International Journal of Economics, Business and Management Research

Vol. 9, No.07; 2025

ISSN: 2456-7760

The Influence of Carbon Emission, Green Accounting and Environmental Performance on Firm Value

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doi.org/10.51505/IJEBMR.2025.9720 URL: https://doi.org/10.51505/IJEBMR.2025.9720

Received: July 08, 2025 Accepted: July 12, 2025 Online Published: July 20, 2025

Abstract
The purpose of this research is to obtain empirical evidence on the factors influencing carbon emissions, green accounting, and environmental performance on firm value. The population used in this study consists of all consumer non-cyclical and cyclical companies listed on the Indonesia Stock Exchange from 2021 to 2024, and purposive sampling is used as the sampling method. With this method, it was found that ninety-six (96) consumer non-cyclical and cyclical companies met the sampling criteria and were selected as the sample, providing a total of 180 data points. This research utilizes multiple regression analysis to analyze the data. The results obtained from multiple regression analysis show that carbon emissions, green accounting, and environmental performance do not significantly affect firm value.

Keywords: firm value, carbon emission, green accounting, and environmental performance.

1. Introduction

The increasing level of public scrutiny over corporate actions that can harm social welfare and the widening consequences of climate change have triggered a growing interest in the academic literature on corporate environmental, social, and governance (ESG) performance in general. In recent years, many companies have realized the importance of implementing social responsibility as part of their business strategy. Measures related to a company's success are now increasingly broad; previously, companies were viewed only from an economic aspect, but now investors also prioritize companies that are responsible in their social and environmental aspects (Halkos & Nomikos, 2021). For these reasons, companies are now beginning to pay attention to achieving sustainable growth through responsibly conducted operational activities. Sustainability is a balance between profit-people-planet, where companies must be responsible for both the positive and negative impacts on economic, social, and environmental aspects.

Investors and other stakeholder groups are increasingly aware of the important role of companies in climate change. There has been a significant shift in stakeholder expectations for companies to demonstrate greater transparency and accountability for their environmental impact. Climate change and global warming are global issues that are receiving increasingly serious attention in

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various parts of the world. One of the main factors contributing to global warming is the carbon emissions produced from industrial and corporate activities. Carbon emissions not only have a negative impact on the environment, but have also become a focus for stakeholders, including investors, consumers, and governments.

Concurrently, the practice of green accounting, also known as environmental accounting, has emerged as an important framework for integrating environmental costs into traditional financial reporting. Green accounting focuses on accounting and management issues related to environmental and social impacts, regulations and restrictions, safety, and the production and supply of environmentally friendly and economically viable energy (Amran & Devi, 2008). The main role of green accounting is to address social and environmental issues. The Program for Pollution Control, Evaluation, and Rating (PROPER) facilitates the implementation of business environmental performance in Indonesia. The Ministry of Environment uses PROPER to evaluate and rank corporate compliance in carrying outits environmental performance. Good environmental performance can provide external benefits, such as attracting investor attention and impacting financial success. Disclosure of environmental performance is very important for businesses to demonstrate their existence and participation in addressing environmental issues. This research will explain the relationship between carbon emissions, green accounting, and environmental performance on firm value.

2. Literature Review

2.1 Legitimacy Theory

Legitimacy theory is one of the most frequently cited theories in accounting studies to develop the theory of social and environmental responsibility disclosure (Badjuri Achmad, 2021). By using legitimacy theory, which focuses on the company's relationship with society and its environment, the company will continuously make improvements and prevent environmental problems that would impact its sustainability.

Legitimacy theory explains that if there is a mismatch between the value system within a company and the value system of the society, especially where the company operates (a legitimacy gap), the company will lose public recognition, and its survival will be threatened (Sulistiawati & Dirgantari, 2016). Corporate concern for the environment becomes very important and can increase firm value, where information regarding environmental costs is disclosed to obtain legitimacy from the public and attract public attention, including investors (Mutamimah & Indriastuti, 2023).

This can be achieved through voluntary disclosures reported in the company's annual report or sustainability report. By providing information related to the company's operational activities that impact the environment, a company that has obtained legitimacy tends to enhance its image and reputation in the public eye, which will impact the overall value of the company (Alfayerds & Setiawan, 2021).

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2.2 Shareholder Theory

According to stakeholder theory, companies have a social obligation to consider the interests of all stakeholders affected by their operations. Stakeholder theory highlights the interconnectedness between a business and various entities such as consumers, suppliers, investors, the community, and other interested parties.

