

THE EFFECT OF CARBON PERFORMANCE AND CARBON EMISSION DISCLOSURE ON FIRM PERFORMANCE



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Abstract

This study aims to examine the effect of carbon performance and carbon emission disclosure on firm performance. Firm performance is measured using Return on Assets (ROA), while carbon performance is measured based on carbon intensity. Carbon emission disclosure is measured using a disclosure index referring to the Carbon Disclosure Project (CDP) checklist developed by Choi et al. (2013). This study applies a quantitative approach using secondary data obtained from annual reports and sustainability reports of Consumer Non-Cyclicals companies listed on the Indonesia Stock Exchange during the 2023-2024 period. The sample was selected using a purposive sampling method, resulting in 242 firm-year observations. The data were analyzed using panel data regression with EViews 12. The results show that carbon performance does not have a positive effect on firm performance. In contrast, carbon emission disclosure has a positive and significant effect on firm performance. In addition, leverage as a control variable has a negative and significant effect on firm performance. These findings indicate that corporate transparency in disclosing carbon emission information can strengthen stakeholder trust and support the improvement of firm performance. This study contributes to the development of environmental accounting literature and provides practical implications for companies, investors, and regulators in encouraging more transparent and accountable carbon emission disclosure practices.

Keywords: Carbon Performance, Carbon Emission Disclosure, Firm Performance, ROA, Leverage

INTRODUCTION

Companies operate in an economic environment that continues to change and develop rapidly, particularly in the increasingly advanced era of globalization. To compete effectively, companies need optimal business management. In evaluating their progress and development, companies require tools that provide accurate, reliable, relevant, and concise information for stakeholders (Aprilia, 2022). The main objective of a company is to achieve maximum profit and maximize firm value (Khairunnisa, 2019). Therefore, every company is required to manage its performance properly and utilize its resources effectively and efficiently, both in the short term and in the long term. Firm performance reflects how a company conducts its business activities and what has been achieved from those activities. Firm performance, which is commonly reflected in profit, is also an indicator of corporate success from a financial perspective. Companies evaluate the results obtained, determine future strategic directions, and assess their achievements as an effort to maintain business sustainability. Thus, firm performance can also be viewed as one form of corporate responsibility (Azis, 2022).

Firm performance can be measured using several financial ratios (Nur & Woestho, 2022). Financial ratios are analytical tools used to assess company performance based on comparisons of financial data presented in financial statements. The financial ratios commonly used to measure and evaluate firm performance consist of profitability, liquidity, solvency, and activity ratios. This study uses profitability ratios because profitability is one of the indicators of long-term financial performance that measures a company's ability to generate profit and reflects the effectiveness of management in carrying out operational activities (Asjuwita & Agustin, 2020). The profitability ratio used in this study is Return on Assets (ROA).

Increasingly intense industrial competition encourages business actors to improve their performance in order to maintain business continuity and achieve the company's objective of maximizing profit (Murniati & Sovita, 2021). However, in pursuing this objective, companies may ignore the environmental impacts generated by their business activities (Rosaline & Wuryani, 2020). Companies should not focus solely on performance measured by profit, but must also consider the environmental impacts caused by their activities.

This study is motivated by the increasing occurrence of natural disasters, climate change, and environmental problems, which have become important issues and major concerns in recent years. These problems are partly caused by environmental pollution resulting from the rapid expansion of industrial activities in many countries. Although industrial development contributes to economic growth, industry is also one of the causes of environmental pollution (Arif & Hardimanto, 2023). One environmental issue that has attracted significant attention in the business world is global warming. Researchers from the Center for International Forestry Research (CIFOR) explain that global warming occurs because solar radiation in the form of heat waves or infrared radiation is trapped in the earth's atmosphere by greenhouse gases (Pratama, 2019). Global warming is one of the main causes of climate change. Several consequences of climate change include floods, landslides, and rising sea levels. Industry is one of the contributors to global warming because industrial operational activities generate large amounts of waste, while machines used in production often rely on fossil fuels and produce exhaust gases from combustion processes, resulting in

air pollution and greenhouse gas emissions (Mukono, 2020). Industrial growth has a positive relationship with the amount of greenhouse gas emissions generated by companies worldwide (Gabrielle & Toly, 2019). Greenhouse gases produced by industrial activities contribute to the increase in carbon emissions on earth.

Several phenomena in Indonesia indicate that industrial activities still lack sufficient concern for social and environmental impacts. Cases of environmental pollution caused by companies demonstrate that many companies have not yet developed adequate awareness of the importance of environmental protection. One case occurred in March 2024 in Boven Digoel, Papua, where approximately 36 hectares of forest belonging to the Awyu and Moi Indigenous Peoples were threatened by land clearing for an oil palm plantation project by PT Indo Asiana Lestari. This situation could harm the Awyu and Moi Indigenous Peoples because the forest is their customary forest, where they have lived for generations and which serves as a source of livelihood, food, culture, and water. If the oil palm plantation project is implemented, these essential resources may be lost. In addition to potentially eliminating natural forest, the plantation project could generate approximately 25 million tons of CO₂ emissions. This amount is equivalent to around 5% of Indonesia's projected carbon emission level in 2030. The impact would not only be felt by local communities in Papua, but could also affect the global environment. The Awyu Indigenous People filed a lawsuit against the environmental permit of the project before the administrative court. However, they lost at two judicial levels, namely at the Jayapura State Administrative Court in November 2023 and at the Manado State Administrative High Court in March 2024. In May 2024, the Awyu Indigenous People held a protest in front of the Supreme Court of Indonesia because their cassation case concerning the environmental permit of PT Indo Asiana Lestari was being examined by the court. Within an undetermined period, the Supreme Court judges would decide whether to accept the lawsuit or rule in favor of the oil palm company (News, 2024).

