The impact of carbon disclosure on firm value: Examining the role of institutional ownership in the energy sector

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Abstract: *This study examines the influence of carbon disclosure on firm value with institutional ownership as a moderator in energy sector companies listed on the Indonesia Stock Exchange during 2019-2022. Carbon disclosure is measured using the disclosure scale developed by Bae Choi et al. (2013a), the percentage of institutional ownership in the company to calculate institutional ownership, and Tobin's Q to calculate firm value. This study uses data from energy sector companies listed on the Indonesia Stock Exchange for the observation period of 2019-2022, with a total of 80 observations through purposive sampling. The results show that carbon disclosure has a negative effect on firm value. However, institutional ownership weakens the negative influence of carbon disclosure on firm value. The results of this study can provide insights into the factors that can increase firm value for investors. This study is expected to provide a perspective for investors to make investment decisions in the capital market by looking at information related to carbon disclosure conducted by companies.*

Keywords: *Coal Mining, Politics, Stocks, Climate Change, Institutional Investors, Climate Crisis*

Introduction

Companies require capital as a crucial aspect to carry out various operational activities, from purchasing inventory and developing products or services to financing marketing activities and business expansion (Dukoski, 2019). This capital is essential to support various business aspects, including employee salaries, overhead costs, and other expenditures crucial to the company's operational continuity. Companies can choose from various funding sources to meet their financial needs. According to Yanti and Wirama (2017), company funds are divided into internal and external funds based on their origin. Internal funds are generated from the company's operational activities, such as retained earnings and depreciation of fixed assets.

In the dynamic finance landscape, companies strategically acquire external funds through various channels, such as loans, bonds, and stock offerings. Particularly, firms engaging in an initial public offering (IPO) harness the power of capital markets by issuing shares to eager investors in the primary market. This process opens up significant opportunities for growth and diversification, ultimately bolstering the business's long-term prospects (N & K, 2022). Consequently, for IPO-listed companies on the Indonesia Stock Exchange, forging robust relationships with investors becomes crucial, as their capital structure heavily relies on these stakeholders to fuel operational success and drive sustainable growth in their competitive markets.

According to an article by Dirgantara (2021) on the Kontan investment page, stock investments related to Environmental, Social, and Governance (ESG) saw a sharp increase from 2019 to 2020, with managed funds reaching 3 trillion IDR, almost doubling from the previous 1.77 trillion IDR. In the same year, the number of ESG-based mutual fund products rose from 10 to 14. In the same article, President Director of BNP Paribas Asset Management, Priyo Santoso, stated that investors are becoming increasingly aware of the need to invest in companies that do not harm their surrounding environment. By enhancing carbon disclosure aligned with ESG's environmental principles, companies can improve their chances of attracting sustainable investors and obtaining more affordable, eco-friendly

funding. This approach benefits not only the company but also the environment and society.

Gradually, awareness of the importance of sustainability has increased year by year. People have begun prioritizing sustainability aspects when selecting companies to invest in. For example, PT RMK Energy's stock price has declined since early August 2023. That month, RMKE's stock price reached IDR 1,085 per share, then fell to IDR 805 at the beginning of September 2023 and continued to decline to IDR 670 the following month. In early November 2023, its stock price dropped again to IDR 645; on January 31, 2024, it decreased further to IDR 575. The public believes this stock price decline is a consequence of environmental sanctions faced by the company. PT RMKE also received sanctions from the Ministry of Environment and Forestry (KLHK) as a temporary operational suspension (Prasetyo, 2024).

In general, energy companies significantly contribute to greenhouse gas (GHG) emissions compared to other sectors. According to LCDI (Low Carbon Development Indonesia) (2024), the energy sector is one of the largest global contributors to greenhouse gas emissions. Based on information from the International Energy Agency (IEA), over 20 years, GHG emissions from the energy sector have more than tripled, from 10 Gigatons of CO2 in 1999 to 33 Gigatons of CO2 in 2019. With such a substantial contribution, the energy sector accounts for approximately 36% of the world's total GHG emissions. Decarbonization has become increasingly urgent for Indonesia, where nearly 90% of its primary energy comes from fossil fuels.

