

MEASURING CARBON DISCLOSURE FROM CEO CHARACTERISTICS

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Abstract

This study aims to examine the influence of CEO characteristics with the proxies used, namely gender, foreign CEOs, and CEO impression management on carbon disclosure. The study takes data on mining sector companies listed on the Indonesia Stock Exchange with a coverage of 2019 to 2023 which includes 68 companies with a total of 340 data. The results showed that all CEO characteristics used in this study proved to have a positive and significant effect on carbon disclosure. The presence of a female CEO leading the company will improve the quality and environmental performance of the company, as well as carbon disclosure. In addition, the presence of foreign CEOs who have a foreign educational background also has a positive impact on corporate carbon disclosure. The narcissistic nature shown by CEOs in company reports through CEO impression management is also proven to have a positive and significant impact on carbon disclosure. All the results of this study are proven to confirm the statements contained in the upper echelon theory.

Keywords: *CEO characteristics and Carbon Disclosure.*

INTRODUCTION

Current environmental issues highlight carbon emissions as a major contributor to global climate change within the greenhouse gas (GHG) phenomenon (Saadah et al., 2024). Increased attention to the risks associated with climate change and the need to provide more information on carbon emissions to the public reflect companies' efforts to contribute to climate change issues (Abdalla et al., 2024). Carbon emissions account for about 73% of total global greenhouse gas emissions (www.climatewatchdata.org).

They not only have adverse environmental and social impacts (Daskalakis et al., 2009), but also have adverse economic effects (Sørensen & Pfeifer, 2011) and (Peters & Romi, 2014). Continued increases in carbon emissions can disrupt ecosystem balance, worsen air quality, and increase the frequency and intensity of natural disasters such as floods, droughts and heatwaves (IPCC, 2021).

The economic impacts of climate change triggered by carbon emissions can include losses in productivity, increased costs associated with mitigation and adaptation, and losses in sectors vulnerable to extreme weather events, such as agriculture, tourism and energy (Stern, 2007). In this context, companies that contribute to carbon emissions should consider reducing their carbon footprint to prevent wider, adverse impacts. In response to this global pressure, many companies are now faced with the obligation to disclose information related to their carbon emissions as part of sustainability disclosure (Kolk & Perego, 2010), which is often influenced by CEO characteristics in their impression management and disclosure strategies (Santoso & Setiawan, 2024).

Based on the upper echelon theory (Hambrick & Mason, 1984) states that top management reflects the organization they lead, the disclosures made by the company will also depend on its top management or CEO. Hambrick & Mason (1984) further revealed that organizational outcomes, related to the strategy chosen and the level of performance, are partly predicted by managerial background characteristics. Yue & You (2016) emphasized that strategic decisions that are comprehensive, incalculable, and have a long-term impact include carbon emissions disclosure. Carbon disclosure is a key way to put pressure on companies to manage and reduce their emissions levels (Siddique et al., 2021). Carbon disclosure provides various benefits for companies, such as improving image, competitiveness, increasing innovation, research, and corporate development (Bedi & Singh, 2024).

CEO characteristics play an important role in supporting efficient and targeted decision making (Clementino & Perkins, 2021); (Tang et al., 2015); and (Zhao et al., 2022) and carbon disclosure decision making is no exception. As the highest leader in the company, the CEO plays a crucial role in determining the success and sustainability of the organization (Al-Duais et al., 2021). One of the characteristics of

CEOs is gender diversity (male and female), where women tend to have higher sensitivity and more focused attention on social and environmental issues (Tingbani et al., 2020). Moreover, women often bring different values, perceptions, and perspectives compared to the majority of men, and create unique points of view in various situations (Jia & Zhang, 2013) more specifically on the disclosure of non-financial information (Al-Shaer & Zaman, 2016) and (Ben-Amar et al., 2017).