This theory suggests that organizations will voluntarily choose to disclose information about their environmental, social, and intellectual performance, beyond their mandatory requirements, to meet the actual or perceived expectations of their stakeholders. The measures related to a company's success are now increasingly broad; previously, companies were viewed only from an economic aspect, but now investors also prioritize companies that are responsible in their social and environmental aspects (Halkos & Nomikos, 2021).

When companies act in accordance with societal expectations and involve stakeholders in decision-making, they tend to gain higher public trust. This is important because a company's value is often influenced by the perceptions of the public and its stakeholders. Gaining legitimacy and meeting stakeholder needs will enhance reputation and investment appeal, ultimately leading to an increase in firm value.

2.3 Firm Value

Firm value is a meaningful representation of a company's condition, where a good or bad firm value reflects the good or bad condition of the company. Firm value is one of the most significant factors for creditors and investors. Investors will consider the business's value when deciding whether to provide a loan. Firm value can also be interpreted as the price a potential buyer is willing to pay if the company is sold.

A company's stock value is influenced by several factors, such as green accounting through environmental disclosure, the company's profitability ratio, and corporate social responsibility disclosure (Dewi & Edward Narayana, 2020). Besides desiring profit, every company also aims to provide the best in terms of corporate reputation and welfare for all its members and shareholders. Increasing firm value is the most important part of the expectations of members and shareholders because the higher the firm value, the higher the level of welfare for members and shareholders (Handayani & Kristianti Maharani, 2021).

Competition in the business world is becoming increasingly tight, requiring companies to constantly innovate to increase firm value for the sake of the company's survival. Financial conditions alone are not sufficient to ensure the sustainable growth of firm value; companies must also consider social and environmental dimensions to prevent rejection from the local community.

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2.4 Carbon Emissions

Carbon emissions/greenhouse gases include natural emissions and industrial emissions (Martinez, 2005). Natural carbon emissions are a natural cycle that can be neutralized by plants and the ocean. Natural carbon emissions are beneficial for keeping the Earth's temperature warm at around 6°C. Industrial carbon emissions originate from human activities that do not consider environmental conditions, thus making carbon dioxide more concentrated and unable to be absorbed by nature.

Global warming and climate change are global problems faced by companies (Griffiths, 2007). The main reason for the problem of climate change comes from carbon emissions produced by business activities. Significant total carbon emissions have the potential to trigger climate change (Ongsakul & Sen, 2019). Because controlling carbon emissions can be a fundamental aspect of ensuring business sustainability, companies tend to develop organizational structures that can control carbon emissions, evaluate carbon emission risks, and resolve carbon emission issues.
Based on ISO 14001:2015 (International Organization for Standardization [ISO], 2015), carbon emissions refer to the measurable results of a company's management of its carbon aspects related to its activities, processes, products, services, and systems. Carbon emission disclosure is necessary to manage emissions from industry. Carbon emission disclosure can be presented in an annual report or a sustainability report. Carbon emission disclosure can be mandatory or voluntary. Mandatory carbon emission disclosure stems from regulations that require companies to disclose information about their carbon emissions periodically. Carbon emission disclosure helps investors to evaluate efforts to reduce carbon emissions and combat climate change.

2.5 Green Accounting

The term "green accounting" refers to a new field of bookkeeping concerned with the identification, categorization, measurement, calculation, estimation, recording, and disclosure of information about the environment. Green accounting is the practice of including information about a company's environmental impact in its financial statements. Information about the environment that is useful for business decision-making is collected and disseminated through the discipline of environmental accounting (Sebastian, 2022). Stakeholders, including governments, banks, and financial institutions, receive updated information on a company's efforts to protect the environment (Sebastian, 2022). This refers to a form of corporate social and environmental responsibility that supports the assessment of environmental performance.

Because human (societal) and corporate behavior have a cause-and-effect relationship with the natural world, social accounting, financial/economic accounting, and environmental accounting are all part of green accounting. This practice not only improves regulatory compliance and stakeholder relations but also attracts environmentally conscious investors and customers, which can ultimately lead to a more favorable market valuation. By integrating these practices, companies can reduce environmental risks, improve operational efficiency, and promote long-term sustainability.

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Companies can enhance their environmental performance and firm value by implementing robust green accounting practices. The Program for Corporate Performance Rating in Environmental Management (PROPER) supports the implementation of business environmental performance in Indonesia. The Ministry of Environment uses PROPER to evaluate and rank a company's compliance in carrying out its environmental performance.

