

RESEARCH ARTICLE

Chief Executive Officer (CEO) and corporate environmental sustainability: A systematic literature review and avenues for future research

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Abstract

Environmental sustainability has gained significant importance for organizations, highlighting the crucial role of business leaders in addressing environmental degradation. However, the connection between chief executive officer (CEO) characteristics and environmental sustainability remains understudied in academic literature. Understanding this relationship is crucial, considering the significance of environmental sustainability in organizational strategies. This paper presents the first systematic literature review (SLR) on this topic, aiming to identify gaps and opportunities for future research. The SLR analysed 139 studies on the CEO–environmental sustainability relationship. The findings indicate a recent increase in research activity, particularly peaking in 2022 and focusing on China and the United States. Most studies employed upper echelons theory and examined the influence of CEO demographic characteristics on environmental performance. However, less attention has been given to CEO psychological traits, such as personality and ethical leadership, and environmental disclosure. Furthermore, qualitative aspects of environmental disclosure, including reporting tone, readability and specificity, have received less attention. The findings offer valuable insights for academics, practitioners and policymakers. Recommendations for future research include exploring the impact of CEO psychological traits and environmental disclosure on a firm's environmental sustainability. Additionally, studying cross-country and cross-industry differences in this relationship is encouraged. This study makes a significant contribution to the field by shedding light on the crucial and relevant topic of environmental sustainability and its association with CEO characteristics, providing valuable insights to guide future research and inform decision-makers.

KEYWORDS

CEO, CEO demographic characteristics, CEO psychological characteristics, corporate environmental sustainability, environmental disclosure, environmental performance

Abbreviations: CEO, chief executive officer; ESG, environmental, social and governance; GHG, greenhouse gas; SDGs, Sustainable Development Goals; SLR, systematic literature review.

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1 | INTRODUCTION

Chief executive officers (CEOs) have gained significant attention in academia, politics and media, with a focus on their characteristics and impacts (Lu et al., 2022). In today's political climate, it is crucial for business leaders to prioritize both commercial success and environmental consciousness. CEOs have a fiduciary responsibility to prevent negative environmental effects and address climate change (Al-Shaer et al., 2022). To fulfil this obligation, CEOs should take measures to reduce their company's carbon footprint, establish measurable targets for greenhouse gas (GHG) emissions reduction and minimize resource usage (Haque, 2017). Increasingly, regulators, investors and environmental organizations demand that CEOs adopt corporate reforms addressing climate change concerns (Al-Shaer et al., 2022). CEOs' approaches to environmental reporting and performance can vary, but society needs assurance that businesses are meeting their environmental responsibilities for sustainable growth. Different perspectives on sustainability influence how CEOs implement sustainability policies and guide corporate decisions (Landrum, 2018).

The connection between CEOs and environmental sustainability has received limited attention, resulting in a growing body of research on the relationship between corporate governance, the board of directors and the CEO regarding environmental performance and reporting (Christensen et al., 2021; Shahab et al., 2020). Previous studies have explored various aspects, including CEO compensation, CEO attributes' impact on environmental performance and environmental disclosure (Adu et al., 2022b; Al-Shaer & Zaman, 2019; Elsayih et al., 2020; Giannarakis et al., 2022; Gómez-Bezares et al., 2019; Oware & Awunyo-Vitor, 2021; Razali et al., 2016; Shahab et al., 2022; Sumarta et al., 2021; Ullah et al., 2022; Winschel, 2021). However, a comprehensive understanding of the CEO–environmental sustainability engagement literature is still lacking. CEOs hold a crucial role in driving environmental initiatives and shaping sustainability strategies (Aabo & Giorici, 2022; Khatib et al., 2021; McLaughlin et al., 2019; Roberts, Hassan, et al., 2021; Roberts, Nandy, et al., 2021; Ullah et al., 2022, 2023). Connecting these efforts to a broader framework, such as the United Nations Sustainable Development Goals (SDGs), can provide a clear pathway for aligning business actions with global sustainability priorities (Rosati et al., 2022; Van Zanten & van Tulder, 2021). Conducting a systematic literature review (SLR) would address the knowledge gap and provide insights into future prospects in the CEO–environmental sustainability engagement field (Shahab et al., 2020).

This SLR aims to investigate the relationship between CEOs and environmental sustainability by examining the existing literature and considering recent developments in the field. The review is motivated by several key factors: firstly, the United Nations climate change conferences that focus on addressing climate change globally and building on previous achievements for future goals; secondly, CEOs' increasing emphasis on implementing environmental strategies, highlighting their recognition of sustainability's importance for organizational success; thirdly, the growing interest of companies in sustainability issues, which can attract investment, enhance stakeholder

engagement and promote the development of sustainable and resilient organizations; and lastly, scholars in the sustainability field increasingly recognize the importance of understanding the connection between CEOs and firms' environmental policies. This review aims to provide a comprehensive overview of the current research landscape and offer insights into future prospects, bridging a significant knowledge gap in the CEO–environmental sustainability engagement literature.

This SLR offers unique contributions to the literature on CEOs and environmental sustainability. Firstly, it comprehensively analyses previous studies published over the past decade, identifying patterns, trends and gaps in the existing literature. It provides a roadmap for future research, synthesizing various aspects like year, journal, country, research methodologies and theoretical frameworks. Prior research has often focused on specific aspects, making this comprehensive approach distinct. Secondly, this study compiles relevant research in a user-friendly table, facilitating future researchers. The table includes publication-specific data such as research methodology, theoretical framework and key findings, enabling quick identification of relevant literature. Thirdly, this study contributes to the development of a theoretical framework that captures key dimensions of the CEO–environmental sustainability relationship. By synthesizing existing literature, it identifies influential factors like CEO characteristics, corporate governance, stakeholder pressure and institutional factors. This framework informs future research and enhances understanding of how CEOs contribute to sustainable development. Lastly, this study provides valuable insights for academics, practitioners, policymakers and business leaders. It highlights gaps in the literature and offers actionable recommendations based on a comprehensive analysis. This unique contribution aids in effectively addressing climate change.

The structure of this review study is organized into five main sections. Section 2 'Research Framework' outlines the scope and objectives of the study, while 'Methodology' describes the methods and approaches used to conduct the review. Section 3 presents the findings of the review. Section 4 provides suggestions for further research. Section 5 summarizes the key points and highlights the significance of the study.

2 | RESEARCH FRAMEWORK AND METHODOLOGY

2.1 | Scope of the review

Recent research has highlighted the importance of substantive and process-oriented carbon reduction initiatives for companies to legitimize their environmental sustainability efforts. For example, several studies have investigated the effectiveness of carbon reduction targets and initiatives in reducing GHG emissions (Haque & Ntim, 2022; Luo & Tang, 2021). These studies have shown that companies that set carbon reduction targets and implement actual initiatives tend to have lower emissions and higher environmental performance than those that do not. Moreover, scholars have emphasized the importance of

process-oriented carbon reduction initiatives in enhancing the legitimacy of a firm's environmental sustainability efforts. Such initiatives include stakeholder engagement, environmental reporting and certification programmes (Alshbili & Elamer, 2020; Alshbili et al., 2021; Banerjee et al., 2003; Boulhaga et al., 2023; Crossley et al., 2021). For example, some studies have shown that stakeholder engagement can enhance the legitimacy of a firm's environmental sustainability efforts by enabling the identification and prioritization of key environmental issues and concerns (Crossley et al., 2021; Elmagrhi et al., 2019; Hassan et al., 2020, 2021; Hazaea et al., 2022). Other studies have shown that environmental reporting and certification programmes can enhance the transparency and credibility of a firm's environmental sustainability efforts, thereby enhancing stakeholder trust and support (Banerjee et al., 2003; Warmate et al., 2021).

Recent research has emphasized the significance of substantive and process-oriented carbon reduction initiatives for companies to legitimize their environmental sustainability efforts (Haque & Ntim, 2022; Luo & Tang, 2021). Setting carbon reduction targets and implementing actual initiatives have been found to result in lower emissions and higher environmental performance (Haque & Ntim, 2022; Luo & Tang, 2021). Process-oriented initiatives, including stakeholder engagement, environmental reporting and certification programmes, enhance the legitimacy of a firm's environmental sustainability efforts (Banerjee et al., 2003; Crossley et al., 2021). Stakeholder engagement enables the identification and prioritization of key environmental issues (Crossley et al., 2021), while environmental reporting and certification programmes enhance transparency and credibility, promoting stakeholder trust and support (Banerjee et al., 2003).

In this SLR, we focus on the relationship between CEOs and environmental sustainability, guided by the principles of clarifying and improving existing definitions (Fatima & Elbanna, 2023). CEO attributes have been recognized as crucial in shaping firm outcomes, including performance (Abernethy et al., 2019; Dikolli et al., 2018; Nienhaus, 2022; Saleh et al., 2020), compensation (Chang et al., 2021; Powers et al., 2016), disclosure (Ernawan & Daniel, 2019; Liu & Nguyen, 2020), earnings management (Alhmoed et al., 2020; Bouaziz et al., 2020) and risk-taking (Campbell et al., 2019; Farag & Mallin, 2018). However, the link between CEO characteristics and environmental sustainability has received relatively limited attention in the academic literature (Arena et al., 2018).

Environmental sustainability encompasses a range of practices and policies aimed at mitigating a firm's impact on the natural environment (Aguilera et al., 2021). These practices include energy and waste reduction, sustainable resource usage and the implementation of environmental management systems. Given the current environmental challenges, businesses are urged to adopt environmentally sustainable strategies (Walls & Berrone, 2017).