CEOs with work or study abroad experience also play an important role in corporate strategic decision-making, especially in developing countries (Z. Xu & Hou, 2021). Muttakin et al. (2018) revealed that CEOs with overseas experience are more adept at corporate strategic decision-making compared to CEOs without overseas experience. CEOs with international experience tend to be more enthusiastically involved in activities that support sustainable and environmental performance improvement compared to CEOs without similar exposure (Shahab et al., 2020). In line with this, Santoso & Setiawan (2024) found evidence that foreign CEOs proved to have a significant effect on corporate disclosure. In addition, Hamza & Jarboui (2022) highlighted the importance of impression management in supporting the implementation of disclosure practices, including carbon disclosure.

In addition to foreign CEOs, another factor that may influence carbon disclosure is CEO impression management. This is emphasized by Petrenko et al. (2016) who explained that impression management has a positive impact on the disclosure made by the company. This suggests that impression management efforts can encourage companies to be more transparent in conveying information, including carbon disclosure. This strategy is used to build reputation, increase stakeholder trust, and fulfill public expectations of corporate accountability. Furthermore, Marquez-Illescas et al. (2019) explain that through earnings announcements, conference calls and other press releases, company executives have the opportunity to craft financial disclosure narratives. Numerous studies have shown that textual tone significantly affects stock returns, which suggests that through word choice, top management can influence market reactions.

Previous studies provide evidence regarding the factors that influence carbon disclosure, including Elsayih et al. (2021) who revealed that CEO executive

experience and CEO duality are positively related to carbon performance. In contrast, CEO tenure, CEO functional background experience, and CEO industry experience are negatively related to carbon performance. In line with the above findings, Choi et al. (2024) reported that common ownership decreases firms' propensity to disclose carbon information as well as the quality of such disclosures. In addition, increased transparency in carbon reporting significantly lowers the implied cost of capital by increasing stock liquidity (W. Xu et al., 2024).

Caby et al. (2024) proved that women's participation in the board of directors has a positive impact on voluntary carbon disclosure and its quality. Female CEOs and top operational management held by women positively influence voluntary carbon disclosure. In line with the previous statement, Abbasi et al. (2024) revealed that non-accounting female experts with better business knowledge and the ability to foresee the impact of management decisions contribute to increased carbon disclosure. Abdalla et al. (2024) explained that there is a positive and significant relationship between female representation on the board of directors and the quality of carbon disclosures provided, suggesting that the presence of female directors on a company's board can be seen as a determinant element of the quality of carbon disclosures.

CEOs were chosen as subjects in this study because they play an important role in determining the strategy and success of the company. Their ability to make strategic decisions is influenced by managerial discretion (Karlsson, 2019). Previous studies have provided empirical evidence on the relationship between CEO characteristics and disclosure, such as experience, financial expertise, board representation and compensation (Acar et al., 2021), CEO duality (Kilincarslan et al., 2020), and ownership (Choi et al., 2024). Therefore, the relationship between gender, foreign CEO status and CEO impression management on carbon disclosure needs further investigation.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Upper Echelon Theory

Hambrick & Mason (1984) coined the upper echelon theory to explain that the strategy adopted by the firm is entirely determined by top management. Its role in the firm's performance and the results achieved by the firm are also determined by top

management. This theory emphasizes that the characteristics and experiences of executives influence how they perceive situations, make strategic decisions, and take action within the organization (Bromiley & Rau, 2016). Disclosures reported by companies (including carbon disclosure) are the result of decisions and policies taken by CEOs that are not only related to societal expectations and resources owned by the company, but this is one of the implementations of the upper echelon theory (Santoso & Setiawan, 2024).

Upper echelon theory focuses on the values, cognitive perspectives and viewpoints of the company's top managers towards the company's performance and strategic decisions. Upper echelon theory focuses on psychological aspects that can be observed through the senses, such as education, community affiliation, age, work experience, financial situation, functional background, and social and economic status. From a direct psychological point of view, it is not easy to explore, so the majority of proxies used to evaluate the steps and policies taken by the company are through the demographics of its top leadership (Hiebl, 2014).