Environmental pollution that is currently widely discussed in the business world is closely related to climate change in various countries. One of the causes of climate change is greenhouse gas emissions generated by human activities, particularly industrial activities. A study in Poland stated that climate change is currently occurring at a faster rate than previously estimated. The Intergovernmental Panel on Climate Change reported that the main drivers of accelerated climate change are human activities involving fossil fuel consumption and forest destruction. In 2021, Carbon Brief, a United Kingdom-based website focusing on climate science and policy, revealed that the largest carbon-emitting countries are generally geographically large countries that conduct extensive deforestation to convert forests into agricultural land. Carbon emissions generated from deforestation contribute nearly 20% to the increase in global warming (Kusumawati & Murwaningsari, 2023). Companies that generate high carbon emissions are often required to comply with stricter environmental regulations. This condition can increase operational costs, such as waste management costs, carbon emission compliance costs, and costs related to improving environmentally friendly infrastructure, which may ultimately affect firm performance (Putri & Agustin, 2023).

Previous studies have produced diverse findings regarding the effect of carbon performance on firm performance. Kusumawati and Murwaningsari (2023) and Houqe et al. (2022) found that carbon emission performance measured using carbon intensity has a negative effect on firm performance. Similarly, Hariswan et al. (2022), Putri and Murtanto (2023), Ladista et al. (2023), and Basri and Husnaini (2025) stated that carbon performance

has no effect on financial performance. However, different findings were reported in studies conducted abroad, particularly in countries that contribute large amounts of carbon emissions. Trinks and Mulder (2020), in their study entitled “An Efficiency Perspective on Carbon Emission and Financial Performance,” found that carbon performance has a positive and significant effect on financial performance measured using Return on Assets. Similar results were found by Yan and Zhou (2022), whose study entitled “The Synergistic Effect of Carbon Performance and Technological Innovation on Corporate Financial Performance” revealed that carbon performance and technological innovation have a synergistic effect on firm performance in the energy sector. These findings are also consistent with the studies of Nguyen (2020), Wang et al. (2021), Miah et al. (2021), Perera et al. (2023), Almaeda et al. (2023), Ibishova et al. (2024), Oestreich and Tsiakas (2024), Senna and Moxoto (2024), Yuliandhari and Ramadhanty (2024), Ningsih and Yamin (2025), and Duan and Zhang (2025), which show that carbon performance has a positive effect on firm performance.

Corporate efforts to reduce greenhouse gas emissions, including carbon emissions, can be identified through carbon emission disclosure. The extent of disclosure can be measured by referring to the questionnaire provided by the Carbon Disclosure Project (CDP). CDP is a non-profit organization based in London, United Kingdom, that requests companies affected by global warming to complete an annual questionnaire (Choi, 2013). Currently, companies worldwide have gradually begun to consider material risks related to climate change, including direct physical impacts on business and climate policies that may change consumption patterns (Luo & Tang, 2020). Septriyawati and Anisah (2019) stated that carbon emission disclosure is part of Corporate Social Responsibility (CSR), particularly environmental disclosure. In annual reports, corporate disclosure can be classified into mandatory disclosure and voluntary disclosure (Sanubari & Wibowo, 2021). Carbon emission disclosure is one form of voluntary disclosure, meaning that companies have the discretion to provide accounting-related and other corporate information that can support decision-making and be presented in annual reports. This disclosure is carried out as a form of transparency and public accountability to stakeholders.

Several studies have examined the effect of carbon emission disclosure on firm performance, but previous findings remain inconsistent. Khairunisa and Pohan (2022) found that carbon emission disclosure has a positive effect on financial performance. This finding is in line with Bazhair (2022), Tsabitah et al. (2022), Hariswan et al. (2022), Liu and Zhou (2023), Safutri et al. (2023), Almeada et al. (2023), Fitriana (2024), Wayuningrum et al. (2024), Wisesa (2025), and Askiah (2025), who stated that carbon emission disclosure can improve financial performance. However, Nasih (2024), Yuliandhari and Ramadhanty (2024), and Ibishova (2024) found that carbon emission disclosure has a negative effect on financial performance. Different results were also reported by Adrati and Augustine (2022), J. Wirawan (2022), Mazaya and Barokah (2022), Q. Wang et al. (2023), Safutri et al. (2023), Al-Mari et al. (2024), and Ranti Windari (2025), who found that carbon emission disclosure has no effect on financial performance.

The inconsistency of previous research findings makes this topic important to re-examine. In addition, this study is motivated by the importance of corporate awareness regarding the environmental impacts generated by business activities and how such awareness may influence firm performance. The conceptual development that distinguishes this study from previous studies is that this study combines several previous research models,

particularly those of Liu et al. (2023) and Senna and Moxoto et al. (2025). Furthermore, this study uses a sample of Consumer Non-Cyclicals companies listed on the Indonesia Stock Exchange during the 2023-2024 period.

Based on the background described above, this study is entitled “The Effect of Carbon Performance and Carbon Emission Disclosure on Firm Performance.” This study aims to analyze and provide empirical evidence regarding the effect of carbon performance on firm performance and the effect of carbon emission disclosure on firm performance. The results of this study are expected to contribute to the development of environmental accounting literature, particularly in relation to carbon-related corporate practices and financial performance. Practically, this study is expected to provide input for companies in improving environmental management and carbon emission transparency. For regulators, this study may serve as a consideration in strengthening environmental policies and sustainability reporting practices. For prospective investors, the findings may provide additional insight in evaluating companies not only based on financial aspects, but also based on environmental responsibility and sustainability-related disclosures.