Researchers in management are increasingly interested in understanding how CEOs and corporate governance structures influence decision-making related to environmental sustainability. Environmental initiatives require significant investments and involve cooperation among various corporate actors (Walls & Berrone, 2017). This

literature review focuses on the broad concept of environmental sustainability, covering environmental performance, innovation and firms' environmental disclosure, all falling under the purview of CEOs.

Considering the global concern for environmental degradation and the urgency for firms to adopt sustainable practices, it is crucial to comprehend the influence of CEOs on these practices and their contributions to sustainable development. This SLR aims to advance research in both the fields of environmental sustainability and CEO characteristics by thoroughly examining the relationship between CEO attributes and environmental sustainability. Moreover, it provides recommendations for future research and offers guidance to business leaders in informing their decision-making processes.

2.2 | Research design

In this study, an SLR methodology was employed to review the existing literature on the relationship between CEO and environmental sustainability. The use of SLR was motivated by the desire to ensure replicability and transparency in the review process (Fatima & Elbanna, 2023). The systematic process outlined by Tranfield et al. (2003) and Klamer et al. (2022) was followed during the SLR. To ensure that the scope of the search was clearly defined, only studies that focused on the concept of environmental sustainability, including firm's environmental performance and reporting, were included. The concept of environmental sustainability and its association with companies' executives have been referred to as climate change, green innovation, environmental, social and governance (ESG), GHG emissions and carbon performance (Balasubramanian et al., 2021; Chithambo et al., 2020; Hossain et al., 2022; Luo et al., 2021; Ren et al., 2021; Villalba-Ríos et al., 2022) in literature. The steps involved in the inclusion and exclusion process are summarized in Figure 1.

The SLR was carried out using two leading databases, Scopus and Web of Science, in the fields of business, accounting, business/finance, management, economics and environmental science. The selection of these databases was based on the number of fields they cover and the quality of the content they provide, ensuring a wider range of articles (Lu et al., 2022; Nguyen et al., 2020). The keywords for the search were identified through a review of the most cited and recent articles on CEO and environmental sustainability in Google Scholar. A set of keywords was used in the search title, abstract and keywords to ensure no relevant article was missed, including 'CEO AND sustainab*¹', 'CEO AND environment', 'CEO AND ESG', 'CEO AND climate change', 'CEO AND carbon', 'CEO AND greenhouse gas', 'CEO AND global warming', 'CEO AND Green innovation', 'chief executive officer and sustainab*', 'chief executive officer and environment', 'chief executive officer and ESG', 'chief executive officer and climate change', 'chief executive officer and carbon',

¹We opted to use the term 'sustainab*' as a truncation or wildcard symbol to capture variations of the word, such as sustainability, sustainable or sustainably. By using this approach, we aimed to ensure a broader scope in our search strategy and encompass a wider range of relevant literature related to environmental sustainability and its various manifestations.

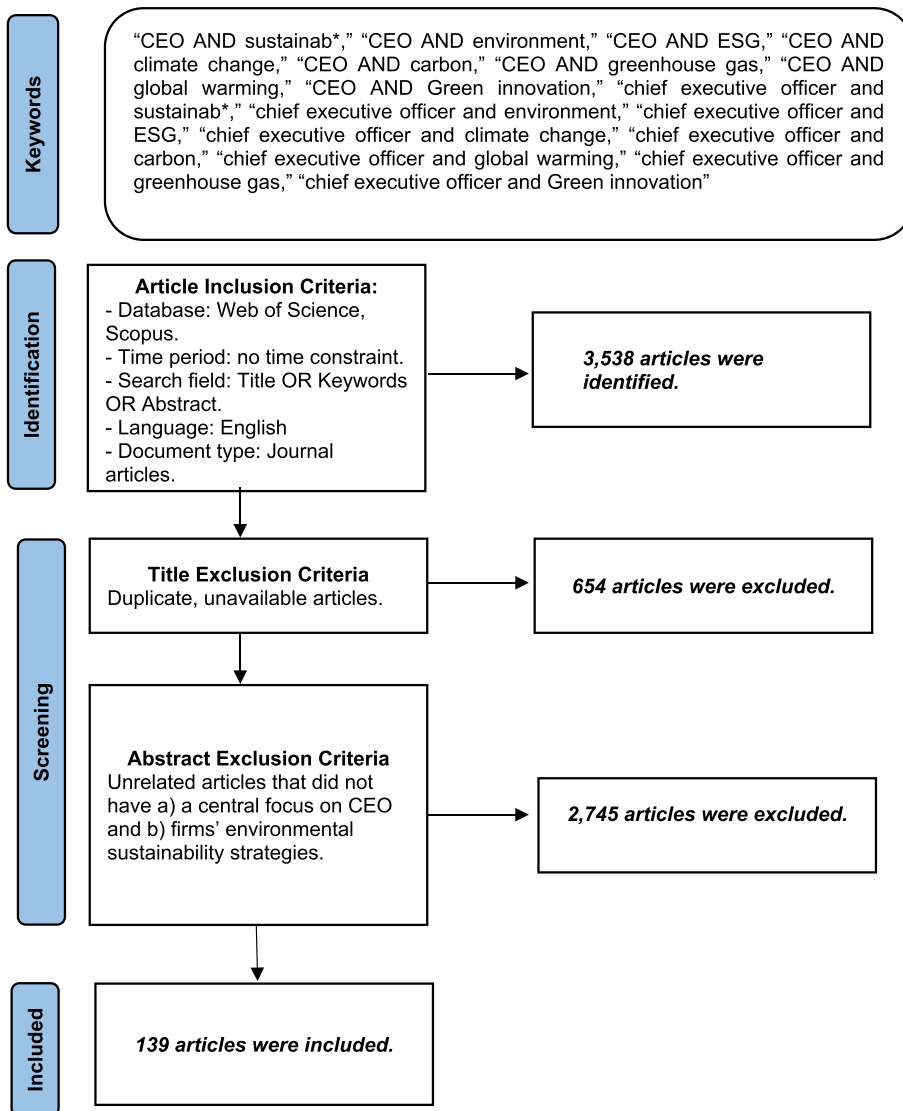


FIGURE 1 PRISMA—research design.

‘chief executive officer and global warming’, ‘chief executive officer and greenhouse gas’ and ‘chief executive officer and Green innovation’. The steps involved in the SLR process, including the inclusion and exclusion criteria, are illustrated in Figure 1.

Additionally, our inclusion criteria did not include any time constraint as it would have limited our ability to analyse and draw conclusions from the existing literature on the relationship between CEO and environmental sustainability. We only included academic journal articles and reviews that were written in English (Fatima & Elbanna, 2023; Roberts, Hassan, et al., 2021). Based on the objective of this SLR, the purpose here is to expand upon the extant literature by providing a comprehensive literature review by synthesizing and analysing publications about CEO and environmental sustainability relationship to critically analyse and identify any critical gaps and limitations in current knowledge. Due to limited publications in the research area, articles from all academic journals are considered (Roberts, Hassan, et al., 2021). To minimize the chances of including unreliable data, we excluded working papers, conference papers and theses that are commonly referred to as ‘grey literature’. This initial search process resulted in

3538 papers, but after removing duplicates and unavailable articles, a total of 2884 relevant articles remained. To further narrow down the list, we used the software NVivo to analyse the titles and abstracts of the remaining articles. After that, we thoroughly read the titles, abstracts and, if necessary, the introduction and conclusion sections of the papers to confirm their relevance to the research themes (Lu et al., 2022). Ultimately, a final sample of 139 articles was used for the analysis. The most relevant sources of our sample articles are shown in Figure 2, while Figure 3 shows the most globally cited documents.

Subsequently, we established a systematic coding procedure for the articles. In line with the method proposed by Gaur and Kumar (2018), we coded the articles based on various criteria, including the year of publication, author(s), title, objective, country, theoretical framework, journal, methodology and primary results. Our analysis revealed that the majority of studies in the literature focused on one or multiple of the following dimensions: CEO compensation, environmental performance, environmental disclosure and CEO characteristics. These dimensions were deduced from our coding process, and all related concepts were integrated into our coding scheme.