The corporate hierarchy places the CEO as a person with great authority in shaping and directing the strategies adopted by the company. This position is often referred to as president, or by other designations such as director or chairman, who adapts the regulations in each country but still retains his position as the highest official in the company in an executive manner. There are two board systems that can be applied to a country, a one-tier board and a two-tier board. The difference between these two one-tier and two-tier systems lies in the division of functions at the highest level of the company, namely the supervisory function and the executive function (Tjahjadi et al., 2021).

There is no difference in the performance of companies using a one-level system and companies using a two-level system (Millet-Reyes & Zhao, 2001). The top executive of the company, or commonly referred to as the CEO, is used as the subject of this study because the role of the CEO is to determine and implement strategic policies for corporate excellence. Karlsson (2019) found that the wisdom of the company's leaders influences the company's strategic policy process, which ultimately leads to the company's strategic decisions.

Hypothesis

CEO Gender Relationship to Carbon Disclosure

As the chief executive of a company, the CEO plays a crucial role in formulating corporate policy (Clementino & Perkins, 2021); (Zhao et al., 2022). These individual characteristics and personalities are influenced by experience as well as innate traits, including gender factors. Women are often considered to be more sensitive and attentive to social and environmental issues (Tingbani et al., 2020). Women also tend to have different values and other perspectives that support information disclosure, such as non-financial information. Female CEOs are therefore able to minimize the information asymmetry that exists in the company between management and stakeholders (Santoso & Setiawan, 2024).

Upper echelon theory suggests that CEO characteristics influence the strategic choices and decisions of the firm (Hambrick & Mason, 1984). In this case, companies led by women tend to be more concerned about environmental issues. Therefore, measures need to be taken to identify and mitigate risks and capitalize on opportunities related to carbon management globally. This encourages companies to disclose information on environmental issues, particularly carbon.

Gurol & Lagasio (2023) found that women's participation has a significant impact on improving environmental, social and governance disclosures. Kilincarslan et al. (2020) also found that the presence of women contributes to an increase in environmental disclosure. This evidence is supported by several studies that come to similar conclusions (Akhter et al., 2023); (Buallay & Alhalwachi, 2022); and (Raimo et al., 2022). However, different results are shown by (Caby et al., 2020) and (Pinheiro et al., 2023), which state that the gender of the CEO does not affect corporate disclosure. From the above description and explanation, the following hypothesis can be formulated:

H1: there is a positive relationship between female CEOs and carbon disclosure.

Carbon Disclosure and Foreign CEO

A CEO with previous experience or life abroad certainly has a different perspective than a CEO who has never been exposed to foreign life, especially on the strategic policies adopted by the CEO, such as the transparency policy on carbon disclosure. Foreign CEOs with international research experience and foreign citizenship are expected to bring different nuances to corporate policies (Z. Xu & Hou, 2021). A person's leadership style is shaped by experience in interacting with the environment, cultural differences and foreign business practices. CEOs with international cultural tendencies will be highly sensitive to disclosure strategies (Santoso & Setiawan, 2024) including carbon disclosure.

The upper echelon theory proposed by Hambrick & Mason (1984) suggests that an individual's educational background and experience can influence a company's strategic decisions, including carbon disclosure strategies. In this case, CEOs with international experience tend to be familiar with global business culture, so they are able to adopt environmental practices that are also applied to global standards. CEOs with foreign experience are able to provide a global perspective that can be applied to the home company's policies, as well as being more involved in the company's carbon emissions disclosure reports (Santoso & Setiawan, 2024).

Shahab et al. (2020) found that international experience has a positive effect on firms' environmental performance. Khalid et al. (2022) also found that the presence of foreign CEOs has a positive effect on voluntary disclosure. Other studies support this finding by showing an increase in disclosure, such as (Matuszak et al., 2019) and (Thin et al., 2021). However, other results were shown by A. A. Zaid et al. (2020) which revealed that foreign nationality does not affect disclosure because the presence of members plays a significant role in disclosure practices, which is influenced by the cultural characteristics of their home country (Garanina & Aray, 2021). From this description, the following hypothesis can be formulated:

H2: there is a positive relationship between foreign CEOs and carbon disclosure.

