“Financial slack, CSR disclosure, and carbon emission disclosure: The moderating role of independent commissioners in Indonesian energy firms”

AUTHORS	Djenni Sasmita Agus Ismaya Hasanudin Imam Abu Hanifah Yeni Januarsi

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Djenni Sasmita (Indonesia), **Agus Ismaya Hasanudin** (Indonesia), **Imam Abu Hanifah** (Indonesia), **Yeni Januarsi** (Indonesia)

FINANCIAL SLACK, CSR DISCLOSURE, AND CARBON EMISSION DISCLOSURE: THE MODERATING ROLE OF INDEPENDENT COMMISSIONERS IN INDONESIAN ENERGY FIRMS

Abstract

Climate change has increasingly pressured companies to enhance their environmental accountability through carbon emission disclosure. The energy sector, as one of the largest contributors to greenhouse gas emissions, plays a critical role in addressing this issue. This study investigates the influence of financial slack and corporate social responsibility (CSR) disclosure on carbon emission disclosure, while also examining the moderating role of independent commissioners. The sample consists of 23 energy companies listed on the Indonesia Stock Exchange (IDX) from 2019 to 2023, selected through purposive sampling. Using multiple regression analysis with STATA 17, the findings reveal that financial slack has no significant effect on carbon emission disclosure, indicating that the availability of financial resources alone does not drive firms to disclose environmental information. In contrast, CSR disclosure positively and significantly affects carbon emission disclosure, showing that broader CSR practices encourage higher transparency in carbon-related reporting. Furthermore, the moderating role of independent commissioners presents mixed results: they strengthen the relationship between financial slack and carbon emission disclosure, but do not significantly moderate the link between CSR disclosure and carbon emission disclosure. The novelty of this study lies in integrating financial slack, CSR disclosure, and corporate governance mechanisms within the context of carbon disclosure in Indonesia's energy sector. The results highlight the importance of CSR as a strategic driver of environmental transparency, while demonstrating that governance oversight is crucial in channeling financial flexibility toward sustainable reporting.

Keywords carbon emission disclosure, CSR disclosure, financial slack, independent board of commissioners, Indonesia Stock Exchange

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Djenni Sasmita, M.A., Doctoral Student, Faculty of Economics and Business, Accounting Department, Sultan Ageng Tirtayasa University, Indonesia. (Corresponding author)

Agus Ismaya Hasanudin, Professor, Lecturer, Faculty of Economics and Business, Accounting Department, Sultan Ageng Tirtayasa University, Indonesia.

Imam Abu Hanifah, Dr., Lecturer, Faculty of Economics and Business, Accounting Department, Sultan Ageng Tirtayasa University, Indonesia.

Yeni Januarsi, Ph.D., Lecturer, Faculty of Economics and Business, Accounting Department, Sultan Ageng Tirtayasa University, Indonesia.

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INTRODUCTION

Greenhouse gas (GHG) emissions are a serious threat to the sustainability of life on Earth. Gases such as CO_2, CH_4, and H_2O trap heat in the atmosphere, causing global warming (Velte et al., 2020). Climate change impacts include productivity loss, global economic downturns, and ecosystem disruption. The International Energy Agency (IEA) reports a surge in CO_2 emissions in Asia due to the shift from natural gas to coal, with Indonesia among the largest contributors, particularly from the energy sector. Globally, developed countries reduced energy-sector emissions by 9% in 2019 through clean energy adoption and efficiency improvements, while developing countries saw a steady increase. In Indonesia, PT Adaro

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Energi Tbk, a major coal producer, remains dependent on coal-fired power plants (CFPPs), which generate substantial emissions. Nonetheless, the company has initiated measures such as using waste as an alternative energy source to reduce carbon output.