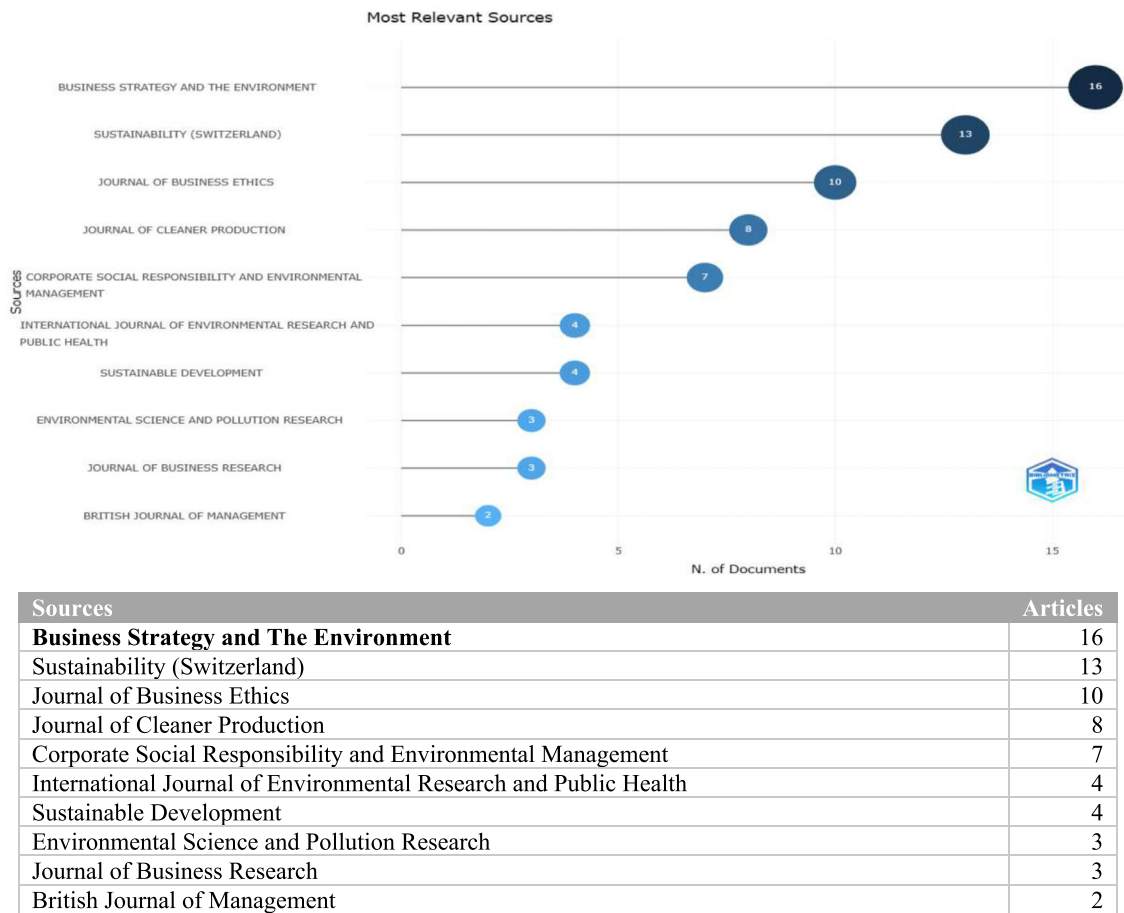


FIGURE 2 Most relevant sources.

In terms of CEO compensation, the studies examined both monetary benefits (Rath et al., 2020) and non-monetary benefits (Deng & Gao, 2013). The environmental performance aspect was investigated using concepts such as sustainability performance (Ahn, 2020), environmental strategies (Fan et al., 2021), environmental innovation (Quan et al., 2021) and environmental responsibility (Zhang, 2017). Environmental disclosure was analysed through ESG disclosure (McBrayer, 2018), sustainability reporting (Gavana et al., 2016), reporting assurance (Al-Shaer & Zaman, 2019) and sustainability reporting style (Lopatta et al., 2022). Lastly, CEO characteristics included demographic characteristics such as age (Oware & Awunyo-Vitor, 2021), background (Adomako & Amankwah-Amoah, 2021), duality (Rezaee et al., 2020), experience (Shahab et al., 2020), gender (Aabo & Giorici, 2022) and political connections (Huang et al., 2021), as well as psychological characteristics like emotional intelligence (Ezzi et al., 2023), narcissism (Lin et al., 2022), humility (Sun et al., 2021), reflective capacity (Jia et al., 2021) and overconfidence (Lee, 2021).

Finally, we employed the established coding scheme to code all 139 relevant articles in the sample. Through this process, it became evident that the studies could be classified into four categories: (1) the relationship between CEO compensation and environmental performance, (2) the relationship between CEO compensation and environmental disclosure, (3) the relationship between CEO characteristics and environmental performance and (4) the relationship

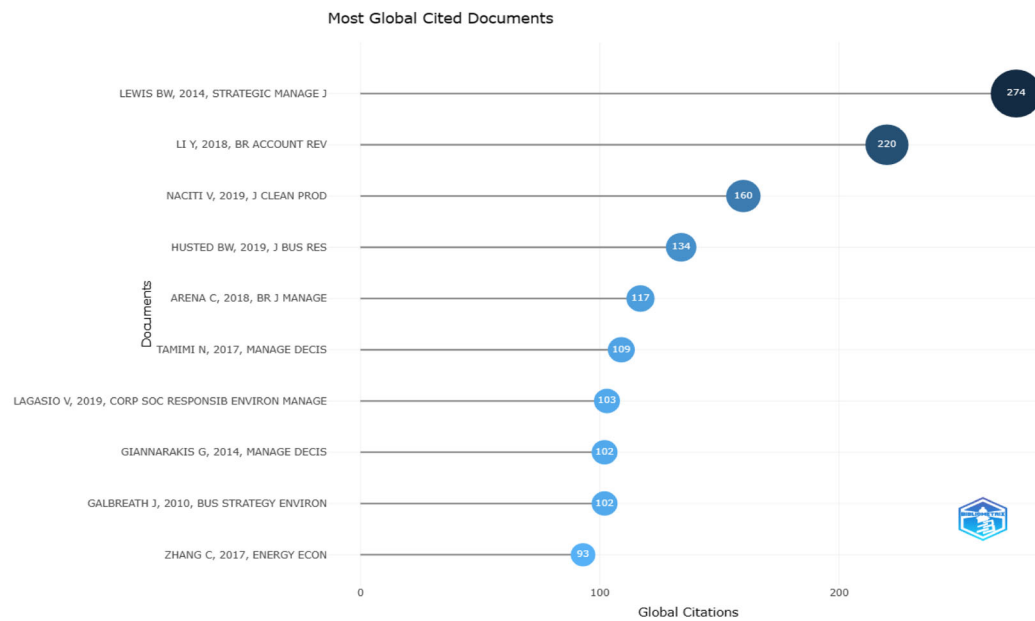
between CEO characteristics and environmental disclosure. Subsequently, the pertinent articles were categorized according to this classification. Figure 4 displays word clouds of the most frequently used words in the titles of the articles.

3 | SLR RESULTS

3.1 | Journal outlets and descriptive analysis

After conducting a comprehensive review of the empirical literature on the relationship between CEOs and environmental sustainability, our analysis revealed a number of insights into the research gaps in this field. To gain a broad perspective of the current state of research on this topic, we focused on two key aspects.

Figure 1 displays the distribution of articles on CEOs and environmental sustainability across 74 different journals, with the largest representation being in the journals Business Strategy and the Environment (16 papers), Sustainability (13 papers) and Journal of Business Ethics (10 papers). However, it is also noted that there are 59 journals that each only have one article on this topic, indicating a lack of concentration in any particular journal. The earliest research in this area is the quantitative study by Stanwick and Stanwick (2001) on the relationship between CEO compensation and the firm's reputation



Paper	DOI	Total Citations (TC)	TC per Year	Normalized TC
Lewis Bw, 2014, Strategic Management J	10.1002/smj.2127	274	27.4	2.4685
Li Y, 2018, Br Account Rev	10.1016/j.bar.2017.09.007	220	36.667	4.2765
Naciti V, 2019, J Clean Prod	10.1016/j.jclepro.2019.117727	160	32	2.8881
Husted Bw, 2019, J Bus Res	10.1016/j.jbusres.2018.01.017	134	26.8	2.4188
Arena C, 2018, Br J Manage	10.1111/1467-8551.12250	117	19.5	2.2743
Tamimi N, 2017, Manage Decis	10.1108/MD-01-2017-0018	109	15.571	1.8701
Lagasio V, 2019, Corp Soc Responsib Environ Manage	10.1002/csr.1716	103	20.6	1.8592
Giannarakis G, 2014, Manage Decis	10.1108/MD-05-2014-0296	102	10.2	0.9189
Galbreath J, 2010, Bus Strategy Environ	10.1002/bse.648	102	7.286	1.1461
Zhang C, 2017, Energy Econ	10.1016/j.eneco.2017.10.036	93	13.286	1.5956

FIGURE 3 Most global cited documents.

in regard to its commitment to the community and environment. Additionally, there are 21 highly influential papers in this field, each with more than 50 citations on Google Scholar, such as Lewis et al. (2014 [274 citations]) and Li et al. (2018 [160 citations]).

Second, with respect to the year of publication, our analysis reveals that the number of research publications on CEOs and environmental sustainability has steadily increased over time. In particular, there were 15 publications in 2019, 14 in 2020, 33 in 2021 and 48 in 2022. This increasing trend can likely be attributed to growing concern over environmental degradation and climate change, which have prompted interest from both academics and practitioners in finding sustainable solutions. The historical development of research on this topic is depicted in Figure 5.

3.2 | Geographical focus

In terms of geographical distribution, the analysis reveals that the majority of empirical studies on the association between CEOs and environmental sustainability were conducted in China, accounting for 27% (37 out of 139 total) of the literature. The United States had the second highest number of publications, with 25 (18%) studies, followed by 20 (14%) studies that focused on global samples. The United Kingdom had seven studies, while seven other studies were based on samples from India and Pakistan. Nine publications were distributed between Australia, Sweden, Italy, France, Denmark and Germany, with only five publications focusing on African countries. There was limited research conducted in developing countries in Asia



FIGURE 4 Word clouds.