2.6 Environmental Performance

The disclosure of environmental performance is crucial for companies to demonstrate their existence and participation in addressing environmental issues. Given the increasing number of negative impacts caused by companies, the public demands that these negative impacts be controlled so they do not escalate. Customers and the community are used as feedback to change a company's approach to environmental conservation or management, as well as to assess its environmental performance. Companies must demonstrate their existence and involvement in handling environmental problems as a form of moral obligation to the environment in which they operate, in accordance with established regulatory theory.

Environmental performance is a mechanism for companies to voluntarily integrate environmental concerns into their operations and interactions with stakeholders, which exceeds the organization's legal responsibilities (Wu & Lin, 2022). The disclosure of environmental performance as a form of corporate responsibility is expected to add value to the company and enhance its sustainability (Wu & Lin, 2022). The government, through the Ministry of Environment, has even established a program called PROPER as a form of environmental compliance for companies in Indonesia.

3. Hypothesis Development

3.1 Carbon Emissions and Firm Value

Growing public concern over the issue of climate change creates new pressure for companies to disclose information about their operational activities that can affect the environment. Social and environmental disclosures will impact a company's reputation. By making environmental disclosures, investors will perceive it as good news for the company's sustainability and will be more interested in investing in the company (Hardiyansah et al., 2021). Carbon emission disclosure can serve as proof that a company has fulfilled its responsibilities. According to Kurnia (2021), carbon emission disclosure will create value and a competitive advantage for the company.

According to the argument presented, Matsumuraindicates that carbon disclosureon hurts firm value (Matsumura Mae, 2014). First, carbon emissions have the characteristics of externalities. How companies will internalize the cost of carbon emissions in the future is still uncertain. Consequently, the market is likely to reflect this uncertainty, which may affect future liabilities related to carbon emissions. Second, if the capital market considers Voluntary Carbon Disclosure Information (VCDI) to be less reliable, it may ignore this information when assessing firm value.

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Companies with higher carbon emissions experience lower corporate performance, as the market reacts negatively and companies need to incur more costs for their environmental expenditures.

H1: Carbon emission has significant effect on firm value

3.2 Green Accounting and Firm Value

The implementation of green accounting indicates that a company has concern for the environment, which is realized through the recording of environmental costs in the company's financial statements (Sapulette & Limba, 2021). Green accounting aims to support environmental preservation activities by companies or other organizations, in line with the interests of those companies and organizations. In other words, the greater the application of green accounting, the higher the firm's value, and conversely, if green accounting decreases, the firm's value will also decline. The application of green accounting also helps companies maintain legitimacy, as legitimacy theory explains that if there is a discrepancy between a company's value system and society's value system (a legitimacy gap), the company risks losing legitimacy, which can threaten its survival (Sulistiawati & Dirgantari, 2016).

The implementation of green accounting not only helps companies address the incongruity between corporate and societal value systems but also demonstrates the company's commitment to sustainability through the recognition, measurement, and reporting of environmental costs, such as contamination analysis, product recycling, waste management, maintenance of polluting machinery, and restoration of polluted waterways. These actions send a positive signal to investors that the company is environmentally responsible, making their investments appear strong (Alexander Nico, 2023) and protected from regulatory and public scrutiny. By incorporating environmental costs and benefits into economic decision-making, green accounting can enhance the company's image, which in turn increases firm value.

According to Sapulette & Limba (2021), green accounting has no effect on firm value. This suggests that the charging and disclosure of environmental costs by companies have not yet provided confidence to investors or consumers in the valuation of a company, thus not affecting the company's sales levels and profits. Furthermore, environmental activities undertaken by companies have become part of corporate social responsibility activity reports and also costs for corporate CSR, so the presence or absence of environmental cost disclosure in the company's income statement will not affect firm value.

Higher disclosure and reporting of environmental costs, which are part of green accounting, can be seen as an additional burden by investors. Consequently, environmental costs recognized in financial statements may reduce investment appeal because they are perceived as decreasing the company's profitability, thereby negatively impacting firm value.

H2: Green accounting has significant effect on firm value

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3.3 Environmental Performance and Firm Value

Environmental performance reflects how a company successfully manages its environmental impact through environmentally responsible policies and practices. Good environmental performance can strengthen firm value because a company with good environmental performance tends to be more trusted by investors, which ultimately increases the company's appeal. Based on legitimacy theory, good environmental performance can strengthen firm value because it increases public and investor confidence in the company's commitment to sustainability.