Coal combustion not only accelerates climate change but also causes health problems such as respiratory illnesses and heart disease. These environmental damages create a trade-off against corporate profits. In response, mining companies have increasingly adopted Environmental, Social, and Governance (ESG) principles to reduce emissions and manage operations sustainably. The Indonesian government has issued Presidential Regulations No. 61/2011 and No. 71/2011 to encourage emission reduction. However, carbon emission disclosure remains voluntary. The Carbon Disclosure Project (CDP) serves as a global benchmark for carbon reporting, providing investors with valuable environmental performance data. Such disclosure can enhance firm value by signaling good corporate governance.

Firm value reflects investor perceptions of future prospects (Kabir et al., 2023). Enhanced environmental disclosure can lower capital costs or increase cash flows (Yao et al., 2023). According to legitimacy theory, sustainability reporting is part of a social contract between companies and society. One factor influencing carbon disclosure is financial slack – the availability of excess financial resources enabling companies to fund risky projects and innovations (Zhang et al., 2018). Firms with high financial slack may disclose more carbon information, yet Mahardika and Kawedar (2019) found no such effect, noting that disclosure is often driven by stakeholder expectations regardless of resources. This divergence forms the first research gap.

Another factor is corporate social responsibility (CSR) disclosure. Broader CSR disclosure is generally linked to higher carbon disclosure (Hu et al., 2018). However, Kholmi et al. (2020) argued that the breadth of CSR reporting does not always correlate with carbon disclosure, forming the second finding gap. A third gap exists regarding the link between carbon disclosure and carbon performance. Csutora and Harangozo (2017) found a positive relationship, suggesting that transparency drives improvement, whereas Milne (2024) found no significant impact, indicating disclosure alone may not change performance.

ESG performance has become a global benchmark for sustainability, with investors prioritizing sustainable practices over short-term profit (Shakil et al., 2020). Independent commissioners and sustainability committees play a critical role in ensuring ESG transparency, overseeing policies, and meeting stakeholder expectations (Susanto et al., 2024). This study leverages these finding gaps to examine the influence of financial slack, CSR disclosure, and governance factors on carbon emission disclosure, as well as its implications for firm value and performance.

1. LITERATURE REVIEW AND HYPOTHESES

Legitimacy theory posits that organizations operate within a "social contract" that binds them to act in accordance with societal norms, values, and expectations. When legitimacy is threatened, companies may adopt strategies such as voluntary environmental disclosure to restore or maintain public trust (Asyifa & Burhany, 2022). Carbon emission disclosure (CED) is one such strategy, enabling firms to demonstrate environmental responsibility and align operations with societal expectations. By publicly reporting carbon performance, firms seek to influence stakeholder perceptions and mitigate reputational risks.

Carbon emissions, measured primarily in CO_2 equivalents, contribute significantly to climate change (Qian & Schaltegger, 2017). Disclosing emissions data – either voluntarily or mandatorily – improves transparency and allows stakeholders to assess environmental performance and related risks (Yan et al., 2020). In Indonesia, disclosure remains voluntary, yet demand for such reports has grown due to rising awareness of climate issues. From a legitimacy perspective, CED serves as both a signal of environmental responsibility

and a competitive advantage. Firms with transparent carbon reporting are often rewarded by investors and other stakeholders (Qian et al., 2018). Empirical evidence suggests a positive relationship between CED and firm value (Asyifa & Burhany, 2022), underscoring its strategic importance.

Hardiyansah et al. (2021) emphasized that communication strategies, particularly those related to carbon information, can alter societal perceptions and redirect attention from negative issues toward achievements in social and environmental performance. Effective corporate governance further strengthens legitimacy, as directors and boards play a crucial role in reducing emissions and improving carbon performance (Machokoto et al., 2021). Legitimacy theory thus overlaps with stakeholder theory, as both stress the importance of aligning corporate actions with societal and stakeholder expectations (Román et al., 2021).

Empirical studies support the role of legitimacy theory in explaining the relationship between environmental performance and disclosure (Lu & Wang, 2021). Independent boards of commissioners, as part of governance structures, influence disclosure practices by balancing the interests of multiple stakeholders (Hanaya & Suhartini, 2025). In this context, CED serves not only as a compliance measure but also as a tool to communicate alignment with societal values, as reflected in sustainability and annual reports.