REVIEW OF LITERATURE

Stakeholder theory explains that companies are responsible not only to shareholders, but also to all parties who have an interest in and are affected by corporate activities. These stakeholders include owners, creditors, suppliers, shareholders, consumers, the public, government, and other related parties (Handoko, 2022). Information regarding corporate activities is considered a right of stakeholders because they contribute directly or indirectly to supporting the company's operations and business continuity (Sapulette & Limba, 2021). Therefore, companies must continuously maintain relationships with stakeholders through responsible policies, transparent communication, and accountability for the impacts of their business activities. In the context of environmental responsibility, companies that are able to improve their carbon performance may gain social legitimacy, investor trust, and a positive public image. This indicates that managing carbon performance is not merely a form of regulatory compliance, but also a business strategy to maintain long-term firm performance. In addition, companies that disclose carbon emissions are able to explain to stakeholders how their activities are conducted and how these activities affect the interests of different stakeholder groups (Bahriansyah & Ginting, 2022).

Legitimacy theory is also relevant in explaining the relationship between carbon-related corporate practices and firm performance. This theory views an organization as part of a broader social and environmental system, meaning that corporate activities and performance must be accepted by society (Zenitha, 2022). Legitimacy theory emphasizes that companies need to demonstrate that their operations are in accordance with the values, norms, and expectations of the society in which they operate, both in terms of legal obligations and ethical values (Mahmud, 2019). In this regard, companies seek to ensure that their activities do not conflict with the social system of the surrounding community so that their existence can be accepted (Sisdianto & Fitri, 2020). To obtain legitimacy, companies disclose social and environmental activities in annual reports or sustainability reports as a way to convince stakeholders that their operations are consistent with prevailing norms (Ramadhan, 2021). Public concern for environmental issues has encouraged companies to pay more attention to environmental conditions and take responsibility for the environmental

impacts of their operations in order to gain legitimacy from society (Ade & Khomsiyah, 2023). Thus, carbon performance and carbon emission disclosure can be viewed as mechanisms used by companies to maintain public trust and strengthen corporate legitimacy.

Firm performance reflects the achievements obtained by a company through management success, which can be shown through sales, total assets, or financial ratios presented in financial statements (Hasiholan & Pranaditya, 2018). Ross, Westerfield, and Jordan (2022) explain that firm performance is the result achieved by an organization as a consequence of its financial, investment, and operational decisions. Firm performance is commonly assessed through profitability, market value, operational efficiency, and the company's ability to create value for shareholders. David and David (2020) state that firm performance represents the extent to which a company achieves its strategic objectives, both in the short term and long term. In this perspective, performance is not only measured by financial results, but also by the company's ability to formulate strategies, gain competitive advantage, maintain market position, and create value for stakeholders. Weygandt, Kimmel, and Kieso (2022) also explain that firm performance reflects the company's ability to generate profit, manage assets efficiently, and increase shareholder value through financial statements and financial ratios.

Firm performance can be measured using profitability ratios because these ratios describe the company's ability to generate profit by utilizing assets or capital productively. Profitability ratios provide information about the effectiveness of management in managing company resources. According to Kasmir (2012), profitability ratios can provide information regarding profit earned in one period, profit compared with previous periods, profit development over time, net profit after tax, and the effectiveness of company funds in generating profit. One of the profitability ratios commonly used to measure firm performance is Return on Assets (ROA). ROA indicates the return generated from the total assets used by the company and is useful for evaluating how effectively a company utilizes its assets to generate profit (Kasmir, 2012). A higher ROA indicates that the company is more effective in using its assets to support business operations. Therefore, this study uses ROA as an indicator of firm performance.

Carbon performance refers to the company's ability to manage, control, and reduce carbon emissions generated from its operational activities. According to the Ministry of Environment and Forestry, several harmful gases released by corporate and human activities into the atmosphere can cause the greenhouse effect. These gases include carbon dioxide (CO₂), sulfur dioxide (SO₂), nitrogen monoxide (NO), nitrogen dioxide (NO₂), methane (CH₄), and chlorofluorocarbons (CFCs). In addition to production activities, gases produced from the combustion of fuel, oil, coal, and other materials are also classified as major carbon-related pollutants (Putri & Murtanto, 2023). Schaltegger and Burritt (2017) define carbon performance as a company's ability to manage carbon emissions through measurement, reduction, and control as part of broader environmental performance improvement. Epstein and Buhovac (2014) explain that carbon performance reflects managerial efforts to reduce greenhouse gas emissions and improve the efficiency of emission-generating processes. Meanwhile, Welford (2021) states that carbon performance describes the success of a company in implementing effective carbon management practices, including identifying emission sources, setting emission reduction targets, monitoring carbon output, and evaluating continuous improvement.

Carbon performance is not only related to the amount of emissions produced, but also to the effectiveness of corporate policies, strategies, and systems in reducing emissions. GRI 305 on emissions classifies greenhouse gas disclosure into several categories, including direct greenhouse gas emissions or Scope 1 emissions, energy indirect greenhouse gas emissions or Scope 2 emissions, other indirect greenhouse gas emissions or Scope 3 emissions, greenhouse gas emission intensity, emission reduction, ozone-depleting substances, and significant air emissions such as nitrogen oxides and sulfur oxides. Previous studies, such as Busch and Bassen (2022) and Houqe and Opare (2022), measured carbon performance using Scope 1 and Scope 2 carbon emissions based on GRI 305-1 and GRI 305-2. In this study, carbon performance is measured using carbon intensity, which compares the amount of carbon emissions with the company's business output. This measurement is relevant because it reflects how efficiently a company manages emissions in relation to its operational scale.

Carbon emission disclosure is the process of communicating transparent and structured information regarding the amount of emissions generated by a company, the environmental impacts caused by its activities, and the strategies implemented to mitigate those impacts. Unerman, Bebbington, and O'Dwyer (2023) define carbon emission disclosure as a form of corporate accountability that focuses on transparency regarding climate impacts caused by operational activities, including quantitative information on Scope 1, Scope 2, and Scope 3 emissions as well as climate mitigation policies. The Routledge Handbook of Environmental Accounting also explains that carbon emission disclosure is part of climate-related disclosure, which communicates physical and transition risks associated with climate change, including how emissions may affect firm value, operational costs, and corporate reputation. Carbon emission disclosure has become increasingly important following the adoption of frameworks such as the Task Force on Climate-related Financial Disclosures (TCFD) and the Greenhouse Gas Protocol, which encourage companies to present climate-related information in a more comprehensive and comparable manner.