There is a possibility that environmental performance is not sufficient to be a considered aspect in the valuation of a company without being supported by concrete and consistent environmental performance. Furthermore, for more conservative investors, an improvement in environmental performance may not be the primary reason for their investment decisions. There is also no evidence to support a direct impact of environmental performance on firm value. Therefore, this hypothesis states that environmental performance does not have a significant effect on firm value, because firm value is often more strongly influenced by financial and operational factors than by non-financial environmental factors.

H3: Environmental performance has significant effect on firm value

3.4 Research Model

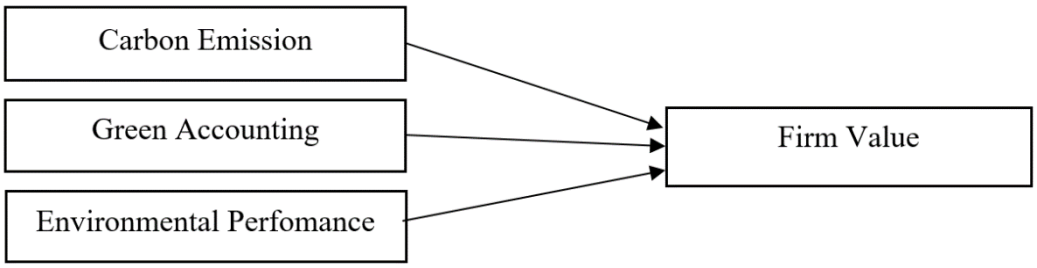

Figure 1. Research Model

4. Method and Result

4.1 Research Method

This research focuses on consumer non-cyclical and cyclical companies listed on the Indonesia Stock Exchange (IDX) during the research period from 2021 to 2023. This study uses purposive sampling to select its sample. Purposive sampling is a method that involves selecting a data sample based on specific criteria established by the researcher. The unit of analysis in this research is the organization (consumer non-cyclical and cyclical companies).

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Table 1
Sample Selection Procedures

Criteria Description	Total Companies	Total Data
Consumer Non-cyclical and Cyclical Companies Consistently Listed on the Indonesia Stock Exchange (IDX) during 2021-2024	45	180
Consumer non-cyclical and cyclical companies that have PROPER certification for the years 2021-2024.	(9)	(36)
Consumer non-cyclical and cyclical companies that have/report environmental costs for the years 2021-2024.	(5)	(20)
Consumer non-cyclical and cyclical companies that meet at least 1 of the 18 carbon emission identification criteria for the years 2021-2024.	(6)	(24)
Number of Samples Firms Used	25	100
Data Outlier	(1)	(4)
Number of Samples Firms Used After Outlier	24	96

4.2 Research Variable

4.2.1 Firm Value

Firm value is an important concept for investors because it serves as an indicator for the market to assess the company as a whole (Riana Sitawati, 2024). In this research, firm value is measured using Tobin's Q. The Tobin's Q ratio is often used as a measure of a company's intangible assets or intellectual capital, because in the presence of intellectual capital, the market often assigns additional value to the company.

$$\text{Tobin's Q} = \frac{(\text{ME}+\text{DEBT})}{\text{TA}}$$

where:
Tobin's Q = Firm Value
ME = Total Equity (Number of Shares x Price)
DEBT = Total Debt
TA = Total Assets

4.2.2 Carbon Emission

Carbon emission disclosure is the presentation and disclosure of environmentally friendly activities as a form of communicative legitimacy to manage threats to legitimacy and protect firm value. Carbon emission disclosure is measured using the content analysis method, where the content of documents and texts in the annual report or sustainability report is calculated based on a specific index. The carbon emission disclosure index includes 18 items from 5 disclosure

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categories: 2 items on climate change information, 7 items on greenhouse gas information, 4 items on energy consumption information, 3 items on reduction and cost information, and 2 items on carbon emission accounting (Han et al., 2023).

4.2.3 Green Accounting

Green accounting is a part of environmental accounting that integrates environmental benefits and costs into decision-making. The implementation of green accounting is expected to protect the environment as part of conservation efforts. Green accounting includes the collection of production costs, inventory, waste, and performance data for planning, development, evaluation, and control of business decisions (May et al., 2023). The measurement of green accounting can be seen from the company's environmental performance (Hamidi, 2019). Environmental performance is the company's performance in creating a good (green) environment. A company's environmental performance is measured based on the achievements of the company, namely by participating in the PROPER program. To measure managerial ownership, a dummy variable with a ratio scale is used, following the methodology described by (Mutamimah & Indriastuti, 2023). A content analysis of published reports is conducted; a score of 1 is given if the company has components related to environmental costs, and 0 if it does not.