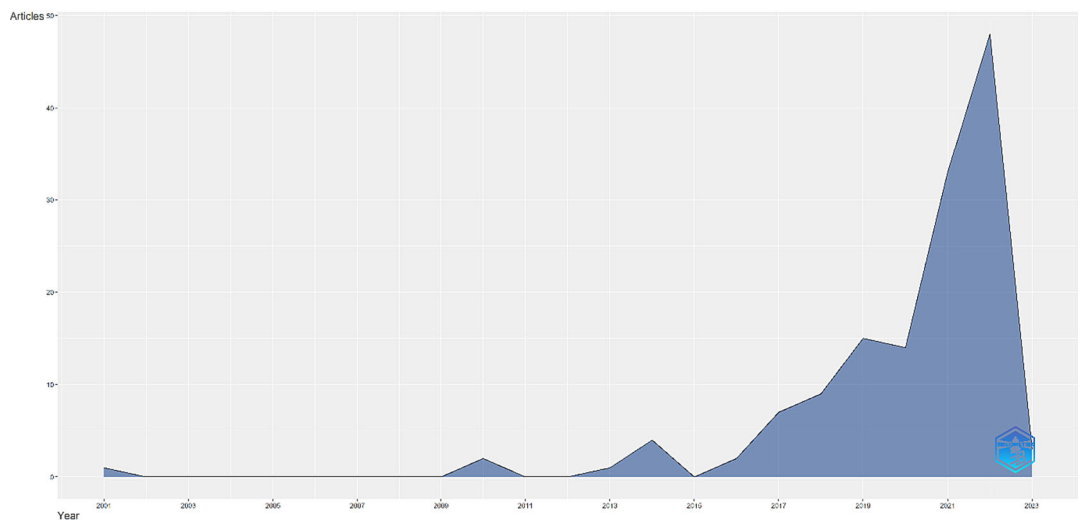


FIGURE 5 Annual scientific production.

and South America, and Oceania received even less attention. To deepen our understanding of the link between CEOs and environmental sustainability, future research should focus on underrepresented regions and explore the possibility of comparative analysis between various regions. Figure 6 illustrates the distribution of research based on geographical locations.

3.3 | Research methods employed

With regard to the research methodologies adopted in previous studies, it was noted that the majority (129 studies) adopted a quantitative approach. These studies conducted quantitative analysis to investigate the relationships between CEO characteristics and either firms' environmental performance or environmental disclosure, utilizing regression analysis. As there is a growing interest in environmental

sustainability by governments and organizations across various industries, it would be beneficial for scholars to consider adopting qualitative approaches, such as interviews and case studies, in their research efforts to examine the relationship between CEOs and environmental sustainability. Furthermore, future research can leverage mixed-methods studies to gain a comprehensive and insightful empirical understanding of the topic, thereby ensuring that the conclusions reached are theoretically valid.

3.4 | Theoretical underpinning and empirical findings

Regarding the theoretical basis of previous studies on CEO and environmental sustainability, 25% of the studies utilized the upper echelons theory, while 24% employed multiple theories. The agency

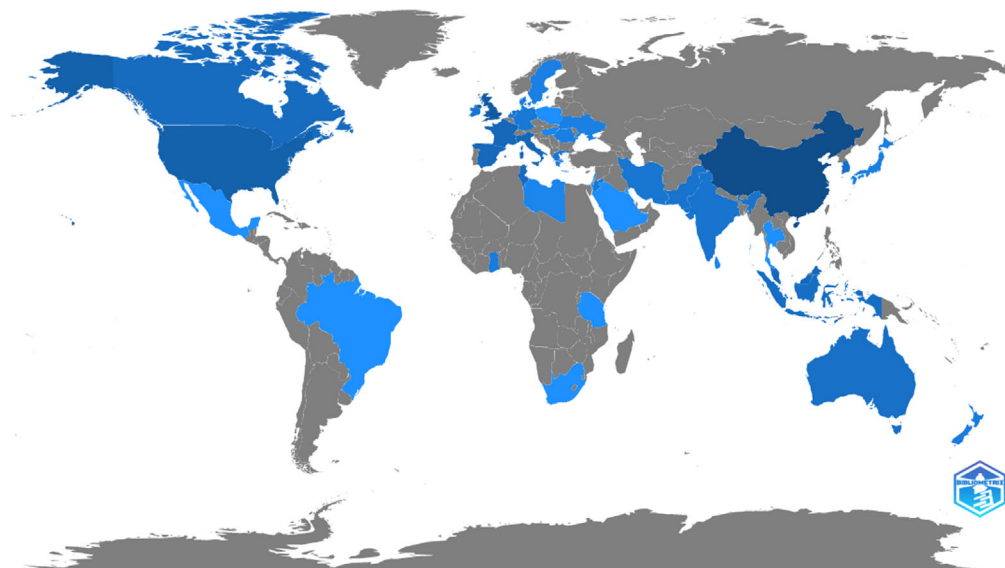


FIGURE 6 Country scientific production.

theory and studies lacking a theoretical foundation were each represented in 16 studies. The remaining studies utilized various theories, highlighting the interdisciplinary nature of the research.

The analysis reveals gaps in the literature. Firstly, there is inconsistency in the theoretical frameworks used, with only a quarter of the studies relying solely on the upper echelons theory. This lack of consistency hinders the direction and findings of future research. Secondly, there is a need for more comprehensive research using alternative theories beyond the upper echelons theory to enhance the understanding of the CEO and environmental sustainability relationship.

Empirical findings show that the majority of articles focused on the relationship between CEO demographic characteristics and the firm's environmental performance or disclosure, with limited attention given to the CEO's psychological characteristics in only 18 studies. Moreover, 74% of the studies examined the impact on environmental performance and innovation, while 23% explored environmental disclosure. Only 1% focused on the CEO's disclosure style. To address these gaps, future studies could investigate the impact of CEO psychological characteristics and consider the attributes of environmental disclosure, such as tone, readability, boilerplate and specificity, and how they may vary based on CEO characteristics.

3.5 | Thematic analysis: A research framework of CEO and environmental sustainability relationship

The research on the relationship between CEOs and environmental sustainability necessitates further examination to address remaining questions and research gaps. To enhance understanding, we present a

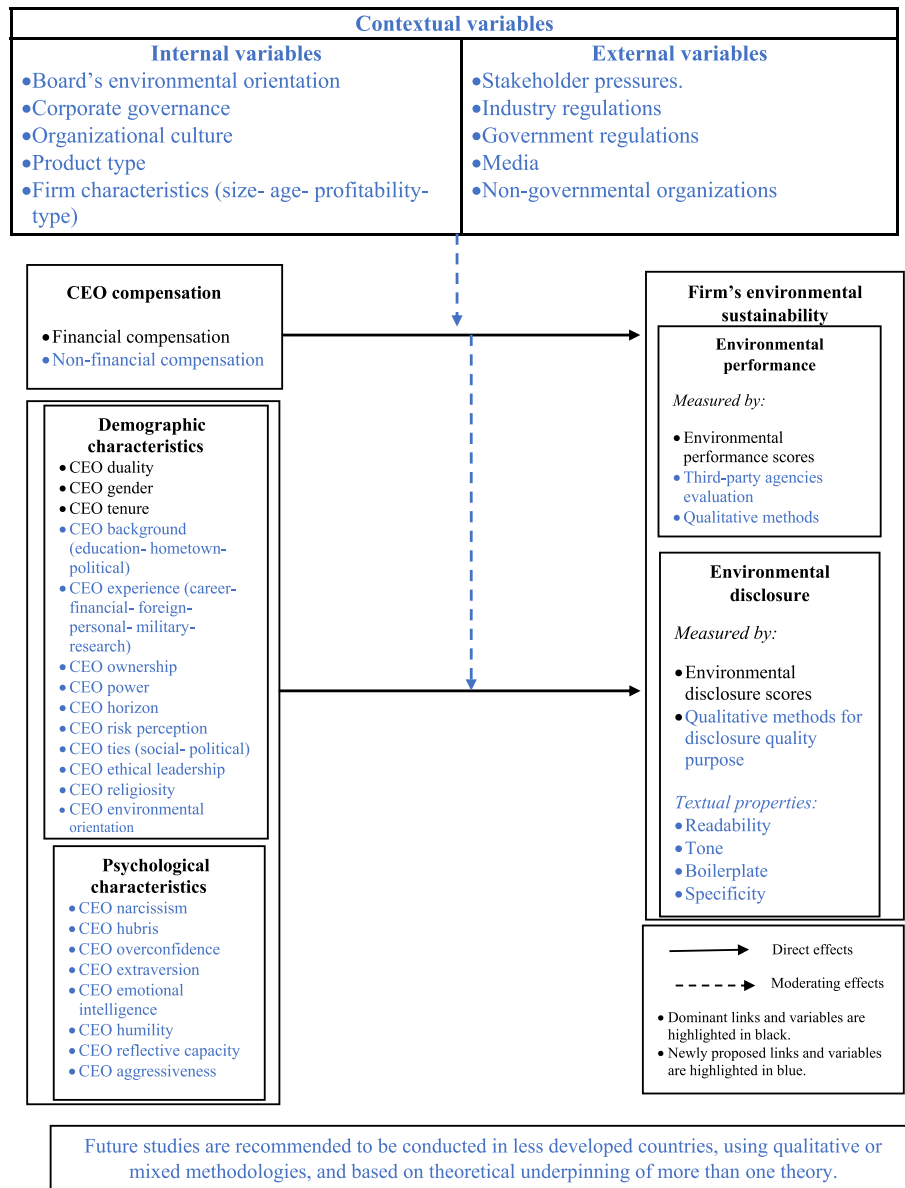
framework derived from a systematic review of 139 pertinent studies. The goal is to leverage these findings, identify future research areas and contribute to both theoretical and practical implications. This section provides a synthesis of the existing research, offering a comprehensive overview of the key relationships outlined in our proposed framework (Figure 7).

3.5.1 | CEO compensation and environmental performance

A total of 22 empirical studies have explored the relationship between CEO compensation and environmental sustainability, with the majority of these studies (18) focusing on the link between CEO compensation and firms' environmental performance, while only 4 studies considered the impact of the environment and pollution on compensation. The studies mainly concentrate on monetary components of CEO compensation, while non-monetary elements such as community standing, social respect, prestige and living environment are given less attention.