In Indonesia, the government has issued policies and regulations to reduce carbon emissions, including Presidential Regulation No. 71 of 2011 concerning the National Greenhouse Gas Inventory and Presidential Regulation No. 61 of 2011 concerning the National Action Plan for Greenhouse Gas Emission Reduction. These policies reflect the government's commitment to reducing emissions by 26% through domestic efforts and up to 41% with international support (Sandi & Soegiarto, 2021). In addition, PSAK 1 issued by the Indonesian Institute of Accountants recommends that companies disclose responsibilities related to environmental and social issues. Environmental disclosure may include carbon emission disclosure as additional information, such as greenhouse gas emission levels, energy use, corporate governance, emission reduction targets, and risks and prospects related to climate change (Wiratno & Fatkhudin, 2020). Carbon emission disclosure is generally categorized as voluntary disclosure presented in annual reports or sustainability reports. This disclosure can function as a medium of communication between companies and stakeholders regarding corporate environmental and social activities (Hapsari, 2023).

Carbon emission disclosure can be measured using the disclosure index developed by Choi (2013), which refers to the Carbon Disclosure Project questionnaire. Another measurement was developed by Jannah and Muid (2014) using the Carbon Emission Disclosure Checklist. The disclosure index developed by Choi (2013) consists of five main

categories, namely climate change, greenhouse gas emissions, energy consumption, greenhouse gas reduction and cost, and carbon emission accountability, with a total of 18 disclosure items. Companies receive a score of one for each item disclosed in their annual report or sustainability report, while undisclosed items receive a score of zero. The total score is then divided by the maximum number of disclosure items to determine the level of carbon emission disclosure.

Leverage is also an important factor in explaining firm performance. Leverage is a financial ratio used to measure the extent to which a company uses debt or borrowed capital to finance its operations and increase profit or investment returns. Leverage describes how far a company relies on debt to fund its business activities (Sari & Wahidahwati, 2021). When managed properly, leverage can have a positive impact on company performance. However, excessive leverage may increase financial risk and reduce firm performance because the company must bear interest expenses and debt obligations (Ayaz, Zabri, & Ahmad, 2021). Arhinful and Radmehr (2023) explain that debt obligations influence earnings because interest costs reduce income, which may affect firm performance. In this study, leverage is used as a control variable and is measured using the Debt to Asset Ratio (DAR), following Harahed et al. (2024). DAR is calculated by dividing total debt by total assets at the end of the reporting period.

Several previous studies have examined the effect of carbon performance on firm performance, but the results remain inconsistent. Ganda and Milondzo (2018) found that, in the short term, carbon performance has a positive and significant effect on firm performance measured using ROA and Tobin's Q. However, in the long term, carbon performance has a negative effect on ROA and remains positively associated with Tobin's Q. Yan and Zhou (2022) examined the synergistic effect of carbon performance and technological innovation on firm performance in the Chinese energy sector and found that carbon performance has a positive effect on firm performance. Senna and Moxoto (2025) also found that carbon performance has a positive and significant effect on financial performance measured using ROA. Similar findings were reported by Nguyen (2020), Wang et al. (2021), Miah et al. (2021), Perera et al. (2023), Almaeda et al. (2023), Ibishova et al. (2024), Oestreich and Tsiakas (2024), Yuliandhari and Ramadhanty (2024), Ningsih and Yamin (2025), and Duan and Zhang (2025). Based on stakeholder theory, companies with better carbon performance are expected to gain stakeholder support, improve reputation, and strengthen firm performance. Therefore, the first hypothesis is formulated as follows: H1: Carbon performance has a positive effect on firm performance.

Previous studies have also examined the effect of carbon emission disclosure on firm performance. Increasing public concern regarding climate change has created pressure for companies to disclose environmental information related to their operational activities. Based on legitimacy theory, companies are expected to respond to global warming issues in order to reduce the legitimacy gap between corporate activities and social expectations (Muhammad, 2021). Carbon emission disclosure is a form of corporate environmental responsibility that can increase transparency, accountability, and public trust. Companies that disclose more carbon emission information may improve their reputation in the eyes of investors and stakeholders. Rusli et al. (2019) found that carbon emission disclosure has a positive effect on financial performance. Similar findings were reported by Khairunisa and Pohan (2022) and Liu et al. (2023), who stated that carbon emission disclosure can positively

influence firm performance. Based on this explanation, the second hypothesis is formulated as follows: H2: Carbon emission disclosure has a positive effect on firm performance.

RESEARCH METHOD

This study aims to examine the effect of carbon performance and carbon emission disclosure on firm performance. This research is classified as explanatory research because it seeks to explain the causal relationship between the independent variables and the dependent variable. A quantitative approach is applied in this study because the data are presented in numerical form and analyzed statistically to answer the research questions and test the proposed hypotheses (Sugiyono, 2019).

The data used in this study are secondary data obtained from annual reports and sustainability reports of Consumer Non-Cyclicals companies listed on the Indonesia Stock Exchange during the 2023-2024 period. The data were collected from the official website of the Indonesia Stock Exchange and the official websites of each company. The population of this study consists of all Consumer Non-Cyclicals companies listed on the Indonesia Stock Exchange during the research period. The sample was selected using purposive sampling, which is a sampling technique based on specific criteria. The criteria used in selecting the sample are: companies in the Consumer Non-Cyclicals sector listed on the Indonesia Stock Exchange during 2023-2024; companies that published annual reports and sustainability reports on the company website or the Indonesia Stock Exchange website during the research period; and companies that provided complete data related to the variables used in this study.

