental organizations, community groups, and regulators. Effective stakeholder engagement can boost the company's reputation and result in more strong environmental practices. Investigate how female board members affect the incorporation of environmental concerns into overall corporate strategy. Investigate the efficacy of linking board member compensation to environmental performance indicators. This can help match the interests of all board members, including women, with the company's sustainability goals, resulting in more concentrated efforts to improve environmental results. Investigate how fostering a supportive and inclusive board culture improves the contributions of women. This involves analysing how mentorship programs, flexible work arrangements, and family-friendly policies affect the efficacy of female board members. Examine the effect of specific training and development programs for female board members on their ability to influence environmental policies and practices. Continuous professional growth can enable women to play more meaningful roles in corporate sustainability initiatives. Understanding their role in creating strategic priorities can help businesses connect their operations with sustainability objectives. Investigate how women on boards influence the uptake of technical breakthroughs in environmental management techniques. This includes using data analytics, environmental monitoring tools, and green technologies to enhance sustainability outcomes. Investigate how female board members affect environmental performance in small and medium-sized businesses (SMEs). SMEs have different governance dynamics and resource restrictions than larger firms, and knowing these can help design methods to improve their sustainability effort. Investigate how cultural and geographical factors impact the effectiveness of women on boards in boosting environmental performance. Comparative studies of different countries and governance systems can help identify best practices and areas for development. Conduct cross-industry analyses to determine how the positive effects of women on boards differ across sectors. Identifying industry-specific constraints and opportunities can assist in developing strategies to maximize the impact of gender diversity on environmental performance. Implement longitudinal research to examine the long-term influence of female board members on environmental performance. This can reveal how persistent gender diversity affects company sustainability over time. To overcome these restrictions, future research should concentrate on many critical areas:

- **Enhanced Data Collection:** Standardized reporting and third-party audits can help improve the quality and reliability of environmental performance data, resulting in more accurate CEP assessments.
- **Longitudinal Studies:** Conducting longitudinal studies that examine changes over time can provide more information about the causal linkages between governance issues and CEP.
- **Industry-individual Analyses:** Investigating the impact of governance issues on individual industries might aid in the identification of sector-specific best practices and challenges.
- **Cross-Cultural Research:** Looking at how cultural and regional differences affect the success of governance systems can help provide a more global perspective on CEP.
- **Broader Governance characteristics:** Incorporating a broader set of governance characteristics, such as environmental competence on the board or the participation of sustainability committees, can provide a more complete picture of what drives CEP.
- **Policy Interventions:** Evaluating the effectiveness of policy interventions, such as obligatory disclosure requirements or governance standards, can assist discover the most effective approaches to improve CEP through governance.
- **Stakeholder Engagement:** Understanding the importance of stakeholder engagement in governance and environmental performance can help organizations better align their operations with stakeholder expectations.
- **Behavioural Aspects:** Looking into board members' views and decision-making processes on environmental concerns can help us better understand the human components that influence governance effectiveness.
- **Integration of Technology:** Investigating the role of technology in improving board governance and environmental performance, such as through the use of environmental management systems and data analytics, can provide new tools and methods for improving CEP.
- **Case Studies:** Documenting and analysing case studies of corporations that have effectively implemented strong governance procedures to improve CEP can serve as useful examples and lessons for other organizations.

By addressing these limitations and focusing on these future research directions, scholars and practitioners can develop a more nuanced and comprehensive understanding of how governance factors influence corporate environmental performance and identify effective strategies for promoting sustainability in the corporate sector.