Existing literature provides evidence on the relationship between executive compensation and environmental responsibility as presented in Appendix A. Several studies, including Adu et al. (2022b), Al-Shaer et al. (2022) and Stanwick and Stanwick (2001), have found a positive correlation between CEO compensation and both environmental initiatives and a firm's environmental reputation. Conversely, Cavallaro et al. (2018) revealed that regulated utility markets do not consistently provide higher compensation for reducing GHG emissions. In addition, Francoeur et al. (2017) discovered that environmentally friendly companies tend to offer relatively lower total

FIGURE 7 A research framework for the links between CEO and firm's environmental sustainability.



compensation to their CEOs, relying less on incentive-based pay structures. This negative relationship is more pronounced in countries with weaker environmental regulations. Zhang and Zhang (2022) reported a threshold effect, indicating a U-shaped pattern in the relationship between executive compensation and corporate environmental responsibility. Beyond a certain threshold, executive compensation promotes corporate environmental performance.

However, it is worth noting that the literature on the relationship between pollution, the environment and CEO compensation is relatively limited, with only four publications exploring this area. Chan et al. (2022) found a positive correlation between air pollution and CEO compensation, suggesting that companies in regions with unhealthy air quality tend to offer higher pay to their CEOs. Deng and Gao (2013) also reported similar results, where companies located in areas with high crime rates or unpleasant environments provided higher compensation.

Despite these findings, it is important to acknowledge the need for a more comprehensive examination of CEO compensation, including both monetary and non-monetary benefits. Additionally, exploring the influence of contextual factors such as state regulations, stakeholder pressure, industry effects and organizational culture would provide a more holistic understanding of compensation policies.

3.5.2 | CEO compensation and environmental disclosure

The existing research on the relationship between CEO compensation and environmental disclosure is limited, but several studies have made attempts to explore this area, as summarized in Appendix B. Adu et al. (2022b) found a positive influence of CEO compensation on environmental disclosure in the banking sector, with the relationship being

moderated by corporate governance mechanisms. Similarly, Suttipun (2021) reported a positive correlation between CEO compensation and ESG disclosure. Conversely, Rath et al. (2020) discovered that a transparent process of ESG disclosure is associated with a reduction in CEO compensation. Additionally, Al-Shaer and Zaman (2019) found that the presence of external assurance on environmental reporting positively impacts the inclusion of sustainability clauses in compensation contracts. These findings underscore the importance of considering the role of environmental disclosure in understanding the relationship between CEO compensation and environmental sustainability. However, further research is necessary to fully comprehend the complex interplay among these variables.

In conclusion, the analysis of the relationship between CEO compensation and environmental disclosure in the reviewed studies reveals a significant gap in the current literature. The existing studies often overlook various dimensions of disclosure, such as textual characteristics (e.g., readability, tone, boilerplate and specificity). Furthermore, the prevalent use of quantitative measures and disclosure scores poses limitations in capturing the comprehensive quality and specific attributes of disclosure policies. To address these gaps, future research should adopt a qualitative approach to gain a deeper understanding of the determinants and extent of environmental disclosure practices.

3.5.3 | CEO characteristics and environmental performance

In our research pool, studies on CEO characteristics and firms' environmental performance are more prevalent compared to studies on CEO compensation or the link between CEO characteristics and firms' environmental disclosure (Kouaib et al., 2020). Scholars recognize that the characteristics of corporate leaders significantly influence firm performance, making it crucial to examine these characteristics for understanding performance disparities among firms (Xu et al., 2022). Consequently, researchers have focused on investigating the impact of various CEO characteristics on environmental performance.

The measurement of environmental performance within corporations remains a subject of debate (Kouaib et al., 2020). Three methods have been identified for measuring corporate environmental performance: analysis of annual reports, collection of information through questionnaires and evaluation of data from independent rating agencies (Xu et al., 2022). Comparing data from ratings to information from surveys and annual reports improves data collection, research transparency and repeatability (Xu et al., 2022).

Among the analysed articles, a significant portion (102 publications, 73%) explores the impact of CEO characteristics on firms' environmental performance (Ahn, 2020; Jia et al., 2021). The predominant approach to measure firms' environmental performance is through environmental performance and responsibility scores. These scores consider various environmental concerns and trends, as well as the company's exposure to these challenges. Qualitative analysis of formalized strategies and segmentation of business areas contribute to

score calculation (Jia et al., 2021). Environmental concerns incorporated in the index encompass the adoption and operation of environmental protection facilities, disclosure of pollutant concentration, quantity and destination, disclosure of environmental objectives, policies and effects, and disclosure of total annual resource consumption (Ahn, 2020).

While the use of independent rating agencies and questionnaires with corporate responsible parties as measures of environmental performance receives less attention, alternative methods have been employed. For instance, Papagiannakis and Lioukas (2018) utilized a questionnaire approach, seeking input from executives responsible for environmental decisions to gauge their companies' engagement in six elements of environmental performance.

The studies by Arena et al. (2018) and Liao and Long (2018) focused on environmental innovation and eco-friendliness, using the environmental product innovation score. Ren et al. (2021), Wang et al. (2022) and Zhou et al. (2021) examined green innovation through the analysis of corporate patent filing data. Adu et al. (2022b), Elsayih et al. (2020) and Garel and Petit-Romec (2022) evaluated environmental performance based on carbon emission intensity, considering the emissions produced by larger companies. In contrast, Al-Shaer et al. (2022) employed a multi-faceted approach, incorporating measures such as environmental pillar scores, emission scores and a composite environment index to assess companies' environmental practices.

In conclusion, while current research focuses on evaluating firms' environmental performance using scores, there is a need for future studies to consider alternative measurement methods and a more holistic approach. This includes exploring CEO characteristics, both demographic and psychological, to better understand their impact on environmental outcomes. Additionally, incorporating third-party assessments and involving responsible parties within corporations can enhance research reliability. By integrating diverse approaches, we can advance our understanding of the relationship between leadership and environmental performance, leading to more effective sustainability strategies.

CEO demographic characteristics and environmental performance

Over the years, the field of research on CEO characteristics has grown significantly, and the impact of these characteristics on various topics has been widely explored, particularly in the management literature (Al-Shaer et al., 2022). Studies have investigated the effects of CEO characteristics on outcomes such as firm performance, risks, earnings management, audit quality and disclosure (Abernethy et al., 2019; Alhmoed et al., 2020; Campbell et al., 2019; Saleh et al., 2020). Our review of the literature shows that a substantial number of empirical studies examine the relationship between firms' environmental performance and CEO demographic characteristics such as CEO tenure, duality, background, gender, age and connections as stated in Appendix C. The impact of CEO duality on environmental performance is the most widely studied, with 19 publications focusing on this topic. Meanwhile, 8 studies investigate the impact of CEO education, 11 studies focus on the impact of CEO gender, 7 studies look into the impact of CEO power and 4 studies examine the impact of

CEO tenure. Other demographic characteristics, such as the CEO's environmental orientation, activism, ethical leadership, regulatory focus, independence, risk perception and awareness of consequences, have received relatively little attention from researchers.

The relationship between CEO duality and firms' environmental performance has been widely studied, with most research indicating a negative association (Goud, 2022; Lu & Wang, 2021; Peng & Zhang, 2022; Romano et al., 2020; Zhu et al., 2022). Zhu et al. (2022) found a positive impact of gender diversity on board and female CEOs on environmental performance, but CEO duality was found to have a negative impact, aligning with agency theory (Romano et al., 2020). Shahab et al. (2022) found no correlation between CEO duality and waste production, while Khan et al. (2021) discovered a positive correlation between CEO duality and environmental performance among Chinese firms.

Regarding CEO demographic attributes, the literature presents conflicting evidence. Sumarta et al. (2021) found no significant effect of CEO gender on environmental performance in Indonesian banks, while Birindelli et al. (2019) and Lu and Wang (2021) argue that female CEOs contribute positively to environmental sustainability. CEO education, power and tenure have also been studied. Sumarta et al. (2021), Tran and Pham (2020), Wang et al. (2022) and Xia et al. (2022) suggest that higher education levels are associated with greater investments in environmental protection. However, Al-Shaer et al. (2022) found that CEOs with more managerial power engage less in environmental programmes due to associated costs. Aibar-Guzmán and Frías-Aceituno (2021) and Javeed et al. (2021) discovered a positive relationship between CEO power and environmental performance.

Less explored CEO demographic attributes include religion, foreign experience and political ties. Ren et al. (2020) found that CEO ethical leadership moderates the relationship between green human resource management and environmental performance. Iguchi et al. (2022) observed a correlation between CEO religiosity and green business activities. Liao and Long (2018) found that CEOs with a promotion focus positively impact environmental operations, while prevention focus has a negative impact, while Khalid et al. (2022) and Quan et al. (2021) established a positive relationship between CEO foreign experience and green innovation. Furthermore, Shahab et al. (2020) found that CEOs with financial expertise, research background and a younger age are more likely to adopt measures enhancing environmental performance. On the other hand, Huang et al. (2021), Khalid et al. (2022) and Zhang (2017) indicate that CEOs with stronger political ties tend to promote more green innovation within their organizations. These studies suggest that political connections can play a role in influencing environmental initiatives and driving sustainable practices. Meanwhile, Ahn (2020) examined the relationship between CEO attention breadth, driven by social ties, and sustainability performance. The study found that a higher number of social ties positively affect attention breadth, which, in turn, has a positive impact on sustainability performance. This suggests that CEOs who maintain a wide range of social connections are more likely to prioritize and enhance sustainability efforts within their organizations.

In conclusion, the literature indicates a mixed relationship between CEO characteristics and firms' environmental performance. While CEO duality is often associated with a negative impact on environmental performance, gender diversity on boards and female CEOs shows a positive influence. CEO demographic attributes such as gender, education, power and tenure yield conflicting results. Less explored attributes like religion, foreign experience and political ties demonstrate potential positive effects on green innovation. Additionally, the breadth of social ties positively affects CEO attention breadth and sustainability performance. Overall, further research is needed to better understand these relationships and explore other CEO attributes contributing to environmental sustainability.