According to studies by the Ministry of National Development Planning/Bappenas, starting in 2022, the energy sector will overtake the forestry sector as Indonesia's largest contributor to emissions. The energy and transportation sectors have become dominant in emissions, contributing around 50.6% of Indonesia's total emissions in 2022, with potential emissions reaching 1 Gigaton CO2eq. The emission potential is projected to continue increasing through 2030, and the energy sector is expected to contribute about 1.4 gigatons of CO2eq (59%) of total emissions. This data serves as a warning to companies to disclose their carbon (GHG) emissions and outline their efforts to mitigate the long-term effects of high GHG output, particularly in the energy sector.

Investors have various considerations when selecting companies to invest in. In market capital research, the market exhibits certain tendencies in decision-making based on new information received (Candraningrat et al., 2023). Investors favor companies emphasizing sustainability values, particularly concerning carbon disclosure (Afrizal et al., 2023). Research from various contexts supports this idea. The concept of sustainability encompasses various aspects, including environmental considerations. Companies committed to the environment and actively managing their carbon emissions are generally considered more responsible and have better long-term prospects. One-way companies demonstrate their commitment to the environment is through carbon disclosure (Mishra & Sharma, 2023).

Carbon disclosure involves companies reporting their carbon emissions to manage risks and uncover opportunities associated with climate change (Wang, 2023). This practice can attract investors who prioritize environmental consciousness, thereby encouraging investment in the firm. Research conducted in Indonesia shows that such disclosures and strong environmental performance result in a positive reaction from investors and enhance market value (Houten & Wedari, 2023a). These findings are consistent with other studies that demonstrate a beneficial impact of carbon disclosure on a company's value (Trimuliani & Febrianto, 2023; Hardiyansah & Agustini, 2021; Damas et al., 2021; Nisa, 2023; Zuhrufiyah & Anggraeni, 2019; Kurnia et al., 2020; Ma et al., 2023; Yuliandhari et al., 2023; Bahriansyah & Lestari Ginting, 2022; Cao et al., 2022).

The positive influence observed can be attributed to several factors, with signaling theory as a primary explanation. Signaling theory posits that companies strive to present accounting information as a positive indicator, enhancing their reputation and trustworthiness. This approach increases investor confidence and directly elevates the company's stock value (Dewi, Putu 2024). On the other hand, research conducted by Hadiwibowo et al. (2023), Choi et al. (2021), Lee et al. (2015), Muhammad & Aryani (2021), and Firmansyah et al. (2021) indicates that carbon disclosure can have a negative impact on firm value. These studies suggest that efforts to reduce carbon emissions often incur additional costs, which may be viewed as harmful to profits or contrary to stakeholder priorities (Hadiwibowo et al.,

2023). This implies that companies may have interests that differ from those of investors, who might prioritize or see added value in a company's sustainability efforts. This reasoning aligns with agency theory, which suggests that managers might prioritize their interests over those of shareholders due to information asymmetry or undisclosed information by company management.

Recent research sheds light on various factors influencing the relationship between carbon emission disclosure, carbon performance, and a firm's value. These factors can enhance or reduce the effects of carbon emission disclosure and performance on a company's worth. This study particularly examines the role of Institutional Ownership as a potential factor influencing the impact of carbon disclosure on firm value. Studies by Altania & Tanno (2023), Imaduddin et al. (2023), Liu (2023), Rahman et al. (2022a), Suleiman & Maharani (2022), Hasanuddin (2022), and Suhandi (2021) indicate that institutional ownership has a positive correlation with increased firm value. Institutional ownership is viewed as a mechanism that restrains managerial misconduct, ensuring managers prioritize enhancing the firm's value over personal interests, thereby mitigating agency problems. Consequently, management becomes more accountable, protecting investor trust and boosting firm value.

Based on the explanation above, companies and investors face a dilemma and conflict regarding carbon disclosure and its impact on firm value. Overall, carbon disclosure is seen as influencing investors' investment choices; however, on the other hand, management has its interests in running the company. Institutional Ownership is expected to facilitate oversight of company management, thereby enhancing firm value. Examining these factors or variables simultaneously can provide a more comprehensive perspective on their mutual influence. Therefore, this study aims to analyze the effect of carbon disclosure on the value of energy sector companies listed on the Indonesia Stock Exchange from 2019 to 2022, with institutional ownership as a moderating variable. The analysis in this study is expected to contribute to the literature by enriching insights into the factors that influence a company's value, especially regarding carbon disclosure.