CSR activities also reinforce legitimacy by demonstrating social and environmental commitment, improving reputation, and fostering harmonious growth (Hu et al., 2018). Furthermore, legitimacy can be manifested through both financial resources and technological capabilities. Financial slack enables investments in energy-saving and emission-reduction (ESER) equipment, while green technology reflects innovation in developing environmentally friendly products and processes (Zhang et al., 2021). Together, these resources form the strategic legitimacy necessary for sustainable operations.

Financial slack is an important internal resource that can be leveraged to enhance firm value through investment and innovation (Aryani & Hussainey, 2017). Social disclosures, including environmental performance reports, serve to strengthen reputation, attract public attention, and enhance legitimacy in the eyes of stakeholders. Managers thus disclose such information strategically to improve the company's image and value. In the context of environmental responsibility, voluntary disclosure aligns with stakeholder expectations and supports the firm's social license to operate. By integrating stakeholder concerns into decision-making, companies can enhance trust, reduce conflict, and secure long-term support for their strategies. Financial slack refers to surplus resources available beyond operational needs. Such reserves enable companies to pursue investment opportunities, support innovation, and absorb potential failures (Mahardika & Kawedar, 2019). In the environmental context, financial slack facilitates two main approaches to emission reduction:

(1) investing in ESER equipment and

(2) developing green technologies (Zhang et al., 2022).

These investments enhance strategic legitimacy by signaling long-term commitment to sustainable development.

Companies are encouraged to assess and disclose the environmental consequences of their operations. Alfani and Diyanty (2019) further argued that firms with greater financial slack are better positioned to invest in sustainable initiatives and voluntary disclosure, which can enhance competitive advantage. An et al. (2025) emphasize that implementing energy-saving technologies demands significant financial resources. While these investments benefit the environment, they may not be prioritized due to their limited short-term profitability, implying that higher financial slack facilitates environmental initiatives.

Suryani and Wijayati (2019) found that financial slack has a positive and significant effect on CED. This proves that high financial slack will reveal more greenhouse gas emissions. Alfani and Diyanty (2019) also showed that financial slack has a positive and significant effect on CED because companies will utilize financial slack to carry out sustainable activities and disclose carbon emissions. Inconsistent research results were

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presented by Mahardika and Kawedar (2019), who found that financial slack had no effect on CED. Thus, the influence of financial slack on CED cannot yet be generalized and needs further research. In this case, researchers are considering using moderating factors.

CSR disclosure extends corporate accountability to a wider set of stakeholders, integrating social and environmental concerns into business strategy (Román et al., 2021). It informs investors about environmental performance and can influence perceptions of corporate responsibility. Firms with greater CSR disclosure often exhibit higher levels of carbon reporting (Andrian, 2020). The benefits of CSR activities include enhanced reputation, stakeholder trust, and long-term profitability. CSR also fosters stronger stakeholder relationships, increasing their willingness to contribute resources to the firm. Empirical evidence supports a positive link between CSR disclosure and firm value (Tarjo et al., 2022). Andrian and Sudibyo (2019) found that CSR disclosure positively influences carbon emission disclosure. Similarly, Román et al. (2021) demonstrated that CSR reporting, assurance, and the presence of a CSR committee are associated with higher emission disclosure.

An independent board of commissioners is composed of members unaffiliated with management or controlling shareholders, appointed to represent minority shareholders and act solely in the company's best interests (Bebchuk & Hamdani, 2017). Such independence enhances oversight, ensuring transparency and accountability in governance. Strong governance, in turn, facilitates integration of climate change considerations into corporate strategy, thereby improving CED practices. Good corporate governance aligns the interests of shareholders, directors, and other stakeholders, ensuring that environmental and social goals are embedded within business objectives (Mason & Simmons, 2014). Within the legitimacy framework, independent commissioners help ensure that carbon disclosures are credible and responsive to stakeholder concerns.