CEO psychological characteristics and environmental performance

The examination of CEO psychological characteristics is essential for understanding CEO behaviour and obtaining a comprehensive view of company leadership. Existing literature (Ernawan & Daniel, 2019; Jia et al., 2021; Lin et al., 2022; Lu et al., 2022) supports the significance of studying these attributes. However, research on the impact of CEO psychological characteristics on a company's environmental performance is limited (see Appendix D). The available studies primarily focus on CEO hubris, overconfidence and narcissism. Our analysis of empirical studies in our sample reveals a limited number of investigations into the impact of CEO psychological traits on environmental performance. CEO narcissism, hubris and overconfidence were each explored in three studies, while other traits such as aggressiveness, extraversion, emotional intelligence, humility and reflective capacity were examined in only one study each. This limited scope emphasizes the need for further exploration of the relationship between CEO psychological traits and environmental performance. To deepen our understanding, it is crucial to expand current research and investigate the impact of these other traits on environmental performance.

Empirical evidence on the relationship between CEO narcissism and environmental performance is inconsistent, with some studies (Lin et al., 2021; Lin et al., 2022) suggesting a positive association, while others (Abatecola & Cristofaro, 2019) indicate a negative impact. Similarly, findings on CEO hubris are contradictory, as some studies (Arena et al., 2018) propose a positive relationship, while others (Abatecola & Cristofaro, 2019) report a detrimental effect. However, Lin et al. (2022) suggest that CEO hubris may enhance the positive effects of corporate sustainability strategies on firm performance in environmental and social aspects. These contrasting results underscore the complexity and nuances of the relationship between CEO psychological traits and environmental performance, calling for further research to gain a comprehensive understanding.

In the field of corporate environmental outcomes, the influence of CEO psychological traits on environmental performance has gained limited attention in academic literature. However, several studies provide valuable insights in this regard. Lee and Kim (2021) emphasized the role of overconfident CEOs in driving environmental

initiatives, particularly in companies with higher levels of female board representation. Meanwhile, Sun et al. (2021) found a positive association between CEO humility and green innovation, indicating the importance of this trait in fostering environmental initiatives. Shah et al. (2021) focused on CEOs exhibiting hierarchical and cognitive leadership traits, highlighting their emphasis on enhancing environmental responsibility and implementing innovative strategies. Meanwhile, Ezzi et al. (2023) suggested that CEOs with high emotional intelligence have a beneficial impact on the interaction between research and development, energy and recycling in the Tunisian energy sector. Hrazdil et al. (2021) found that firms led by extraverted CEOs tend to perform better in terms of environmental and social outcomes. Furthermore, Kim et al. (2022) explored the impact of CEO facial masculinity on ESG practices, indicating that companies with effective ESG measures are less susceptible to deception by masculine-faced CEOs.

Through synthesizing these studies, it becomes evident that CEO psychological traits play a crucial role in shaping corporate environmental outcomes. Overconfidence, humility, leadership traits, emotional intelligence, extraversion and facial masculinity all have varying impacts on environmental initiatives and performance.

3.5.4 | CEO characteristics and environmental disclosure

The importance of CEOs in shaping corporate environmental practices has gained significant attention due to the growing significance of environmental sustainability (Oware & Awunyo-Vitor, 2021). Understanding the role of CEOs in this context is crucial. It is equally important to examine the impact of CEO characteristics on corporate environmental disclosure. This section provides an overview of the research on this topic, including the categorization of CEO traits into demographic and psychological characteristics. Additionally, this section aims to assess the current state of research and identify potential gaps in the field.

CEO demographic characteristics and environmental disclosure

The impact of CEO demographic traits on various communication channels, including financial reports, auditor reports and media, has been the subject of previous research. However, the effect of these traits on corporate environmental disclosure has not received as much attention (Lee, 2021). The majority of the literature (17 articles) in this field focuses on the effect of CEO duality on environmental disclosure, with a smaller number of studies exploring the impact of CEO tenure. Other demographic characteristics such as gender, education, power, social ties and background have received limited attention.

The findings of studies on the relationship between CEO duality and environmental disclosure have been inconsistent. While some studies support the conclusion that CEO duality has no significant impact on environmental disclosure (Kumari et al., 2022; Lagasio &

Cucari, 2019; Pasko et al., 2021), others have found a positive relationship between duality and environmental disclosure in Indian family-controlled firms (Oware & Awunyo-Vitor, 2021). On the other hand, a number of studies have reported a negative relationship between CEO duality and environmental reporting (Hamidah & Arisukma, 2020; Husted & de Sousa-Filho, 2019; Lagasio & Cucari, 2019; Nuskiya et al., 2021).

The impact of CEO tenure, power, gender, background and experience on environmental disclosure has received limited attention in the literature. However, some studies have explored these relationships and produced noteworthy results as described in Appendix E. Li et al. (2018) found that stronger CEO power can enhance the relationship between environmental disclosure and firm value, suggesting that stakeholders view environmental disclosure from companies with more powerful CEOs as a stronger commitment to environmental practices.

On the other hand, several studies have explored the relationship between CEO characteristics and environmental disclosure. Razali et al. (2016) found a negative effect of CEO tenure and CEO legal education on environmental disclosure. In contrast, Lagasio and Cucari (2019) discovered a positive association between women CEOs and better environmental voluntary disclosure, while CEO ownership did not show a significant impact. Meanwhile, Lewis et al. (2014) also suggested that CEOs with MBA degrees or recently recruited were more likely to disclose. Overall, these findings underscore the importance of CEO attributes in shaping environmental disclosure practices, but further synthesis is needed to explore underlying mechanisms and moderating factors.

CEO psychological characteristics and environmental disclosure

While the majority of studies in the field of environmental disclosure have focused on the impact of CEO demographic characteristics, there has been limited examination of the relationship between CEO psychological characteristics and environmental disclosure as displayed in Appendix F. As such, the influence of psychological traits on CEO decision-making regarding disclosure has been overlooked. Recent studies, such as Dabbebi et al. (2022), have found that CEO narcissism is positively associated with ESG disclosure. Furthermore, Lee (2021) found that CEO overconfidence is favourably linked to voluntary disclosure of GHG emissions. These findings suggest that there is a need for further research to delve into the relationship between CEO psychological characteristics and environmental disclosure.

4 | DISCUSSION AND FUTURE RESEARCH AVENUES

Despite the progress made in the field of environmental sustainability and CEO interactions, there are several gaps that need to be addressed by future research. The limitations and suggestions of the association between CEO and environmental sustainability are addressed in this section.

4.1 | Theories

In the reviewed studies, the upper echelons theory was utilized in 25% of cases, while 24% employed a combination of theories. However, many studies lacked clear explanations of how these theories were applied to their empirical findings. To improve the quality of research, it is advisable for future studies to adopt a well-defined theoretical framework and appropriately integrate or compare relevant theories. For CEO characteristics, theories from psychological and sociological perspectives can provide a solid foundation. Employing multiple theories can offer a more comprehensive understanding of CEO behaviour and their role in environmental sustainability.

4.2 | Context

Most studies on the relationship between environmental sustainability and CEOs have focused on developed countries, particularly the United States, leaving a gap in representation from developing economies due to limited data accessibility and contextual differences. To address this limitation, future research should prioritize studying less explored regions and conducting cross-country comparisons, enabling a more comprehensive understanding of the topic.

Considering contextual factors is crucial when examining the CEO–environmental sustainability relationship. While exploring every factor may not be necessary, focusing on relevant ones can enhance the validity and reliability of results. Incorporating a framework, such as Figure 7, can illustrate the interaction of different factors, including state regulations, stakeholder pressure, industry effects and organizational culture, which can impact CEO compensation and its relationship with environmental performance and disclosure. Future research should consider these contextual factors to deepen our understanding of the linkages between CEO compensation and environmental sustainability.

Furthermore, there is a noticeable lack of research explicitly addressing the connection between CEOs and corporate environmental sustainability with specific United Nations SDGs. Acknowledging the importance of the SDGs as a framework, it is crucial to highlight the existing gap in the literature. The limited exploration of how CEO characteristics and actions align with and contribute to specific SDGs presents an opportunity for further investigation. Future research should aim to bridge this gap by explicitly examining the relationship between CEO behaviour and the achievement of sustainability goals outlined by the United Nations. By addressing this research gap, valuable insights can be gained into how CEOs can effectively drive environmental sustainability efforts within organizations and contribute to the broader global sustainability agenda.

4.3 | Characteristics

Existing research on CEO attributes and environmental sustainability primarily focuses on environmental performance and overlooks

environmental disclosure. Furthermore, certain areas within each theme have not been thoroughly explored. For instance, CEO traits like power, backgrounds, experience, environmental orientation, risk perception, ownership, ethical leadership, regulatory focus and awareness of consequences have not received sufficient attention. Psychological characteristics like overconfidence, extraversion, emotional intelligence, humility and reflective capacity are also worthy of exploration. Future studies should investigate the impact of these less researched traits and personality characteristics on CEO behaviour and their role in environmental sustainability performance.

In the light of the environmental disclosure theme, while CEO duality has been extensively studied in relation to environmental disclosure, other important CEO characteristics have been neglected. Moreover, the connection between CEO psychological traits and environmental disclosure remains underexplored. Future research should examine the relationship between CEO demographic and psychological characteristics and corporate environmental reporting. Additionally, studies on environmental disclosure should move beyond quantitative indicators and explore textual properties such as reporting tone, readability, boilerplate and specificity.