The dependent variable in this study is firm performance. Firm performance is measured using Return on Assets (ROA), which reflects the company's ability to generate profit from its total assets. ROA is calculated by dividing net income after tax by total assets. This measurement follows Liu et al. (2023). The formula for firm performance is as follows:

$$\text{KP} = \text{Net Income After Tax} / \text{Total Assets}$$

The independent variables in this study are carbon performance and carbon emission disclosure. Carbon performance reflects the company's ability to manage, control, and reduce carbon emissions generated from its operational activities. In this study, carbon performance is measured using carbon intensity, which compares total Scope 1 and Scope 2 emissions with total sales at the end of the year. This measurement follows Senna and Moxoto (2025). The formula for carbon performance is as follows:

$$\text{KK} = \text{Ln} (\text{Total Scope 1 and Scope 2 Emissions} / \text{Total Sales at the End of the Year})$$

Carbon emission disclosure refers to the process of presenting transparent and structured information regarding the amount of carbon emissions produced by the company, the environmental impacts caused by its activities, and the mitigation strategies implemented. Carbon emission disclosure is measured using the checklist developed by Choi et al. (2013), which consists of 18 disclosure items. These items cover five main categories: climate change risks and opportunities, greenhouse gas emissions, energy consumption, greenhouse gas reduction and costs, and carbon emission accountability. Each disclosed item is given a score of 1, while an undisclosed item is given a score of 0. The total score obtained by each company is then divided by the total number of disclosure items. The formula for carbon emission disclosure is as follows:

$$\text{PEK} = \text{Number of Carbon Emission Disclosure Items Disclosed} / \text{Total Carbon Emission Disclosure Items}$$

This study also uses leverage as a control variable. Leverage reflects the extent to which a company uses debt to finance its assets. In this study, leverage is measured using the Debt to Asset Ratio (DAR), which is calculated by dividing total debt by total assets at the end of the reporting period. This measurement follows Senna and Moxoto (2025). The formula for leverage is as follows:

$$\text{LEV} = \text{Total Debt} / \text{Total Assets}$$

The data analysis method used in this study is panel data regression analysis. Panel data regression is appropriate because the study combines cross-sectional data from several companies and time-series data from the 2023-2024 period. The use of panel data allows the study to analyze the effect of carbon performance and carbon emission disclosure on firm performance across companies and over time. The data were processed using Microsoft Excel and EViews 12. The regression model used in this study is formulated as follows:

$$\text{KP}_{it} = \alpha + \beta_1 \text{KK}_{it} + \beta_2 \text{PEK}_{it} + \beta_3 \text{LEV}_{it} + \varepsilon_{it}$$

Where KP represents firm performance, α represents the constant, β_1 - β_3 represent regression coefficients, KK represents carbon performance, PEK represents carbon emission disclosure, LEV represents leverage, ε represents the error term, i represents the company, and t represents the research period.

Before conducting hypothesis testing, this study performs descriptive statistical analysis to describe the characteristics of the research data. Descriptive statistics include minimum value, maximum value, mean, and standard deviation. This analysis is used to provide an overview of the distribution of each variable, namely firm performance, carbon performance, carbon emission disclosure, and leverage (Ghozali, 2018).

In panel data regression, three estimation models can be used, namely the Common Effect Model, Fixed Effect Model, and Random Effect Model. The Common Effect Model combines cross-sectional and time-series data without considering individual or time differences. The Fixed Effect Model assumes that differences across companies can be accommodated through different intercepts. Meanwhile, the Random Effect Model assumes that differences across companies are accommodated by the error component and may be correlated across individuals and time (Baltagi, 2021). To determine the most appropriate model, this study conducts the Chow test, Hausman test, and Lagrange Multiplier test. The Chow test is used to choose between the Common Effect Model and the Fixed Effect Model. The Hausman test is used to choose between the Fixed Effect Model and the Random Effect Model. The Lagrange Multiplier test is used to choose between the Common Effect Model and the Random Effect Model (Basuki, 2021).

Classical assumption testing is conducted depending on the selected panel data regression model. According to Gujarati and Porter (2015), the Common Effect Model and Fixed Effect Model use the Ordinary Least Squares approach, while the Random Effect Model uses the Generalized Least Squares approach. If the selected model is the Random Effect Model, classical assumption testing is not required because the Generalized Least Squares estimation method is considered to have fulfilled the classical assumptions. However, if the selected model is the Common Effect Model or Fixed Effect Model, classical assumption testing is required.

Hypothesis testing in this study is conducted using the coefficient of determination test, simultaneous test, and partial test. The coefficient of determination, indicated by adjusted R-square, is used to measure the ability of the independent variables and control

variable to explain variations in firm performance. The simultaneous test is used to examine whether carbon performance, carbon emission disclosure, and leverage jointly affect firm performance. The partial test is used to examine the individual effect of each independent variable on firm performance. The significance level used in this study is 5%. If the probability value is less than 0.05, the variable is considered to have a significant effect. Conversely, if the probability value is greater than 0.05, the variable is considered to have no significant effect on firm performance (Ghozali, 2018).

RESULTS AND DISCUSSION

Data Description

This study uses a quantitative approach by collecting secondary data obtained from companies' annual reports and sustainability reports. The companies used as the sample in this study are Consumer Non-Cyclicals companies listed on the Indonesia Stock Exchange for the 2023-2024 reporting period. The selection of companies in the Consumer Non-Cyclicals sector as the sample is based on the fact that companies in this sector often have a direct impact on the environment through production activities. The production process of consumer non-cyclicals goods can generate carbon emissions, waste, and other pollution. Therefore, it is important for companies in this sector to consider the environmental impacts of their operational activities.