Carbon Disclosure Relationship influenced by CEO Impression Management

Impression management is a strategy used by individuals to influence how others perceive them (Leary, 2001). CEOs engage in impression management to shape stakeholder views, enhance their image and improve their company's reputation. In

practice, companies tend to withhold negative information and emphasis positive aspects. Communication strategies are designed to emphasis certain information and de-emphasis others in order to influence stakeholder perceptions. Thus, impression management is a representation of corporate performance (Bai & Yao, 2023) including carbon disclosure practices. CEOs with good environmental performance tend to appear more confident, while CEOs with poorer performance may be more likely to hide their identity (Santoso & Setiawan, 2024).

Upper echelon theory, initiated by Hambrick & Mason (1984), links the strategic choices made by the company, one of which is determined by the impression management of the CEO's behavior. The firm will continue to strive to maintain legitimacy with stakeholders, especially when the firm's condition is unstable or underperforming. The CEO's expertise in creating a good impression as a representative of the company is expected to promote stakeholder perceptions through carbon disclosure in order to minimize conflicts of interest in information asymmetry, in the hope that stakeholders will make decisions in line with the company's interests.

Petrenko et al. (2016) argue that impression management has a positive impact on CSR disclosure. This finding is consistent with the research of Al-Shammari et al. (2019), who also find a similar positive impact. Other studies show that impression management has a positive impact on disclosure (Marquez-Illescas et al., 2019) and (Lassoued & Khanchel, 2023). However, this is in contrast to Kind et al. (2023) who found that impression management did not have a significant effect on disclosure. From the description above, hypothesis three in this study is:

H3: there is a positive relationship between impression management and carbon disclosure.

The following research model can be derived from several descriptions of the hypotheses formulated above:

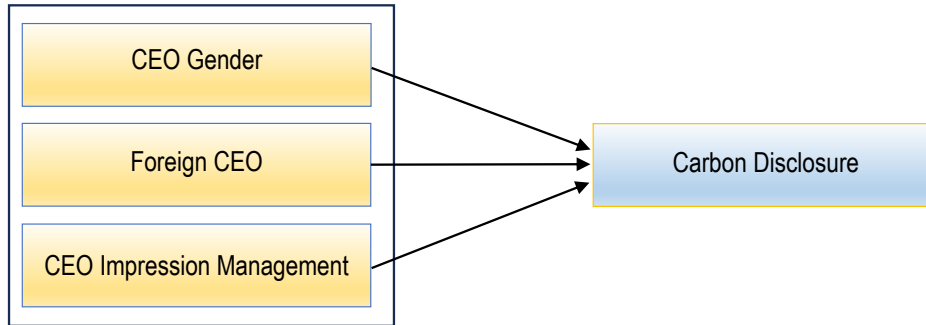


Figure 1. Research Model

RESEARCH METHOD

The population in this study are all mining companies listed on the Indonesia Stock Exchange (IDX) in the period 2019 to 2023 with a total of 96 companies. From this population there are 22 companies that are not consistently listed on the IDX, then there are 6 companies that do not publish reports on the IDX, so the number of samples used in this study is 68 companies. The data used is secondary data, which includes Annual Reports, Financial Reports, and Sustainability Reports. Variable descriptions and measurements can be explained in the table as follows:

**Table 1
Variable Measurement**

Variable	Measurement
Carbon Disclosure (Dependent)	Measured using total disclosures as defined by the Task Force on Climate-related Financial Disclosures (TCFD). TCFD (2017) & Dias et al. (2024)
CEO Gender (Independent)	Measured using a dummy variable with the criteria scored 1 if the CEO is a woman and vice versa if the CEO is a man, scored 0. Lin et al. (2020)
Foreign CEO (Independent)	Measured using dummy variables, if the CEO is a foreigner and has studied abroad, it is given a score of 1, otherwise it is given a score of 0. Shahab et al. (2020)