4.4 | Measurements

While environmental performance scores and responsibility measures have been commonly used, other indicators of environmental performance and disclosure have received less attention. Future studies could adopt less common measurement methods, such as scores from third-party organizations, and incorporate more qualitative techniques like questionnaires with responsible corporate personnel. Additionally, studies on environmental disclosure should go beyond quantitative metrics and disclosure scores to examine the quality and specific attributes of disclosure policies. This qualitative perspective can deepen our understanding of the factors shaping the scope of environmental disclosure.

4.5 | Methodology

The complexity of CEO behaviour and its impact on corporate environmental sustainability necessitates the integration of qualitative or mixed methods alongside quantitative research. While quantitative methods are commonly used, they may not fully capture the nuances of CEO actions. Scholars like Abebe and Acharya (2022), Kilincarslan et al. (2020) and Nuskiya et al. (2021) have recommended the inclusion of qualitative methods such as interviews and surveys to gain a more holistic understanding of the relationship between CEOs and environmental sustainability.

Table 1 shows future research directions and suggested research questions classified based on theories, context, characteristics, measurements and methodology.

TABLE 1 Future research directions.

Future research opportunity	Suggested research questions
Theoretical opportunities	<ul style="list-style-type: none"> • How can agency theory, stewardship theory and social identity theory be integrated to provide a more comprehensive understanding of the relationship between CEO characteristics and environmental outcomes? • How do different theoretical perspectives explain variations in CEOs' commitment to environmental sustainability across different organizational contexts? • In what ways do these theories intersect or complement each other in explaining CEOs' environmental decision-making processes?
Contextual opportunities	<ul style="list-style-type: none"> • How does the relationship between CEOs and environmental sustainability differ in developing economies compared to developed economies? • What lessons can be learned from studying the relationship between CEOs and environmental sustainability in diverse contexts? • What contextual factors influence the effectiveness of CEOs' environmental practices and decision-making in different regions and countries? • How does the impact of CEO demographic and psychological characteristics on environmental outcomes differ across industries with varying environmental footprints? • How do CEO traits impact the integration of environmental considerations into organizational strategy, decision-making and culture? • What are the mechanisms through which personality traits and ethical leadership influence employee attitudes, behaviours and organizational outcomes related to environmental sustainability?
Characteristics opportunities	<ul style="list-style-type: none"> • How do CEO traits such as power, backgrounds, experience and ethical leadership influence environmental sustainability practices and outcomes? • What is the impact of psychological characteristics like overconfidence, emotional intelligence, humility and reflective capacity on CEOs' environmental decision-making and behaviour? • How do CEO demographic and psychological characteristics relate to the quality and specific attributes of environmental disclosure? • How do these psychological factors interact with demographic characteristics to shape CEOs' environmental behaviours? • Are there any mediating or moderating mechanisms that explain the relationship between psychological factors and CEOs' environmental practices? • How do CEO traits influence the qualitative aspects of environmental disclosure, such as reporting tone, readability and specificity? • How do the qualitative characteristics of environmental disclosure, such as reporting tone, readability and specificity, influence stakeholders' perceptions, trust and engagement with a company's environmental initiatives? • How do different stakeholder groups interpret and respond to the various aspects of environmental disclosure?
Measurement opportunities	<ul style="list-style-type: none"> • How do scores from third-party organizations contribute to the assessment of environmental performance and disclosure? • What insights can be gained from using qualitative techniques, such as questionnaires with responsible corporate personnel, to understand environmental practices? • How does the qualitative dimension of environmental disclosure, such as reporting tone, readability and specificity, shape stakeholder perceptions and behaviours?
Methodological opportunities	<ul style="list-style-type: none"> • How can the inclusion of qualitative methods, such as interviews and surveys, enhance the understanding of CEO behaviour and its impact on environmental sustainability? • In what ways can mixed-methods approaches provide a more comprehensive understanding of the relationship between CEOs and environmental sustainability? • How does the integration of different research methodologies contribute to the validity and reliability of findings in CEO–environmental sustainability research?

5 | CONCLUSION

The primary objective of this SLR is to thoroughly analyse the research on CEOs and their effects on corporate environmental sustainability. We aim to understand existing knowledge, identify gaps and propose a framework for future research. Synthesizing 139 publications, we critically examine current research's limitations and contribute to the corporate environmental sustainability literature. Our results highlight gaps in the literature. Studies predominantly focus on environmental performance rather than disclosure. The role

of context and less explored CEO traits like personality and ethical leadership are overlooked. Qualitative aspects of environmental disclosure, such as reporting tone and specificity, are also neglected. To address these gaps, future research should consider a broader range of CEO characteristics, adopt a multi-theoretical approach, examine context and include comprehensive environmental disclosure analysis.

This SLR contributes to the literature by providing a comprehensive review, benefiting researchers, practitioners and policymakers. We present suggestions for future research based on country, research method and theoretical framework analysis. Environmental

sustainability studies peaked in 2022, indicating growing interest in the field. Our theoretical contribution includes a framework mapping CEO variables and environmental sustainability, identifying knowledge gaps and research objectives. Future studies should incorporate psychological factors alongside demographic traits to understand CEOs' motives behind environmental practices. Additionally, exploring CEO influence, compensations, context, and environmental performance and disclosure measurements offers fruitful research directions.

Our study has several limitations that should be acknowledged. Firstly, the limited number of publications in the field of CEO characteristics and environmental sustainability limits the generalizability of our findings. Secondly, our study focused on environmental performance and environmental disclosure, and other important aspects such as environmental policy, environmental strategy and environmental reporting were not explored. Lastly, we did not consider the potential mediating and moderating effects that could influence the relationship between CEO characteristics and environmental sustainability, which could have significant implications for future research.

CONFLICT OF INTEREST STATEMENT

The authors declared no potential conflicts of interest.

DATA AVAILABILITY STATEMENT

Data are available on request from the authors.

ETHICS APPROVAL STATEMENT

This article does not contain any studies with human participants or animals performed by any of the authors.

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APPENDIX A: CEO COMPENSATION AND ENVIRONMENTAL PERFORMANCE STUDIES

Article	Title	Journal	Country	Theory	Research method	Findings summary
Francoeur et al. (2017)	Green or greed? An alternative look at CEO compensation and corporate environmental commitment	Journal of Business Ethics	Global	Stewardship, institutional	OLS regression	Environmentally responsible companies pay their CEOs less compensation package and depend less on incentive-based remuneration than environmentally unconcerned companies.
Cavallaro et al. (2018)	Decarbonizing the boardroom? Aligning electric utility executive compensation with climate change incentives	Energy Research & Social Science	The United States	Agency	Case study	The regulated utility market does not regularly reward CEOs with increased pay for reducing GHG emissions.
Hossain et al. (2022)	Firm-level climate change risk and CEO equity incentives	British Journal of Management	The United States	Compensating wage differential	OLS regression	CEOs who lead companies that face a higher level of climate change risk receive more equity-based pay.
Zhang and Zhang (2022)	The threshold effect of executive compensation on corporate environmental responsibility: Based on the moderating effect of industry competition	Sustainability	China	ERG, upper echelons	OLS regression	The influence of CEO remuneration on corporate environmental responsibility has a U-shaped threshold effect, which means that executive remuneration only promotes corporate environmental responsibility after crossing a specific threshold.

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Article	Title	Journal	Country	Theory	Research method	Findings summary
Adu, Flynn, and Grey (2022a)	Carbon performance, financial performance and market value: The moderating effect of pay incentives	Business Strategy and the Environment	The United Kingdom	Neo-institutional	OLS regression	CEO pay has a favourable moderating influence on the relationship between carbon performance and financial performance.
Winschel (2021)	Climate change policies and carbon-related CEO compensation systems: An exploratory study of European companies	Journal of Global Responsibility	Global	Stakeholder, agency	Content analysis	Carbon objectives are mostly used to establish short-term remuneration. Furthermore, carbon-related CEO compensation is almost equally prevalent among carbon-intensive and non-carbon-intensive businesses.
Al-Shaer et al. (2022)	CEO power and CSR-linked compensation for corporate environmental responsibility: UK evidence	Review of Quantitative Finance and Accounting	The United Kingdom	Stakeholder, managerial power	Multivariate regression	CEOs who are compensated for their participation in environmental initiatives are encouraged to enhance environmental performance.

APPENDIX B: STUDIES ON CEO COMPENSATION AND ENVIRONMENTAL DISCLOSURE

Article	Title	Journal	Country	Theory	Research method	Findings summary
Rath et al. (2020)	CEO compensation and firm performance: The role of ESG transparency	Indonesian Journal of Sustainability Accounting and Management	India	Agency, stakeholder	Multivariate regression	Scores for environmental and governance disclosure have the potential to strengthen the unfavourable link between business performance and CEO remuneration.
Suttipun (2021)	The influence of board composition on environmental, social and governance (ESG) disclosure of Thai listed companies.	International Journal of Disclosure and Governance	Thailand	Agency	Multivariate regression	There is a positive association between CEO compensation and ESG disclosure.
Adu, Al-Najjar, and Sitthipongpanich (2022)	Executive compensation, environmental performance, and sustainable banking: The moderating effect of governance mechanisms	Business Strategy and the Environment	Global	Agency	OLS regression	CEO compensation raises sustainable banking disclosures.
Al-Shaer and Zaman (2019)	CEO compensation and sustainability reporting assurance: Evidence from the UK	Journal of Business Ethics	The United Kingdom	Agency, stakeholder	Logistic regression	The inclusion of sustainability elements in pay contracts is positively and significantly associated with sustainability reporting assurance.