The data were obtained by accessing the official website of the Indonesia Stock Exchange and the official websites of the companies. The sample was obtained using the purposive sampling technique, in which sample selection was based on certain criteria and considerations. The following presents the sample selection from the observed population:

Table 1.
Sample Selection Results

Description	Total
Consumer Non-Cyclicals companies listed on the Indonesia Stock Exchange for the 2023-2024 reporting period.	121
Number of research periods	2
Total research sample	242

Source: Data Processed by the Researcher, 2026

Based on the table above, the number of Consumer Non-Cyclicals companies listed on the Indonesia Stock Exchange for the 2023-2024 reporting period is 121 companies. The number of research periods is 2 years, so the sample used in this study consists of 242 company samples.

Research Results

Descriptive Statistical Test

Descriptive statistical analysis in this study is used to analyze the data in detail. This method includes the use of measures such as the mean, standard deviation, maximum value, and minimum value to provide a comprehensive description of the distribution of the collected data. The variables analyzed descriptively in this study are the independent variables consisting of carbon performance and carbon emission disclosure, the dependent variable namely firm performance, and the control variable namely leverage in Consumer Non-Cyclicals companies listed on the Indonesia Stock Exchange for the 2023-2024

reporting period. The following is the table of descriptive statistical test results conducted using EViews 12.

Table 2.
Descriptive Statistical Test Results

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Firm Performance	242	-0.689008	0.943569	0.033600	0.126239
Carbon Performance	242	-27.05341	-2.527711	-11.91776	2.952401
Carbon Emission Disclosure	242	0.111111	1.000000	0.649219	0.200919
Leverage	242	0.015688	2.641679	0.442179	0.316283

Source: Data Processed by EViews 12, 2026

Based on Table 2 above, there are four research variables consisting of firm performance, carbon performance, carbon emission disclosure, and leverage, with the number of observations in the study (N) during the 2023-2024 period totaling 242 samples. The descriptive statistical test results show the minimum value, maximum value, mean, and standard deviation of each research variable, which can be explained as follows:

Based on the descriptive statistical test results in Table 2, it is known that the firm performance variable has the lowest value (minimum) of -0.689008, which belongs to Wicaksana Overseas International Tbk in 2024. This means that the company experienced losses during the research period, resulting in relatively low firm performance. Meanwhile, the highest value (maximum) is 0.943569, which belongs to Prasadha Aneka Niaga Tbk in 2023. This means that the company was able to generate profit from its operations, resulting in relatively high firm performance. The mean value of the 242 samples studied is 0.0336, with a standard deviation of 0.126239. The standard deviation value of the firm performance variable is greater than the mean value, indicating that the firm performance variable is heterogeneous or varied, which means that the average firm performance variable has a high level of deviation.

Based on the descriptive statistical test results in Table 2, the carbon performance variable has the lowest value (minimum) of -27.05341, which belongs to Pinago Utama Tbk. in 2023. This means that the company had implemented efforts to reduce carbon emissions generated during its business activities, resulting in low carbon performance. Meanwhile, the highest value (maximum) of -2.527711 was obtained by Bumi Teknokultura Unggul Tbk in 2023, which indicates that the company did not implement efforts to reduce carbon emissions generated during its business activities, resulting in high carbon performance. The mean value of the 242 samples studied is -11.91776, with a standard deviation of 2.952401. The standard deviation value of the carbon performance variable is greater than the mean value, indicating that the carbon performance variable is heterogeneous or varied, which means that the average carbon performance variable has a high level of deviation.

Based on the descriptive statistical test results in Table 2, the carbon emission disclosure variable has the lowest value (minimum) of 0.111111, which belongs to Indo Pureco Pratama Tbk. in 2024. This means that the carbon emission disclosure carried out by the company was relatively low compared with other companies in the study. This also indicates that the company was less effective in communicating carbon emission disclosure, so it could not be used as a tool for management decision-making with the objective of gaining confidence from stakeholders that could bring benefits to the company. Meanwhile,

the highest value (maximum) of 1.000000 was obtained by Salim Ivomas Pratama Tbk. for the 2023-2024 reporting period, Palma Serasih Tbk. for the 2023-2024 reporting period, Indofood Sukses Makmur Tbk. for the 2023-2024 reporting period, Indofood CBP Sukses Makmur Tbk. for the 2023-2024 reporting period, and Austindo Nusantara Jaya Tbk. for the 2023-2024 reporting period. This means that these companies disclosed the most carbon emission information among the sample companies in this study. This also indicates that the companies were quite effective in communicating carbon emission disclosure, so it could be used as a tool for management decision-making with the objective of gaining confidence from stakeholders that could bring benefits to the company. The mean value of the 242 samples studied is 0.649219, with a standard deviation of 0.200919. The standard deviation value of the carbon emission disclosure variable is smaller than the mean value, indicating that the carbon emission disclosure variable is homogeneous. This shows that the standard deviation value obtained is good and can generally be used as a representation of the entire data.

Based on the descriptive statistical test results in Table 2, leverage has the lowest value (minimum) of 0.015688, which belongs to Cisarua Mountain Dairy Tbk. in 2023. This means that the company had a smaller burden or obligation to external parties or creditors, which could improve firm performance and have an impact on increasing company profitability. Meanwhile, the highest value (maximum) of 2.641679 belongs to Bakrie Sumatera Plantations Tbk in 2024, which means that the company had a greater burden toward external parties or creditors. This condition is highly likely to reduce firm performance and have an impact on decreasing company profitability. The mean value of the 242 samples studied is 0.442179, with a standard deviation of 0.316283. The standard deviation value of leverage is smaller than the mean value, indicating that the leverage variable is homogeneous. This shows that the standard deviation value obtained is good and can generally be used as a representation of the entire data.

Panel Data Regression Model Selection Test

Several tests can be conducted to select the most appropriate model, namely the Chow test, Hausman test, and Lagrange Multiplier test.

a. Chow Test

The hypotheses in the Chow Test are as follows:

H0: Common Effect Model (CEM) is selected

Ha: Fixed Effect Model (FEM) is selected

The decision criteria are as follows:

1. If the probability value > 0.05 , then H0 is accepted and Ha is rejected. Therefore, the appropriate model is the Common Effect Model.
2. If the probability value < 0.05 , then H0 is rejected and Ha is accepted. Therefore, the appropriate model is the Fixed Effect Model.