Variable	Measurement
CEO Impression Management (Independent)	This variable is measured with five scores with the following details: Score 1: if the report does not display the CEO's photo. Score 2: if it displays a profile photo of the CEO (small). Score 3: if there is a photo of the CEO with other executives. Score 4: if there is a half-page photo of the CEO. Score 5: if the report includes a photo of the CEO on more than half a page. Kalbuana et al. (2023)

RESULTS AND DISCUSSION

The number of mining companies used in this study was 68 for the period 2019-2023, resulting in 340 data points. The descriptive statistical results of all processed data can be seen in the following table:

Table 2
Descriptive Statistics

Variable	N	Min.	Max.	Mean	Std. Deviation
Carbon Disclosure	340	0,00	11,00	4,12	3,83
CEO Gender	340	0,00	1,00	0,40	0,49
Foreign CEO	340	0,00	1,00	0,37	0,48
CEO Impression Management	340	1,00	5,00	3,53	1,33

Source: Data Processed, 2024

The data description in the table above shows that the total carbon disclosure of the mining companies listed on the IDX has an average of 4,12 (out of a maximum of 11). This shows that the level of disclosure by all mining companies is still relatively low. In addition, the gender of the CEO also shows an average value of 0,40, which means that 40% of mining companies have women as CEOs. Similarly, foreign CEOs have an average score of 0,37, indicating that approximately 37% of all mining companies use foreign CEOs to lead the company. On a scale of 1 to 5, CEO impression management has an average score of 3,53. This indicates that the majority of mining companies listed on the IDX tend to be more narcissistic in their reporting, one of which is carbon disclosure.

Hypothesis Testing

The results of hypothesis testing using multiple regression analysis can be

presented in the following table:

Table 3
Multiple Linear Regression Analysis Results

No.	Hypothesis	Coefficient	Sig.
1	H1: there is a positive relationship between female CEOs and carbon disclosure.	1,3751	0,0007**
2	H2: there is a positive relationship between foreign CEOs and carbon disclosure.	2,1115	0,0002**
3	H3: there is a positive relationship between impression management and carbon disclosure.	0,3560	0,0109*

N= 340, F= 11,315 (Sig: 0,000), Adjusted R Square: 0,084

Regression using Random Effect Model (REM)

Note: * $p < 0,05$; ** $p < 0,01$

Source: Data Processed, 2024

The results of the multiple regression tests show that all CEO characteristics used in this study have a significant effect on carbon disclosure. These results explain that all the hypotheses proposed in this study are accepted. From the results of the table above also shows the adjusted R square value is 0,084 or 8,4%, which means that the dependent variable in this study is influenced by the independent variable by 8,4%. Then the remaining 91,6% is influenced by other variables outside the study. In addition, the significance value of the F test is less than 0.05 (0.000), which means that variable X (CEO characteristics) simultaneously influences variable Y (carbon disclosure).

Discussion

The test results show that CEO gender has a significant positive effect on carbon disclosure. This suggests that companies with female CEOs tend to disclose more information, including carbon disclosure. These findings are consistent with the research conducted by Kilincarslan et al. (2020). Other studies that support the findings of this study include Buallay & Alhalwachi (2022); Raimo et al. (2022); Chouaibi & Affes (2021); and Pucheta-Martínez et al. (2020). Empirically, the positive effect of CEO gender on carbon disclosure confirms the upper echelon theory. In addition, Chang et al. (2024) found that women tend to have traits such as empathy, compassion, sensitivity in interpersonal relationships, and greater concern for the welfare of others. In addition, women are seen as having higher levels of sensitivity and concern,

especially in terms of social and environmental actions (Al-Duais et al., 2021). In developing countries, the presence of more female leaders can lead to better efficiency (Elango, 2019). The specialization of characteristics of women, especially CEOs, will make them more active and effective in initiating better carbon disclosure. There is ample evidence that CEOs who are women are more tolerant in their decision-making, more detailed in their long-term planning, more productive in their performance, and have an advantage in corporate responsibility.