Machokoto et al. (2021) highlighted that effective corporate governance, particularly through a competent board of directors, serves as a critical resource. In Pakistan's weak regulatory context, financial slack – proxied by the debt-to-equity ratio – partially mediates the relationship between governance and firm performance, with implications for carbon emission disclosure. Yang et al. (2021) found that environmental management maturity enhances managerial oversight, with independent commissioners strengthening the positive effect of financial slack on emission disclosure in China's heavy-pollution industries. Li et al. (2017) similarly reported that board independence reinforces the link between CSR disclosure and carbon emission disclosure in a regulated Chinese context. Coelho et al. (2023), analyzing 6,306 heavily polluting Chinese firms, find that optimized shareholding structures and improved governance mechanisms boost CSR fulfillment and long-term economic benefits, thereby increasing emission disclosure. Overall, prior studies suggest that financial slack and CSR disclosure each positively influence carbon emission disclosure, and that robust corporate governance can strengthen these relationships.

The purpose of this study is to examine the relationship between financial slack, CSR disclosure, and CED with an independent board of commissioners as a moderator. The study's working assumptions are as follows:

H1: Financial slack affects carbon emission disclosure.

H2: CSR disclosure affects carbon emission disclosure.

H3: An independent board of commissioners strengthens the influence of financial slack on carbon emission disclosure.

H4: An independent board of commissioners strengthens the influence of CSR disclosure on carbon emission disclosure.

2. METHOD

The study employed a quantitative research methodology. The population included 88 energy sector companies whose shares were listed on the Indonesia Stock Exchange in 2019–2023. The reason for choosing energy sector compa-

nies is that the complexity of industrial activities is more related to carbon emissions. The sampling technique was purposive sampling. The aim was to obtain a sample aligned with the research criteria. The following criteria were used in this study:

1. Energy sector companies listed on the Indonesia Stock Exchange (IDX) for the 2019–2024 period.

2. Companies that provided complete annual reports for the 2019–2023 period (The reason for using 2019 as the starting year was that more data were available relating to carbon emissions disclosure in sustainability reports than in previous years).

3. Companies had complete environmental performance data for the period from 2019 to 2023.

4. Companies were required to disclose complete information regarding carbon emissions in their annual report or sustainability report for the period from 2019 to 2023.

Based on the above criteria, 23 companies were selected as samples. With observations covering five years, from 2019 to 2023, a total of 115 observations were obtained. The reason for selecting 2019 as the starting year is that data availability related to carbon emission disclosure in sustainability reports is more extensive compared to previous years. The list of companies that were selected as the research sample is shown in Table 1.

Table 1. Sampled companies in the energy sector

Source: Processed data, 2024.

No.	Sampled Companies	No.	Sampled Companies
1	PT Mitrabara Adiperdana Tbk	12	PT Darma Henwa Tbk
2	PT Vale Indonesia Tbk	13	PT Golden Eagle Energy Tbk
3	PT Petrosea Tbk	14	PT Resource Alam Indonesia Tbk
4	PT Prima Andalan Mandiri Tbk	15	PT Radiant Utama Interinsco Tbk
5	PT Bukit Asam Tbk	16	PT Adaro Energy Indonesia Tbk
6	PT Golden Energy Mines Tbk	17	PT Alfa Energi Investama Tbk
7	PT Aneka Tambang Tbk	18	PT Indika Energy Tbk
8	PT Harum Energy Tbk	19	PT TBS Energi Utama Tbk
9	PT Bayan Resources Tbk	20	PT Bumi Resources Mineral Tbk
10	PT Merdeka Copper Gold Tbk	21	PT Bumi Resources Tbk
11	PT Indo Tambangraya Megah Tbk	22	PT Samindo Resources Tbk
–	–	23	PT Astrindo Nusantara Infrastruktur Tbk