The following presents the results of the Chow Test conducted in this study:

Table 3.
Chow Test

Redundant Fixed Effects Test	Alpha	Cross-section Chi-square (Prob.)	Conclusion
Fixed Effects Tests	< 0.05	0.0000	Fixed Effect Model

Source: Data Processed by EViews 12, 2026

Based on Table 3, it shows that the probability value (p-value) of the calculated F is 0.0000, which is smaller than the predetermined significance level of 0.05. Thus, it can be written as $0.0000 < 0.05$, meaning that H_a is accepted. Therefore, the selected model is the Fixed Effect Model (FEM) (Napitupulu, 2021).

b. Hausman Test

The hypotheses in the Hausman Test are as follows:

H_0 : Random Effect Model (REM) is selected

H_a : Fixed Effect Model (FEM) is selected

The decision criteria are as follows:

1. If the probability value > 0.05 , then H_0 is accepted and H_a is rejected. Therefore, the appropriate model is the Random Effect Model.
2. If the probability value < 0.05 , then H_0 is rejected and H_a is accepted. Therefore, the appropriate model is the Fixed Effect Model.

The following presents the results of the Hausman Test conducted in this study:

Table 4.
Hausman Test

Test Summary	Alpha	Chi-Sq. Statistic (Prob.)	Conclusion
Cross-Section Random	< 0.05	0.2202	Random Effect Model

Source: Data Processed by EViews 12, 2026

Based on Table 4, it shows that the Cross-section Random probability value is 0.2202, which is greater than the predetermined significance level of 0.05. Thus, it can be written as $0.2202 > 0.05$, meaning that H_0 is accepted. Therefore, the selected model is the Random Effect Model (REM) (Napitupulu, 2021).

c. Lagrange Multiplier (LM) Test

The hypotheses in the Lagrange Multiplier Test are as follows:

H_0 : Common Effect Model (CEM) is selected

H_a : Random Effect Model (REM) is selected

The decision criteria are as follows:

1. If the probability value > 0.05 , then H_0 is accepted and H_a is rejected. Therefore, the appropriate model is the Common Effect Model.
2. If the probability value < 0.05 , then H_0 is rejected and H_a is accepted. Therefore, the appropriate model is the Random Effect Model.

The following presents the results of the Lagrange Multiplier Test conducted in this study:

Table 5.
Lagrange Multiplier Test

Test Summary				Alpha	Chi-Sq. Statistic (Prob.)	Conclusion	
Correlated Multiplier-Test	Breusch	Pagan	Lagrange	< 0.05	0.0000	Random Model	Effect

Source: Data Processed by EViews 12, 2026

Based on Table 5, it shows that the Breusch Pagan probability value is 0.0000, which is smaller than the predetermined significance level of 0.05. Thus, it can be written as $0.0000 < 0.05$, meaning that H_0 is rejected. Therefore, the selected model is the Random Effect Model (REM) (Napitupulu, 2021).

Recommendation for the Best Model Selection

Table 6.
Results of Panel Data Regression Equation Testing

Test Name	Description	Result
Chow Test	CEM VS FEM	FEM
Hausman Test	FEM VS REM	REM
Lagrange Multiplier Test	CEM VS REM	REM

Source: Data Processed by EViews 12, 2026

Based on Table 6 above, the Chow Test shows that the Fixed Effect Model (FEM) is better used in panel data regression analysis. However, the Hausman Test shows that the Random Effect Model (REM) is better used in panel data regression analysis. This result is then supported by the Lagrange Multiplier Test, in which the Random Effect Model (REM) is better used in panel data regression analysis. Based on the results of the Chow test, Hausman test, and Lagrange Multiplier test, the best model for panel data regression testing in this study is the Random Effect Model (REM). Therefore, in this study, the classical assumption test does not need to be conducted (A. Badawi., 2022) (Napitupulu, 2021).

Panel Data Regression Selection Scheme Test

Panel data regression is a combination of several objects and several time periods. In panel data regression, there are three models, namely the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). Each of these three models has its own strengths and weaknesses. The three models were tested to select the best model for regression. The following explains the three models tested in this study:

a. Common Effect Model (CEM)

The common effect model shows a constant value of -0.065184, the regression value of the Carbon Performance (KK) variable of -0.003000, the regression value of the Carbon Emission Disclosure (PEK) variable of 0.173753, and the regression value of the Leverage (LEV) variable of -0.112555.

b. Fixed Effect Model (FEM)

The fixed effect model shows a constant value of 0.082197, the regression value of the Carbon Performance (KK) variable of -0.005625, the regression value of the Carbon Emission Disclosure (PEK) variable of 0.016027, and the regression value of the Leverage (LEV) variable of -0.285052.

c. Random Effect Model (REM)

The random effect model shows a constant value of -0.057399, the regression value of the Carbon Performance (KK) variable of -0.003214, the regression value of the Carbon Emission Disclosure (PEK) variable of 0.162478, and the regression value of the Leverage (LEV) variable of -0.119387.

Panel Data Regression Analysis Test

Based on the explanation above, the results of the panel data regression equation can be seen, which tests the independent variables, namely carbon performance and carbon emission disclosure, on the dependent variable, namely firm performance, with leverage as the control variable, in 121 Consumer Non-Cyclicals companies listed on the Indonesia Stock Exchange during the 2023-2024 period.

Table 7.