Literature review and hypothesis development

Signaling theory

Godfrey et al. (2010) state that managers will attempt to signal to investors through controllable accounting information to influence investor behavior in alignment with management's objectives. The assumption is that management has the same interests as the company's goals: to increase firm value so that investors continue to invest in the company, ensuring the company's ongoing existence and sustainability. The guidance provided to investors serves as a signal carrying positive information about the company's condition, intending to foster a positive perception of the company (Connelly et al., 2011). According to signaling theory, when a company discloses its carbon emissions, it sends a positive signal to investors and stakeholders. This signal reflects the company's commitment to environmental sustainability and responsible business practices. Consequently, this positive signal can enhance the company's reputation and trustworthiness, creating higher value for investors and potentially improving financial performance.

Stewardship theory

Bebbington & Rubin (2022) state that stewardship theory is a framework that emphasizes the role of management in acting as stewards of the resources entrusted to them, prioritizing the interests of the company and its stakeholders over personal gain. This theory contrasts with agency theory, which focuses on conflicts of interest between managers (agents) and shareholders (principals).

According to stewardship theory, managers will act in the common interest, creating a strong connection between organizational success and owner satisfaction, where stewards protect and maximize the organization's wealth through company performance, thereby maximizing utility functions (Raharjo, 2007). This theory suggests that management will operate the company according to the principal's wishes without prioritizing their interests. In contrast, agency theory posits that agents tasked with operating the business on behalf of principals

(shareholders) prioritize their interests over those of shareholders, leading to agency problems. These problems arise due to information asymmetry, where agents have more information about the company's operations than principals and the challenges principals face in effectively monitoring agents' actions (Pramana & Hermawan, 2022). Stewardship theory asserts that managers, in managing the company, are motivated by factors beyond financial incentives, such as professional ethics, corporate culture, and intrinsic satisfaction in contributing to the organization's success (Ramadhani et al., 2021).

Firm value

Firm value, as described by Rosmiasih and Ersyafdi (2023), is exemplified by the company's stock price, which reflects investors' perceptions of how effectively the company is managing its resources. Essentially, firm value is the amount a potential buyer would pay for the company, representing its market value. This value is crucial as it indicates shareholder prosperity through the appreciation of stock prices (Suriana et al., 2020). Corporate values, on the other hand, define the guiding principles for an organization, shaping its behavior and decision-making processes to foster innovation, productivity, and credibility, all of which are critical for maintaining a sustainable competitive advantage (Serrat, 2017).

As noted by Bhargava and Tandon (2023), firm value can be assessed by contrasting the market value with the book value of its assets, a measure known as Tobin's Q. Numerous factors, including debt policy, profitability, and company size, have a favorable impact on the firm value of manufacturing companies (Dipanala & Djoko Sampurno, 2018). Additionally, factors such as company age, funding, and debt policy can influence firm value, as stated by Rosmiasih and Ersyafdi (2023). Firm value serves as a reflection of investor perceptions, shareholder wealth, and the company's ability to innovate and grow. Understanding the firm value and the various factors that affect it is vital for stakeholders to make well-informed decisions. Tobin's Q is frequently used to calculate firm value.

Carbon disclosure

Carbon disclosure refers to the practice of companies revealing their carbon emissions and related information, as discussed by Jiang et al. (2023). This process involves companies voluntarily providing details about their carbon emissions in sustainability reports, showcasing environmental responsibility, and potentially aiding governmental emission reduction efforts, according to Maharani et al. (2022). By communicating their carbon management performance to stakeholders, companies offer timely information crucial for sustainability and accountability in the future (Guo & Pan, 2022). Research by Ma et al. (2023) indicates that corporate carbon information disclosure enhances brand value, suggesting that transparency can improve a company's reputation. Additionally, Yuliandhari et al. (2023) found that revealing carbon emissions positively impacts firm value, illustrating the financial advantages of environmental transparency.

Positive investor reactions to carbon emissions disclosure and environmental performance often influence market value (Houten & Wedari, 2023b). This is consistent with other studies that show a favorable effect of carbon disclosure on firm value, reported by Trimuliani & Febrianto (2023), Hardiyansah & Agustini (2021), Damas et al. (2021), Nisa (2023), Zuhrufiyah & Anggraeni (2019), Kurnia et al. (2020), Ma et al. (2023), Yuliandhari et al. (2023), Bahriansyah & Lestari Ginting (2022), and Cao et al. (2022). Studies focusing on Chinese companies demonstrate that high-quality carbon disclosure is positively linked to firm value. In environments where greenwashing is prevalent, this effect is temporarily enhanced, notably in non-heavy polluting companies and those operating in supportive legal settings (Cao et al., 2022). Therefore, the following hypothesis can be proposed:

H1: Carbon disclosure has a positive effect on firm value.