4.2.4 Environmental Performance

Environmental performance is the company's performance in creating a good environment (Wu & Lin, 2022). This environmental performance is also the company's performance in creating a green environment (Gianni Guastella, 2022). Environmental performance is seen as a form of corporate social responsibility. This research uses the PROPER rating launched by the Ministry of Environment. The assessment of environmental performance through the PROPER program is carried out by giving scores from a rating proxied by numbers 1 to 5 (Deswanto, 2018).

In this study, hypothesis testing was conducted using multiple regression analysis to analyze the relationship between the independent variables, namely Carbon Emission, Green Accounting, and Environmental Performance, and the dependent variable, namely firm value.

$$FV = \alpha + \beta 1\ CE + \beta 2\ GA + \beta 3\ EP + \varepsilon$$

where:

FV = Firm Value
α = Constant
β1-β3 = Regression constant
CE = Carbon Emission
GA = Green Accounting
EP = Environmental Performance
ε = Error

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4.3 Result

4.3.1 Descriptive Statistic

Table 2 Descriptive Statistic

	N	Minimum	Maximum	Mean	Std. Deviation
FV	96	1.40526767	4790.19764100	56.5568074	479.023695
CE	96	1	17	9.62	3.643
GA	96	50000000.00	376398000000.00	24166457698.56	62767210249.62
EP	96	2	4	2.97	0.413

Table 4.2 shows that the total data being observed by researcher is 96. Carbon emission (CE) has a minimum value of 1, which belongs to Budi Starch & Sweetener Tbk. in 2021, 2022, and 2023, while the maximum value of carbon emissions is 17, which belongs to Sawit Sumbermas Sarana Tbk. in 2021, 2022, and 2023. Carbon emission has a mean value of 9.62 and a standard deviation value of 3.643.

Green accounting (GA) has a minimum value of 50000000.00, which belongs to Campina Ice Cream Industry Tbk. in 2023, while the maximum value of green accounting is 376398000000.00 which belongs to Wilmar Cahaya Indonesia Tbk. in 2021. Green accounting has a mean value of 24166457698.56 and a standard deviation value of 62767210249.62.

Environmental performance (EP) has a minimum value of 2 which belongs to Sumber Alfaria Trijaya Tbk. in 2021, 2022, 2023 and 2024, while the maximum value of environmental performance is 4 which belongs to Sariguna Primatirta Tbk. in 2021, 2022, 2023 and 2024. Environmental performance has a mean value of 2.97 and a standard deviation value of 0.413.

4.3.2 Normality Test Before Outlier

Table 3 Normality Test Before Outlier

	Unstandardized Residual
N	100
Asymp. Sig (2-tailed)	0.000

The research results show an Asymp. Sig. (2-tailed) value of 0.000. This value is less than 0.05, which means the data is not normally distributed. Therefore, the researcher will use an outlier test to make the data normally distributed.

4.3.3 Normality Test After Outlier

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Table 4 Normality Test After Outlier

	Unstandardized Residual
N	96
Asymp. Sig (2-tailed)	0.143

The results of the normality test after removing outliers show an Asymp. Sig. (2-tailed) value of 0.143, which is greater than 0.05. This means the data is now normally distributed. Therefore, the researcher will proceed using the data after removing outliers for subsequent tests.

4.3.4 Multicolinearity Test

Table 5 Multicolinearity Test

Variable	Colinearity Test		Conclusion
	Tolarance	VIF	
CE	0.993	1.007	No Multicolinearity
GA	0.998	1.002	No Multicolinearity
EP	0.991	1.009	No Multicolinearity

The results of the multicollinearity test show that the three independent variables in this study have tolerance values above 0.1 and VIF values below 10. This indicates that multicollinearity is not present and the data are suitable for use in the research.

4.3.5 Heteroscedasticity Test

Table 6 Heteroscedasticity Test

Variable	Significance	Conclusion
CE	0.732	No Heteroscedasticity
GA	0.535	No Heteroscedasticity
EP	0.917	No Heteroscedasticity

The dependent variable and independent variables have a significance value greater than 0.05, which means there are no heteroskedasticity problems and the variance from one residual observation to another is the same in the regression model.