This study uses profitability, firm size, and quality of earnings as control variables. The STATA 17 application software program is one of the data processing technologies used in this investigation. To prevent outliers, data of 0.05 are substituted. This is accomplished by using a winsorize of 0.05 to minimize the quantity of data that are replaced. Winsorization is applied to each financial slack, firm value, and quality of earnings variables. Following winsorization, data analysis is carried out using the newly winsorized variables. Multiple regression analysis for evaluating hypotheses. This study created the following model in order to evaluate the hypotheses:

$$\begin{aligned} CED &= a_0 + a_1 FS_t + a_2 CSR\ Disclosure_t \\ &+ a_3 DKI_t + a_4 FSxDKI_t \\ &+ a_5 CSR\ DisclosurexDKI_t \\ &+ a_6 ROA_t + a_7 FSZ_t + a_8 QOE_t + \varepsilon, \end{aligned} \quad (1)$$

where *CED* – Carbon Emission Disclosure; *FS* – Financial Slack; *CSR Disclosure* – CSR Disclosure; *DKI* – Independent Board of Commissioners; *ROA* – Return on Assets; *FSZ* – Firm Size; *QOE* – Quality of Earnings.

3. RESULTS

3.1. Descriptive statistical analysis

Descriptive analysis is the first step in understanding data. Its primary goal is to summarize and present data using statistical methods. Some techniques used in descriptive analysis include mea-

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Table 2. Descriptive statistical analysis

Variable	Obs.	Mean	Std. dev.	Min	Max
FS	115	.2904	.1942	–.0957	.8535
CSR Disclosure	115	.4500	.1355	.2500	.8333
DKI	115	.4066	.1148	.2000	.7500
CED	115	.4343	.2176	.0556	1.0000
ROA	115	.1215	.1757	–.2599	.9844
FSZ	115	25.5845	4.5199	16.9959	31.8813
QOE	115	3.0166	4.4710	–.4827	18.1299

Note: *FS* – Financial Slack; *CSR Disclosure* – CSR Disclosure; *DKI* – Independent Board Commissioners; *CED* – Carbon Emission Disclosure; *ROA* – Return on Assets; *FSZ* – Firm Size; *QOE* – Quality of Earnings.

sures of central tendency, such as the mean, standard deviation (Std. dev.), minimum, and maximum values. This descriptive data analysis provides a clear picture of the distribution of values from summary statistics using STATA software, eliminating outliers. This is achieved by minimizing the number of data points replaced with a winsorize of 0.05.

Table 2 presents the descriptive statistics of the observed variables, which provide an overview of the financial, governance, and sustainability characteristics of the sampled firms. The average value of financial slack is 0.2904, indicating that, on average, firms hold relatively modest financial reserves. The standard deviation of 0.1942 suggests noticeable variation across companies, with some firms facing liquidity constraints (minimum = –0.0957) while others maintain considerable buffers (maximum = 0.8535).

CSR disclosure records a mean score of 0.45 with a standard deviation of 0.1355, reflecting moderate levels of reporting. The limited dispersion indicates that most firms in the sample adopt relatively consistent disclosure practices, with values ranging between 0.25 and 0.8333. The proportion of independent commissioners shows a mean of 0.4066 and a standard deviation of 0.1148, with a range from 0.20 to 0.75. This result implies that the appointment of independent commissioners is a common and relatively uniform governance practice among the observed firms. CED averages 0.4343 but exhibits substantial variation (standard deviation = 0.2176). The wide range (0.0556 to 1.0000) suggests that while some firms disclose emissions comprehensively, others provide only minimal information. This heterogeneity highlights differences in environmental awareness and responsiveness to stakeholder and regulatory pressures. Turning to financial performance, return on assets (ROA) has a mean of 0.1215, showing that most firms are moderately profitable. However, the relatively high standard deviation of 0.1757 and the wide range (from –0.2599 to 0.9844) reveal that some companies face losses while others achieve strong returns. Firm size appears relatively stable, with an average of 25.5845 and a standard deviation of 4.5199. The values range from 16.9959 to 31.8813, suggesting that the sample is composed of firms of broadly comparable size, although some larger players are present. Finally, the quality of earnings shows considerable variation, with a mean of 3.0166 and a high standard deviation of 4.4710. The spread, from –0.4827 to 18.1299, indicates that while some firms report stable and reliable earnings, others may face issues related to earnings volatility or aggressive accounting practices. Overall, the descriptive statistics depict a diverse sample of firms that differ substantially in financial flexibility, disclosure practices, and performance. While governance structures such as independent commissioners appear relatively consistent, environmental and financial indicators reveal notable disparities. These differences may reflect variations in industry dynamics, regulatory compliance, and strategic orientations among the firms studied.