APPENDIX C: SAMPLE OF STUDIES ON CEO DEMOGRAPHIC CHARACTERISTICS AND ENVIRONMENTAL PERFORMANCE

Article	Title	Journal	Country	Theory	Research method	Findings summary
Sumarta et al. (2021)	CEO characteristics and environmental performance: Evidence from Indonesian banks	International Journal of Business and Society	Indonesia	Agency, upper echelons	Panel data regression	CEO international experience has a favourable impact on environmental performance. Furthermore, CEO gender, age and educational background have no influence on environmental performance in Indonesian banks; however, CEO nationality and foreign education have a negative effect.
Peng and Zhang (2022)	Corporate governance, environmental sustainability performance, and normative isomorphic force of national culture	Environmental Science and Pollution Research	The United States	Agency	Multiple regression	There is a negative association between CEO duality and environmental sustainability performance.
Zhu et al. (2022)	Gender diversity and firms' sustainable performance: Moderating role of CEO duality in emerging equity market	Sustainability	Pakistan	Agency	Panel data regression	Female directors on boards and female CEOs have a considerable favourable influence on environmental performance, although CEO duality has no effect on this connection. Furthermore, CEO duality has a significant negative influence on firms' long-term performance.
Goud (2022)	Corporate governance: Does it matter management of carbon emission performance? An empirical analyses of Indian companies	Journal of Cleaner Production	India	Agency	Multiple regression	There is a negative relationship between CEO duality and corporate carbon emission performance.
Velte (2020)	Does CEO power moderate the link between ESG performance and financial performance? A focus on the German two-tier system	Management Research Review	Germany	Stakeholder, upper echelons	Multivariate regression	There is a positive impact of ESG performance on financial performance, and this link is more pronounced by CEO power.

Article	Title	Journal	Country	Theory	Research method	Findings summary
Al-Shaer et al. (2022)	CEO power and CSR-linked compensation for corporate environmental responsibility: UK evidence	Review of Quantitative Finance and Accounting	The United Kingdom	Stakeholder, managerial power	Multivariate regression	Newly appointed CEOs are more involved in environmental initiatives, but CEOs with managerial power are less involved in environmental activities due to the expenses involved.
Shahab et al. (2020)	Chief executive officer attributes, sustainable performance, environmental performance, and environmental reporting: New insights from upper echelons perspective	Business Strategy and the Environment	China	Upper echelons	Panel and probit regression	CEOs with a research background and international experience are more likely to engage in initiatives that increase environmental performance. In addition, CEOs with financial expertise are associated with improved long-term success and environmental reporting.
Zhou et al. (2021)	Can CEO education promote environmental innovation: Evidence from Chinese enterprises	Journal of Cleaner Production	China	Upper echelons	Multivariate regression	Highly educated CEOs are more likely to participate in environmental innovation, particularly if businesses operate in areas with rigorous environmental regulations.
Khalid et al. (2022)	Carbon Disclosure Project: Chinese chief executive officer background and corporate voluntary climate change reporting	Carbon Management	China	Upper echelons	Logistic regression	CEOs with academic backgrounds, international experience and political ties influence corporations' decisions to engage environmental activities.
Ren et al. (2021)	CEO hometown identity and firm green innovation	Business Strategy and the Environment	China	Upper echelons	Regression	There is a positive link between CEO hometown identity and a firm's environmental innovation performance.
Liao and Long (2018)	CEOs' regulatory focus, slack resources and firms' environmental innovation	Corporate Social Responsibility and Environmental Management	China	Upper echelons	Questionnaires	CEO's promotion focus has a positive influence on firm's environmental

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Article	Title	Journal	Country	Theory	Research method	Findings summary
						processes, whereas a CEO's prevention focus has a negative influence.
Wang, Qiu, and Luo (2022)	CEO foreign experience and corporate sustainable development: Evidence from China	Business Strategy and the Environment	China	Upper echelons	OLS regression	CEO foreign experience has a positive impact on firm green innovation.
Birindelli et al. (2019)	The impact of women leaders on environmental performance: Evidence on gender diversity in banks	Corporate Social Responsibility and Environmental Management	Global	Upper echelons	Panel regression	There is relationship between female CEOs and the environmental performance.

APPENDIX D: SAMPLE OF STUDIES ON CEO PSYCHOLOGICAL CHARACTERISTICS AND ENVIRONMENTAL PERFORMANCE

Article	Title	Journal	Country	Theory	Research method	Findings summary
Hrazdil et al. (2021)	Executive personality and sustainability: Do extraverted chief executive officers improve corporate social responsibility?	Corporate Social Responsibility and Environmental Management	The United States	Upper echelons	Regression	
Businesses led by	extraverted CEOs have higher environmental and social performance.					
Lin et al. (2021)	The eco-friendly side of narcissism: The case of green marketing	Sustainable Development	China	Upper echelons	Questionnaires	Narcissistic CEOs are associated with higher level of corporate environmental marketing programme.
Lin et al. (2022)	Impact of CEO narcissism and hubris on corporate sustainability and firm performance	The North American Journal of Economics and Finance	Taiwan	Upper echelons	Regression	In comparison to narcissistic CEOs, hubristic CEOs will have a greater favourable impact on business sustainability performance, particularly in the environmental and social dimensions.
Lee and Kim (2021)	Would overconfident CEOs engage more in environment, social, and governance investments? With a	Sustainability	South Korea	Upper echelons	OLS regression	Overconfident CEOs are more likely to participate in ESG investments. Furthermore, the negative relationship

Article	Title	Journal	Country	Theory	Research method	Findings summary
	focus on female representation on boards					between CEO overconfidence and firm value is minimized in firms with high ESG investments. Finally, the impact of CEO overconfidence on corporate value is unique in firms with female board participation.
Ezzi et al. (2023)	Exploring the relationship between managerial emotional intelligence and environmental performance in energy sector: A mediated moderation analysis	International Journal of Energy Sector Management	Tunisia	Behavioural	Questionnaires	There is positive impact of CEOs' emotional intelligence on the R&D, energy and recycling. Furthermore, the diversification strategy impacts the function of CEOs' emotional intelligence in providing justifications for R&D investments in the Tunisian energy sector's environmental challenges.
Jia et al. (2021)	Beyond bounded rationality: CEO reflective capacity and firm sustainability performance	Management and Organization Review	China	Upper echelons	Multivariate regression	The importance of CEO reflective capability for business sustainability performance is aligned with the view that sustainability, which involves conflicts between complex economic, environmental and social challenges, necessitates complex cognitive frameworks for executives.
Kim et al. (2022)	CEO facial masculinity, fraud, and ESG: Evidence from South Korea	Emerging Markets Review	South Korea	Upper echelons	OLS regression	We find that firms with well-designed ESG practices are less likely to experience masculine-faced CEOs' fraud than those with poor ESG practices.

APPENDIX E: SAMPLE OF STUDIES ON CEO DEMOGRAPHIC CHARACTERISTICS AND ENVIRONMENTAL DISCLOSURE

Article	Title	Journal	Country	Theory	Research method	Findings summary
Oware et al. (2022)	Female and environmental disclosure of family and non-family firms. Evidence from India	Management Research Review	India	Gender socialization, critical mass, legitimacy	Panel regression	Female CEOs and CEO duality have a positive association with corporate environmental disclosure in a family-controlled firm, but this does not exist in non-family-controlled firms.
Amran et al. (2014)	Determinants of climate change disclosure by developed and emerging countries in Asia Pacific	Sustainable Development	Global	Agency	Multiple regression	CEO-board chair role linked with an increase in the climate change disclosure.
Oware and Awunyo-Vitor (2021)	CEO characteristics and environmental disclosure of listed firms in an emerging economy: Does sustainability reporting format matter?	Business Strategy & Development	India	Institutional, stakeholder	Panel regression	CEO age and tenure have no impact on with environmental disclosure, but CEO duality has a negative association effect.
Giannarakis et al. (2014)	Financial, governance and environmental determinants of corporate social responsible disclosure	Management Decision	The United States	Legitimacy	Least squares dummy variable model	CEO duality has a negative impact on the extent of ESG disclosure.
Razali et al. (2016)	Does CEO characteristics play important role on Malaysian firms' environmental disclosure?	International Journal of Business Research	Malaysia	Upper echelons	Multiple regression	CEOs who have spent a long time in the business and CEOs with legal backgrounds may be less willing to take the risk of disclosing environmental information.
Lagasio and Cucari (2019)	Corporate governance and environmental social governance disclosure: A meta-analytical review	Corporate Social Responsibility and Environmental Management	Global		Meta-analysis	Female CEOs enhance ESG voluntary disclosure, while CEO duality does not improve the ESG disclosure level.

Article	Title	Journal	Country	Theory	Research method	Findings summary
Lewis et al. (2014)	Difference in degrees: CEO characteristics and firm environmental disclosure	Strategic Management Journal	The United States	Institutional	Questionnaire	Firms with MBA CEOs are much more likely to disclose environmental information than other firms. On the other hand, firms run by CEOs with legal educations are more likely to resist disclosure constraints.

APPENDIX F: STUDIES ON CEO PSYCHOLOGICAL CHARACTERISTICS AND ENVIRONMENTAL DISCLOSURE

Article	Title	Journal	Country	Theory	Research method	Findings summary
Dabbebi et al. (2022)	Peering through the smokescreen: ESG disclosure and CEO personality	Managerial and Decision Economics	The United States	Upper echelons	OLS regression	CEOs with higher levels of narcissism are more likely to disclose their ESG activities.
Lee (2021)	CEO overconfidence and voluntary disclosure of greenhouse gas emissions: With a focus on the role of corporate governance	Sustainability	South Korea	Upper echelons	Logistic regression	CEO overconfidence is favourably associated with voluntary disclosure of greenhouse gas emissions.