Institutional ownership

Institutional ownership refers to the portion of a company's shares owned by large entities like banks, insurance companies, mutual funds, or pension funds (Satria & Widyawati, 2023).

This type of ownership can greatly influence corporate behavior and investment decisions due to the significant stakes held by these institutions (Mehdi et al., 2018). Such ownership involves these corporate entities in decision-making processes and resource management, which helps reduce agency conflicts and improve the quality of earnings (Bukar et al., 2016). Research has shown that institutional ownership can enhance a company's financial performance by increasing oversight, sending positive signals to the market, and providing access to larger resources (Altania & Tanno, 2023). Various studies by Altania & Tanno (2023), Imaduddin et al. (2023), Liu (2023), Rahman et al. (2022a), Suleiman & Maharani (2022), and Suhandi (2021) have indicated a positive effect of institutional ownership on firm value.

An increase in institutional ownership often correlates with a rise in company valuation, reflecting a symbiotic relationship between the two (Liu, 2023). This ownership enhances firm value by increasing control and monitoring, aligning management interests with those of shareholders, and optimizing company operations (Rahman et al., 2022b). Building on previous research that highlights the positive influence of institutional ownership on firm value, it is predicted that institutional ownership will amplify the impact of carbon disclosure on firm value. Carbon disclosure acts as a signal to investors of the firm's commitment to environmental sustainability, while institutional ownership ensures strong managerial oversight that reduces information asymmetry. With institutional ownership overseeing carbon disclosures, there is likely to be an assurance of quality and significant impact, leading to the following hypothesis:

H2: Institutional ownership strengthens the effect of carbon disclosure on firm value.

Methodology

Research Method

This study represents a comprehensive quantitative research effort that employs secondary data meticulously gathered from the analysis of annual reports and sustainability reports of various companies. The research focuses on a carefully selected sample of firms operating in the energy sector, all of which are listed on the Indonesia Stock Exchange. The data encompasses a significant timeframe from 2019 to 2022, providing valuable insights into the performance and sustainability practices of these organizations. The sample was sourced from the official website, ensuring the reliability and accuracy of the information used in the study. The description of the sample selection is summarized in Table 1.

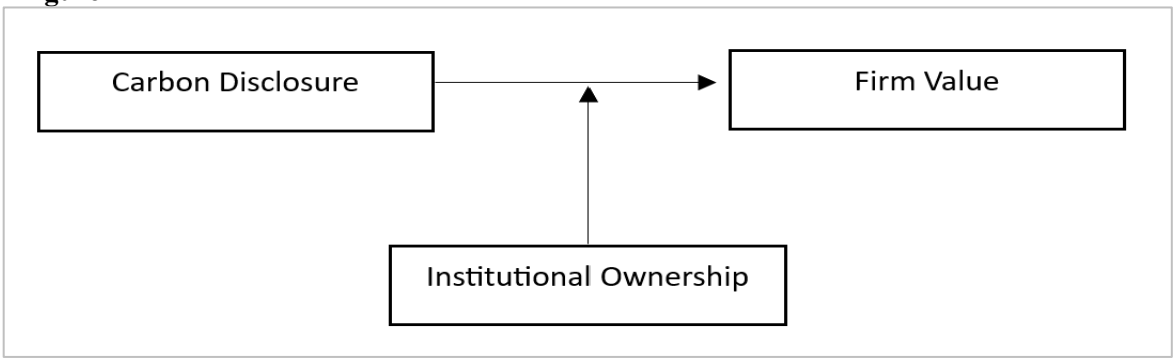
Table 1. Sample selection

No	Criteria	Amount
1	Energy sector companies listed on IDX as of December 2023	83
2	Energy sector companies listed on IDX after 2019	(21)
3	Energy sector companies listed on IDX before 2019	62
4	Energy sector companies without complete financial reports for 2019-2022	(12)
5	Energy sector companies without complete sustainability reports for 2019-2022	(30)
	Total Companies Used	20
	Observation Years	4
	Total Sample Used	80

Figure 1 illustrates the relationships among three key variables. Carbon disclosure serves as the independent variable, directly influencing the dependent variable, firm value. This relationship is represented by an arrow pointing from carbon disclosure to firm value. Additionally, institutional ownership acts as a moderating variable, influencing the strength or direction of the relationship between carbon disclosure and firm value. This moderation effect is depicted by an arrow originating from institutional ownership and interacting with the

primary relationship. The framework highlights that while carbon disclosure may impact firm value, the extent of this effect is contingent upon the level of institutional ownership within the energy sector.