3.2. Hypothesis testing results

Table 3 shows that the significance level for the positive coefficient value of 0.005 in the first hypothesis, financial slack in CED, is 0.626. So, since it is bigger than 0.05, we cannot support H1. Coefficient 2.204, significance level 1%, and value 0.000 all lend credence to the second hypothesis, which investigates the connection between CED and CSR disclosure. A positive coefficient value of 0.314, significance of 5%, and a value of 0.022 were demonstrated by the three independent boards of commissioners' hypothesis, which supports H3. This further em-

Table 3. Regression results

CED	Coef.	Std.Err.	t-value	p-value	[95% Conf	Interval]	Sig
FS	.005	.01	0.49	.626	–.015	.024	–
CSR Disclosure	2.204	.275	8.01	0.00	1.657	2.752	***
DKI	.745	.03	25.02	0.00	.685	.804	***
FSDKI	.314	.135	2.33	.022	.046	.582	**
CSR Disclosure DKI	–.397	.259	–1.53	.129	–.913	.119	–
ROA	.022	.078	0.28	.779	–.133	.177	–
FSZ	–.001	.007	–0.14	.892	–.014	.013	–
QOE	0	.001	–0.31	.759	–.001	.001	–
Constant	.373	.2	1.86	.067	–.026	.771	*

Note: *** $p < .01$, ** $p < .05$, * $p < .1$. *CED* – Carbon Emission Disclosure; *FS* – Financial Slack; *CSR Disclosure* – CSR Disclosure; *DKI* – Independent Board of Commissioners; *FSDKI* – Firm Size X Independent Board of Commissioners; *CSR DisclosureDKI* – CSR Disclosure X Independent Board of Commissioners; *ROA* – Return on Assets; *FSZ* – Firm Size; *QOE* – Quality of Earnings.

phasizes the impact of financial slack on CED. The significance level of H4 is too high to be accepted (>0.05). Also, the fourth hypothesis that independent boards of commissioners will increase the impact of CSR disclosure on CED has a 0.397 negative coefficient and a 0.129 significance level.

4. DISCUSSION

4.1. Hypothesis 1: The effect of financial slack on carbon emission disclosure

The first hypothesis examined the relationship between financial slack and carbon emission disclosure. The results show no significant effect of financial slack on carbon emission disclosure. This finding is consistent with Mahardika and Kawedar (2019), where the probability value ($p > |t|$) was 0.626, exceeding the 0.05 significance threshold (0.626 > 0.05), leading to the rejection of Hypothesis 1. These results indicate that the availability of financial resources does not necessarily encourage management to engage in environmental initiatives or expand carbon emission disclosure as part of corporate responsibility. Although companies may possess sufficient financial resources, management often considers the costs of carbon reporting to outweigh the perceived benefits, such as improved corporate image or compliance with regulations.

He et al. (2013) similarly argued that firms perceive the benefits of carbon disclosure as disproportionate to its costs, and therefore, financial slack alone does not motivate greater transparency. However, this result contrasts with Alfani and Diyanty (2019), who emphasized that the adoption of energy-efficient technologies requires higher levels of financial slack. They suggested that businesses must recognize their environmental impacts and allocate resources toward sustainable solutions. Kim et al. (2019) found that both financial slack and human resource slack increase the publication of CSR and sustainability reports in Korea, as they allow for additional costs for this voluntary information. By doing so, firms gain legitimacy and public recognition. Firms with strong financial positions may therefore have greater potential to disclose carbon emissions. Nonetheless, the present findings suggest that the availability of financial slack does not automatically translate into higher levels of carbon disclosure. Future research could further investigate the adoption of energy-saving technologies, distinguishing between technological capabilities and managerial practices.