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4.3.6 Autocorelation Test

Table 7 Autocorelation Test

Variable	Significance	Conclusion
RES_2	0.201	No Autocorelation

The table above shows the results of the autocorrelation test using the Godfrey test. The residual value (RES_2) has a significance value of 0.201; because this value is greater than the alpha value (0.05), it can be concluded that there is no autocorrelation problem, and therefore the data is suitable for use.

4.3.7 R Test

Table 8 R Test

Model	R
1	0,066

The table above shows an R value of 0.066. This means there is a weak and positive relationship between the independent variables (carbon emission, green accounting, and environmental performance) and the dependent variable (firm value).

4.3.8 F Test

Table 9 F Test

Model	F	Sig.
Regression	0.119	0,948

The F-test result shows that the regression model has a significance value of 0.948, which is higher than 0.05, meaning that the regression model is not fit for this research.

4.3.8 t Test

Table 9 t-Test

Variable	Coefficients	Sig	Conclusion
Constant	-0.254	0.800	
CE	-0.554	0.581	No Influence
GA	0.172	0.864	No Influence
EP	-0.087	0.931	No Influence

Carbon Emission (CE) has a significance value of 0.581, which is higher than 0.01, 0.05, or 0.10. HA1 is rejected, which means that carbon emission has no effect on firm value. This is because carbon emission disclosure implementation is costly and leads to higher expenses and lower cash

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flow. The capital market considers carbon emission disclosure to be less reliable information, so they may ignore this information when assessing firm value. This result aligns with prior research (Kurnia et al., 2021).

Green Accounting (GA) has a significance value of 0.864, which is higher than 0.01, 0.05, or 0.10. HA2 is rejected, meaning that green accounting has no effect on firm value. This is because the recognition and disclosure of environmental costs by the company have not yet provided confidence to investors or consumers in their assessment of the company, and thus do not affect the company's sales and profit levels. Furthermore, environmental activities undertaken by the company are already part of the corporate social responsibility activities report and CSR costs, so the presence or absence of environmental cost disclosure in the company's income statement will not affect firm value. This result aligns with prior research (Sapulette & Limba, 2021).
Environmental Performance (EP) has a significance value of 0.931, which is higher than 0.01, 0.05, or 0.10. HA3 is rejected, which means that environmental performance has no effect on firm value. There is a possibility that environmental performance is not sufficient to be a considered aspect in the valuation of a company without being supported by concrete and consistent environmental performance. Additionally, for more conservative investors, an improvement in environmental performance may not be the primary reason for their investment decisions. There is also no evidence to support a direct impact of environmental performance on firm value. Therefore, this hypothesis states that green accounting has no significant effect on firm value, as firm value is often more strongly influenced by financial and operational factors than by non-financial environmental factors. This result aligns with prior research (May et al., 2023).

5. Conclusion and limitation

This research concludes that carbon emission, green accounting and environmental performance have no significant effect on the firm value of consumer cyclical and non-cyclical companies in Indonesia from 2021-2024.

5.1 Conclusion

Based on the data analysis, the following conclusions were drawn:

- Carbon emission has no significant relationship with firm value. This suggests that the implementation of carbon emission disclosure is costly, leading to higher expenses and lower cash flow, without being positively valued by the market.
- Green accounting has no significant relationship with firm value. This indicates that the recognition and disclosure of environmental costs by companies have not yet provided confidence to investors or consumers in their assessment of a company, and thus do not affect sales levels or profits.
- Environmental performance has no significant relationship with firm value. This suggests that for more conservative investors, an improvement in environmental performance may not be a primary reason for their investment decisions. There is also no evidence to support a direct impact of environmental performance on firm value.

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5.2 Research Limitations

The limitations of this research are as follows:

- Among the cyclical and non-cyclical companies studied, some have not yet fully disclosed their implementation of carbon emission, green accounting, and environmental performance measures.
- Of the 45 cyclical and non-cyclical companies listed on the Indonesia Stock Exchange during the 2021-2024 period, several were excluded because:
  - 9 companies did not participate in the PROPER rating program.
  - 5 companies did not report environmental costs.
  - 6 companies did not meet at least 1 of the 18 carbon emission disclosure criteria.

5.3 Suggestions for Future Research

Based on the findings and limitations, future research could:

- Continue to examine carbon emission disclosure as standards and regulations evolve.
- Utilize samples from other industries with more direct environmental consequences, such as the mining industry.
- Use a broader sample population to enhance the generalizability of the findings.
- Incorporate other variables that may influence firm value, such as corporate governance mechanisms or media exposure.

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