Figure 1. Research model



In this research, the dependent variable is the firm value of each company included in the sample. According to Agnova & Muid (2015), firm value is defined as the price an interested buyer or investor would be willing to pay for a company's stock. This study uses Tobin's Q as the measure of firm value. As detailed by Trimuliani & Febrianto (2023), Tobin's Q is a ratio that assesses a company's market value against the replacement cost of its assets. The Q ratio is used to analyze various corporate phenomena, such as differences in investment and diversification strategies, the relationship between managerial stock ownership and firm value, the connection between managerial performance and tender results, and responses to investment opportunities and tender proposals. Moreover, Tobin's Q is crucial for exploring issues related to financing, dividend strategies, and corporate compensation. Tobin's Q can be defined as follows.

$$\text{TOBIN'SQ} = \frac{\text{MVE} + \text{DEBT}}{\text{TA}}$$

TOBINSQ = Firm Value (Y); MVE = Market Value of Equity (closing stock price × number of shares outstanding); DEBT= Total Company Debt; TA = Total Assets

The independent variable used is carbon disclosure. The measurement of carbon disclosure in this study utilizes the disclosure scale developed by Bae Choi et al. (2013). This scale is based on the information request sheet commonly sent by the Carbon Disclosure Project (CDP) to companies to assess the extent of their carbon disclosure. The disclosure scale (Bae Choi et al., 2013a) consists of 5 categories related to carbon emissions and climate change: 1) Climate change (risks and opportunities), 2) Greenhouse gas emissions, 3) Energy consumption, 4) Greenhouse gas reduction and cost, 5) Carbon emission accountability. Each category includes 18 indicators that companies must fulfill to achieve a high score on the disclosure scale. Each fulfilled indicator is calculated as an additional score, totaling and dividing by the maximum possible score. The formula for measuring carbon emission disclosure is as follows:

$$\text{CD}_{\text{it}} = \frac{\sum \text{X}_{\text{it}}}{\text{n}}$$

CD_{it} = Carbon emission disclosure index for the company *i* in year *t*
X_{it} = Total carbon emission disclosure score for company *i* in year *t*
n = Maximum possible carbon emission disclosure score

Institutional ownership is calculated as a percentage by dividing the shares owned by institutional investors (institutional ownership) by the total outstanding shares, with the following formula:

$$\text{INDCOM} = \frac{\text{Institutional Ownership}}{\text{Outstanding Share}} \times 100\%$$

Hypothesis testing uses panel data regression analysis by applying a regression model process to find the most optimal model among the three common models: the common model, the fixed effects model, and the random effects model, through the Chow test,

Hausman test, and Lagrange Multiplier test. The study uses the following model:

$$TOBIN'SQ_{it} = \alpha_{\circ} + \beta_1 CD_{it} + \beta_2 INDCOM_{it} + \beta_3 (CD_{it} * INDCOM_{it}) + \beta_4 SIZE_{it} + \beta_5 LIQ_{it} + \varepsilon_{it}$$

$TOBIN'SQ_{it}$= Firm value for company *i* in year *t*
CD_{it} = Carbon emission disclosure index for the company *i* in year *t*
KI_{it} = Institutional ownership for the company *i* in year *t*
$SIZE_{it}$ = Natural logarithm of the size of company *i* in year *t*
$LIKUID_{it}$ = Liquidity of company *i* in year *t*
$\alpha_{\circ}$ = Constant
ε_{it} = Error

Descriptive statistics

Based on the data in Table 2, each variable includes 80 data points. The dependent variable, firm value (TOBINSQ), has an average value of 1.284123. The firm value has a standard deviation of 0.9901213. This lower standard deviation indicates low variation between the maximum and minimum values of the firm value variable. The highest value for firm value is 5.995305, while the lowest is 0.4902212.