4.2. Hypothesis 2: The effect of corporate social responsibility disclosure on carbon emission disclosure

The second hypothesis tested the relationship between CSR disclosure and carbon emission disclosure. The results indicate a significant positive effect, suggesting that greater CSR disclosure is associated with higher levels of carbon emission disclosure. This aligns with Román et al. (2021), who found that CSR disclosure directly influences transparency in environmental reporting. As Gamerschlag et al. (2011) noted, CSR disclosure represents a voluntary effort by companies to integrate social and environmental concerns into business activities and stake-

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holder relations. From the perspective of legitimacy theory, firms voluntarily disclose environmental and social information to strengthen stakeholder trust and fulfill societal expectations. Accordingly, a higher level of CSR disclosure tends to correspond with broader carbon disclosure (Pratiwi, 2017).

Nevertheless, these findings differ from Kholmi et al. (2020), who argued that CSR disclosure does not significantly affect carbon emission disclosure, as firms may prioritize only environmental issues directly linked to production activities. Recently, however, investors have shown growing interest in sustainability practices rather than short-term financial outcomes. The ESG framework has become a crucial tool for evaluating firms, guiding resource allocation, and fostering sustainable corporate behavior.

ESG practices provide several benefits:

(1) risk management, as firms that proactively address social and environmental risks are better prepared for regulatory changes and market disruptions;

(2) long-term performance, as companies prioritizing sustainability often attract socially responsible investors and demonstrate resilience; and

(3) cost efficiency, as eco-friendly practices like energy efficiency can reduce operational costs.

However, challenges remain, including the lack of standardized ESG reporting and the difficulty of collecting reliable data. Future studies should explore how specific and accurate environmental disclosures within CSR reporting can enhance the quality of carbon emission disclosure.

4.3. Hypothesis 3: The moderating effect of independent commissioners on the relationship between financial slack and carbon emission disclosure

The third hypothesis examined whether independent commissioners strengthen the relationship between financial slack and carbon emission disclosure. The results confirm this moderating effect, with a significant interaction term ($p = 0.02 < 0.05$). This indicates that the presence of independent commissioners enhances the positive influence of financial slack on carbon disclosure. This finding is consistent with Kılıç and Kuzey (2019), who argued that independent boards positively affect environmental disclosure. According to Hamidah et al. (2015), a higher proportion of independent commissioners reduces managerial conflicts. It strengthens the board's ability to encourage firms to allocate financial slack toward environmental reporting (Apriani et al., 2025). Thus, when companies have greater financial flexibility, independent commissioners can play a decisive role in ensuring that these resources are directed toward sustainability initiatives.

From a legitimacy theory perspective, independent commissioners influence disclosure practices by ensuring that firms act in line with stakeholder expectations (Hasnan et al., 2023). By providing external oversight, independent commissioners help guide the allocation of financial slack, balancing shareholder interests with broader societal concerns. Jeanette and Eriandani (2021) further highlight that the proportion of independent commissioners is a critical factor in this governance role. Similarly, Yang et al. (2021) emphasized that environmental maturity within governance systems reinforces internal monitoring and promotes environmental protection practices. In summary, the results confirm that independent commissioners strengthen the relationship between financial slack and carbon emission disclosure.

4.4. Hypothesis 4: The moderating effect of independent commissioners on the relationship between CSR disclosure and carbon emission disclosure

The fourth hypothesis tested whether independent commissioners strengthen the relationship between CSR disclosure and carbon emission disclosure. The regression results indicate no significant moderating effect ($p = 0.129 > 0.05$). This suggests that independent commissioners do not enhance the influence of CSR disclosure on car-

bon disclosure. One explanation is that extensive disclosure of carbon emissions may be perceived as risky, potentially damaging the firm's reputation among investors and stakeholders. To protect shareholder interests and maintain corporate reputation, independent commissioners may prefer to limit disclosure levels. This finding is consistent with Amaliyah and Solikhah (2019), who reported that independent commissioners do not significantly affect carbon disclosure. Given their supervisory role, independent commissioners may lack the time and capacity for continuous monitoring, which limits their influence over CSR-related reporting.