This study also successfully demonstrated that foreign CEOs have a positive and significant impact on carbon disclosure. Companies led by foreign CEOs and those with international educational backgrounds tend to provide more comprehensive carbon disclosure. These findings are consistent with the research conducted by Shahab et al. (2020) who found that foreign CEOs have a positive impact on corporate environmental performance, including carbon disclosure. Other studies that support the results of this study such as Khalid et al. (2022); Shehadeh et al. (2020); and Thinh et al. (2021), so these results can confirm the upper echelon theory proposed by Hambrick & Mason (1984). Foreign CEOs bring international experience and insights that provide unique perspectives in formulating corporate policies and making strategic decisions (Hiebl, 2014) including carbon disclosure strategies.

CEO leadership style is strongly influenced by the presence of foreign CEOs who have a lot of experience with the international level of environment, cultural differences and implementation of corporate governance. In conditions where environmental regulations are not consistently adhered to, such as in developing countries, foreign executives will use this as a strategic gap where carbon disclosure is used as evidence of corporate social responsibility and differentiation from the competitive level of local companies. This leads to the understanding that companies with foreign CEOs have high participation in carbon disclosure. This is not only to strengthen legitimacy with stakeholders, but also to adapt to local culture, which is maintained by local stakeholders.

Companies that display large photos are associated with a level of corporate disclosure that is perceived to be more detailed and good. Conversely, if the company displays a relatively small photo, or no photo at all, it indicates a lack of confidence in its environmental performance. Protecting the reputation of the company is the

responsibility of the CEO as the most senior executive in the company. As such, the CEO will make strategic decisions, in particular decisions on carbon disclosure. The appearance of CEOs in photos in company reports, especially in developing countries, indicates better carbon disclosure performance. This may be because narcissistic CEOs want to enhance their personal image and gain recognition from stakeholders. The impression of a visionary leader is expected through sustainability statements and wants to attract good public attention in order to seek prestige and awards (Junge et al., 2024).

CONCLUSIONS AND SUGGESTIONS

Conclusions

This study successfully proves that CEO characteristics measured by gender, foreign CEOs and CEO impression management have a positive and significant effect on carbon disclosure in mining companies listed on the Indonesia Stock Exchange during 2019 to 2023. Women, with their uniqueness and values, have more sensitivity and feminine attitudes even in leading companies, including in carbon disclosure efforts. In addition, CEOs who come from abroad (foreigners) and have experience studying abroad also bring their own characteristics to the company, especially in carbon disclosure strategies. The existence of different cultures, systems and patterns between Indonesia and abroad makes the presence of foreign CEOs provide a different nuance in the company, such as in carbon disclosure. Furthermore, this study confirms that the disclosure of personal information contained in the annual report in the form of a CEO photo (as a proxy for CEO impression management) has proven to be significant for the disclosure of other information such as carbon disclosure. Company reports that are more visually presented with photos and images reflect better disclosure of company policies, including carbon disclosure. More generally, the results of this study suggest that having a female CEO, a CEO with foreign experience and a narcissistic CEO is not a bad idea, especially if the company intends to increase carbon disclosure. The results of this study also support the upper echelons theory, which highlights the importance of top management characteristics in influencing strategic choices and organisational performance.

Limitations and Suggestions

This study has provided a new perspective on CEO characteristics in carbon disclosure, but there are still limitations that need to be improved in future research. First, not all mining companies can be used in this research analysis because there are 28 companies that do not meet the criteria, so the results cannot be generalized to all other mining companies. Future research is expected to dig deeper into other company report publication channels to get complete company data. Second, this research takes mining companies as the object because they contribute the most carbon emissions. The focus on mining companies may provide different analysis results when conducted on other company sectors. Future research is expected to expand the object of research by adding sectors other than mining.

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