Table 2. Descriptive statistics

Variable	Mean	Std. dev.	Min	Max	Observations
TOBINSQ	1,284123	0,9901213	0,4902212	5,995305	80
CD	0,497917	0,29956	0	0,944444	80
INDCOM	0,793827	0,1628383	0,3504	0,98523	80
SIZE	23,0115	1,636553	19,71355	25,84793	80
LIQ	2,2305	1,679416	0,49	7,88	80

Carbon disclosure has an average value of 0.497917 and a standard deviation of 0.2995600. This relatively low standard deviation indicates minimal variation between the highest and lowest values of the carbon disclosure variable, suggesting consistent reporting practices. Notably, the minimum value is 0, while the maximum reaches an impressive 0.944444. According to calculations based on research conducted by Bae Choi et al. (2013), a value approaching 1 signifies superior carbon disclosure performance, reflecting better environmental accountability.

Institutional ownership exhibits an intriguing pattern, with an average value of 0.793827 and a standard deviation of 0.1628383. The relatively small standard deviation suggests minimal variation in institutional ownership, indicating that the values are closely clustered. Specifically, the minimum recorded value is 0.3504, while the maximum value remains unspecified, hinting at a relatively stable range of institutional participation within this context.

Firm size is quantified by taking the natural logarithm of the total value of all assets owned by the company. This variable has a mean value of 23.0115, with its standard deviation at 1.636553. Since the standard deviation is significantly lower than the average, this indicates that there is minimal fluctuation or variation in the firm size data, suggesting that most companies are clustered closely around the mean value. The smallest recorded firm size is 19.71355, while the largest firm size reaches a maximum of 25,84793

The average growth in liquidity or profit stands at 2.2305, accompanied by a standard deviation of 1.679416. This relatively small standard deviation, which is less than the average, suggests that the liquidity values are tightly clustered, indicating a low level of variation between the highest and lowest observed values. Specifically, the minimum recorded value of the liquidity variable is 0.49, while the maximum reaches 7.88, demonstrating the range within which the liquidity fluctuates.

Multiple linear regression test

Based on the information presented in Table 3, the adjusted R-squared value obtained in the multiple linear regression analysis is 0.122853. This statistic reveals that the combination of all the independent and control variables examined significantly impacts the dependent variable, which in this context is the firm's value,

accounting for an influence of approximately 12.29 percent. Furthermore, independent variables that were not included in this analysis appear to exert an even more substantial effect, influencing the firm's value by a notable 69.84 percent.

Table 3. Summary of hypothesis testing results

VAR	Coeff.	t-stat.	Prob.	
Cons	8,510683	2,840378	0,0029	***
CD	-0,00038	-2,41373	0,00915	***
INDCOM	-0,87586	-0,7119	0,2394	
CD* INDCOM	4,179541	1,942121	0,02795	**
SIZE	-0,00269	-2,09854	0,01965	**
LIQ	-0,05852	-1,01146	0,15755	
R-squared	0,178369			
Adjusted R-squared	0,122853			
Prob>F	0,00111			

Note: *significant at the 10% level, **significant at the 5% level, *** at the 1% level.

Result and discussion

The effect of carbon disclosure on firm value

The results obtained from testing the effect of carbon disclosure on firm value indicate that carbon disclosure negatively affects firm value, meaning the assumption of H1 is rejected. This finding is consistent with the studies by Hadiwibowo et al. (2023), Choi et al. (2021), Lee et al. (2015), Muhammad & Aryani (2021), dan Firmansyah et al. (2021) but does not align with the research of (Trimuliani & Febrianto, 2023) (Hardiyansah & Agustini, 2021), (Damas et al., 2021); (Nisa, 2023) (Zuhrufiyah & Anggraeni, 2019), (Kurnia et al., 2020) (Ma et al., 2023) (Yuliandhari et al., 2023) (Bahriansyah & Lestari Ginting, 2022) and (Cao et al., 2022). These findings suggest that investors are concerned that extensive carbon disclosure may worsen the company's prospects (Firmansyah et al., 2021), leading to a negative response from investors towards substantial carbon disclosure. Efforts by companies to reduce carbon emissions often involve additional costs, which are perceived as a threat to profits or stakeholder priorities (Hadiwibowo et al., 2023). Consequently, since excessive spending on carbon disclosure does not provide significant short-term benefits to investors, firms with extensive carbon disclosure are perceived as having lower value in the eyes of investors.