However, this result contrasts with Walls and Berrone (2017), who argued that independent commissioners can strengthen the CSR–CED link by encouraging firms to disclose environmental responsibilities as part of investor decision-making processes. Legitimacy theory suggests that companies voluntarily disclose environmental and social performance to gain stakeholder support (Andrian, 2020). Similarly, Li et al. (2017) found that independent commissioners may enhance the positive impact of CSR disclosure on carbon disclosure. Overall, the present findings suggest that while CSR disclosure itself influences carbon reporting, the role of independent commissioners as moderators in this relationship remains limited. Further research is needed to explore the conditions under which independent boards can effectively support the integration of CSR practices into environmental disclosure.

CONCLUSION

This study examined the influence of financial slack and CSR disclosure on carbon emission disclosure, with independent commissioners serving as a moderating variable. The findings provide several important insights. First, financial slack was found to have no significant effect on carbon emission disclosure, indicating that the mere availability of financial resources does not necessarily motivate companies to increase transparency in their environmental reporting. Second, CSR disclosure showed a significant positive effect on carbon emission disclosure, confirming that firms with broader CSR practices tend to disclose more comprehensive environmental information. Third, independent commissioners strengthened the relationship between financial slack and carbon emission disclosure, suggesting that good governance plays a decisive role in directing financial flexibility toward sustainability initiatives. Finally, independent commissioners did not moderate the relationship between CSR disclosure and carbon emission disclosure, reflecting limitations in their supervisory role over voluntary CSR reporting. From a practical perspective, these results highlight that financial resources alone are insufficient without effective governance structures to ensure their allocation toward environmental initiatives. Companies should strengthen the role of independent commissioners not only in monitoring financial decisions but also in guiding CSR-related disclosures toward greater transparency. Meanwhile, the positive relationship between CSR disclosure and carbon emission disclosure suggests that sustainability practices embedded in corporate strategy can enhance environmental accountability and build stronger stakeholder trust.

For future research, several avenues can be explored. First, examining other moderating variables such as board diversity, ownership structure, or regulatory pressure could provide a deeper understanding of the drivers of carbon disclosure. Second, longitudinal studies covering a longer time span may reveal how changes in governance practices and financial conditions influence disclosure trends over time. Third, cross-country comparisons would allow researchers to capture how institutional, cultural, and regulatory contexts shape the relationship between financial slack, CSR disclosure, and carbon emission disclosure. Lastly, future studies could integrate qualitative approaches, such as case studies or interviews with corporate leaders, to capture the strategic considerations behind disclosure practices. In conclusion, the findings underline the importance of integrating financial flexibility, CSR practices, and governance oversight to strengthen carbon disclosure. By aligning these elements, companies can not only meet stakeholder expectations but also contribute more effectively to sustainable development.

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AUTHOR CONTRIBUTIONS

Conceptualization: Djenni Sasmita, Agus Ismaya Hasanudin.
Data curation: Djenni Sasmita.
Formal analysis: Djenni Sasmita, Imam Abu Hanifah, Yeni Januarsi.
Funding acquisition: Djenni Sasmita.
Investigation: Djenni Sasmita, Imam Abu Hanifah, Yeni Januarsi.
Methodology: Djenni Sasmita, Agus Ismaya Hasanudin.
Project administration: Djenni Sasmita, Yeni Januarsi.
Resources: Djenni Sasmita, Imam Abu Hanifah.
Software: Djenni Sasmita.
Supervision: Agus Ismaya Hasanudin, Imam Abu Hanifah, Yeni Januarsi.
Validation: Agus Ismaya Hasanudin, Imam Abu Hanifah, Yeni Januarsi.
Visualization: Agus Ismaya Hasanudin, Imam Abu Hanifah, Yeni Januarsi.
Writing – original draft: Djenni Sasmita.
Writing – review & editing: Djenni Sasmita, Agus Ismaya Hasanudin, Imam Abu Hanifah, Yeni Januarsi.

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