This investor concern stems from the general public's lack of environmental awareness. Investors view the information provided by companies regarding carbon disclosure as undesirable, as the sector examined in this study is the energy sector, which produces more carbon and environmental damage. The energy sector is known for its high carbon emissions. Carbon disclosure implies a need to reduce the impact of carbon emissions, which could mean allocating part of the dividend to address these issues, thus affecting investors. This sentiment resonates in Indonesia, where carbon disclosure does not significantly impact market value, as investors prioritize environmental management outcomes over detailed carbon information (Houten & Wedari, 2023b). Investors' negative perception of carbon disclosure is also due to regulatory uncertainty and government policies related to carbon emission management. This uncertainty risks investors, ultimately leading to a decline in firm value. This approach could lead to a more favorable market response and enhance firm value by aligning investor interests with environmental sustainability goals.

The role of institutional ownership in strengthening the positive effect of carbon disclosure on firm value

The test results indicate that institutional ownership did not strengthen the positive effect on firm value, resulting in the rejection of hypothesis H2. However, the test results show that institutional ownership successfully

reassures the market by compensating for energy sector companies' negative perception of carbon disclosure. It demonstrates that institutional ownership can strengthen the regulatory effect in enhancing carbon emission disclosure (Kiswanto et al., 2023). As a result, investors' perspectives on carbon disclosure shifted in a more positive direction. Investors believe institutional ownership can make carbon disclosure more reliable and reflect a company's true value. Institutional ownership reassures investors of oversight by institutions over companies in the energy sector, which helps to enhance firm value.

Institutional ownership was found to be capable of mitigating this negative effect. Large institutions often have the resources and influence to help companies manage carbon disclosure more efficiently. They can facilitate access to more effective environmentally-friendly technologies, provide financial support for green projects, and encourage strategic internal policies focused on long-term sustainability. It can make carbon disclosure appear as a positive strategic move rather than a financial burden. Additionally, institutional shareholders significantly influence market perception. Their presence can enhance other investors' confidence in the company's ability to manage environmental risks and capitalize on sustainable business opportunities. Large institutions tend to have a long-term perspective and may view environmental initiatives as strategic investments that will yield future benefits, alleviating short-term negative impacts perceived by other investors.

Long-term institutional investors are better positioned to recognize the long-term value of environmental initiatives and carbon disclosure. According to Kałdoński & Jewartowski (2022), long-term institutional investors play a crucial role in improving corporate governance and performance, positively affecting financial decision-making and payout policies. They understand that efforts to reduce carbon emissions and transition to a low-carbon economy are not merely obligations or burdens but strategic investments that can provide significant future advantages. Institutional investors recognize that carbon reduction efforts and the shift to a low-carbon economy can enhance the company's competitiveness and profitability in the long run. This is due to increasingly strict environmental regulations, rising consumer demand for eco-friendly products and services, and the potential for developing energy-efficient technologies. Long-term institutional investors are more tolerant of potential short-term negative impacts of carbon disclosure, such as compliance costs or perceived higher risk. They focus on greater long-term benefits, such as improved corporate reputation, access to cheaper capital, and stronger appeal to sustainability-focused investors.

Conclusion and limitation

In the context of energy sector companies listed on the Indonesia Stock Exchange, this study found that carbon disclosure has a negative impact on firm value. This means that the higher the carbon disclosure by a company, the lower the firm value is perceived by investors. Efforts to reduce carbon emissions often require additional costs, which can reduce the company's profitability and be seen as unfavorable by investors. When incorporating institutional ownership, it was found that institutional ownership does not strengthen the positive influence of firm value on carbon disclosure. However, institutional ownership can help increase investor confidence in carbon disclosure; in this study, institutional ownership compensated for investors' negative perceptions of carbon disclosure. Institutional investors have the resources and influence to assist companies in better managing carbon disclosure, thereby improving the quality of information and investor perception.

The limitations of this study stem from the methodology used to assess carbon disclosure, utilizing an index developed by Bae Choi et al. (2013b) based on data from a 2009 questionnaire iteration from the Carbon Disclosure Project (CDP). In this study, the scoring system relies on 18 indicators presented in the index by Bae Choi et al. (2013b), where a perfect score of 18 indicates optimal performance. It is important to note that the sample for this study exclusively consists of energy sector companies listed on the Indonesia Stock Exchange, which limits the generalizability of the findings to other industries. Future research efforts could enhance the robustness of the results by including a broader dataset and extending the research period. This study suggests that the Financial Services Authority (Otoritas Jasa Keuangan) and the Indonesian government

establish standards and regulations for carbon disclosure to improve the quality of carbon disclosure and reduce the uncertainty risk investors bear.

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