Panel Data Regression Test

Dependent Variable: KP

Method: Panel EGLS (Cross-section random effects)

Date: 05/26/26 Time: 11:46

Sample: 2023 2024

Periods included: 2

Cross-sections included: 121

Total panel (balanced) observations: 242

Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.057399	0.045740	-1.254876	0.2108
KK	-0.003214	0.002904	-1.106699	0.2695
PEK	0.162478	0.043224	3.758954	0.0002
LEV	-0.119387	0.028007	-4.262798	0.0000

Effects Specification

	S.D.	Rho
Cross-section random	0.077017	0.4341
Idiosyncratic random	0.087926	0.5659

Weighted Statistics

Mean dependent var	0.021105	R-squared	0.121851
S.D. dependent var	0.093519	Adjusted R-squared	0.110781
Sum squared resid	1.850891	S.E. of regression	0.088186
Durbin-Watson stat	2.022139	F-statistic	11.00816
		Prob(F-statistic)	0.000001

Unweighted Statistics

R-squared	0.155501	Mean dependent var	0.033600
Sum squared resid	3.243402	Durbin-Watson stat	1.153961

Source: Data Processed by EViews 12, 2026

Notes: C = Constant; KP = Firm Performance; KK = Carbon Performance; PEK = Carbon Emission Disclosure; LEV = Leverage.

Based on the table above, the panel data linear regression equation can be formulated as follows:

$$KP_{it} = -0.057399 - 0.003214 KK_{it} + 0.162478 PEK_{it} - 0.119387 LEV_{it} + e_{it}$$

Based on the regression equation above, it can be interpreted as follows (Sugiyanto et al., 2022): the constant value of -0.057399 means that in the absence of the variables carbon performance, carbon emission disclosure, and leverage, the firm performance variable will decrease by 5.7399%. The beta coefficient value of the carbon performance variable is -0.003214, meaning that if other variables remain constant and carbon performance increases by 1%, firm performance will decrease by 0.3214%. The beta coefficient value of the carbon emission disclosure variable is 0.162478, meaning that if other variables remain constant and carbon emission disclosure increases by 1%, firm performance will increase by 16.2478%. The beta coefficient value of the leverage variable is -0.119387, meaning that if other variables remain constant and leverage increases by 1%, firm performance will decrease by 11.9387%.

Hypothesis Test

The following presents the hypothesis test results used in the study:

Coefficient of Determination Test (Adjusted R2)

This coefficient proves how much total variation in the dependent variable can be explained by the independent variables in the observed regression model. The coefficient of determination can be seen from the Adjusted R2 value. The value of the coefficient of determination ranges from 0 to 1. An R2 value equal to or close to 1 indicates that the variables in the model formed can explain the actual data. The coefficient of determination value will be larger when the number of independent variables and the number of observed data are greater.

Table 8.
Coefficient of Determination Test

Mean dependent var	0.021105	R-squared	0.121851
S.D. dependent var	0.093519	Adjusted R-squared	0.110781
Sum squared resid	1.850891	S.E. of regression	0.088186
Durbin-Watson stat	2.022139	F-statistic	11.00816
		Prob(F-statistic)	0.000001

Source: Data Processed by EViews 12, 2026

Based on Table 8, the Adjusted R Square value is 0.110781 or 11.0781%. This coefficient of determination value indicates that the independent variables consisting of Carbon Performance (KK) and Carbon Emission Disclosure (PEK), controlled by Leverage (LEV), are able to explain the Firm Performance (KP) variable by 11.0781%, while the remaining 88.9219% (100 - adjusted R Square value) is explained by other variables not included in this research model (Sihabudin et al., 2021) (Sugiyanto et al., 2022).

4.2.6.2 Simultaneous Test (F Test)

The F test aims to examine whether each independent variable in the regression model jointly affects the dependent variable. The results of the F test equation are presented in the following table:

Table 9.
Simultaneous Test (F Test)

Mean dependent var	0.021105	R-squared	0.121851
S.D. dependent var	0.093519	Adjusted R-squared	0.110781
Sum squared resid	1.850891	S.E. of regression	0.088186
Durbin-Watson stat	2.022139	F-statistic	11.00816
		Prob(F-statistic)	0.000001

Source: Data Processed by EViews 12, 2026

Decision-making criteria (Suyono, 2015) (Nuryadi et al., 2017):

1. If calculated $F > F$ table or Prob. $< \alpha$, then H_a is accepted.
2. If calculated $F < F$ table or Prob. $> \alpha$, then H_0 is accepted.

According to Suyono (2015), the formula for finding the F table uses the numerator degrees of freedom of $k-1$ and the denominator degrees of freedom of $n-k$, where k is the total number of variables and n is the number of samples. The Prob value of $0.000001 < 0.05$ means that H_0 is rejected and H_a is accepted. This means that carbon performance and carbon emission disclosure simultaneously affect firm performance.

Partial Test (T Test)

The t test aims to examine whether each independent variable individually affects the dependent variable. The decision-making criteria are as follows (Suyono, 2015) (Nuryadi et al., 2017):

1. If calculated $t > t$ table or sig. $< \alpha$, then H_a is accepted.
2. If calculated $t < t$ table or sig. $> \alpha$, then H_0 is accepted.

According to Sihabudin et al. (2021), if a one-tailed right-side or positive-direction hypothesis is used, H_a is accepted if calculated $t > t$ table or sig. $< \alpha$ and the coefficient direction is positive. According to Suyono (2015), the formula for calculating the t table uses degrees of freedom $n - k$, where n is the number of samples and k is the total number of variables. The calculated t value is always read in absolute terms, meaning its value is always positive. If the calculated t value is negative, its absolute value is obtained by removing the negative sign, and then it is compared with the t table value (Suyono, 2015). The test results for each variable (t test) in the equation are presented in the following table:

Table 1.0
Partial Test (T Test)

Variable		Prediction Coefficient	Std. Error	t-Statistic	Sig. (Two Tail)	Conclusion
Constant		-0.057399	0.045740	-1.254876	0.1054	
Carbon Performance	+	-0.003214	0.002904	-1.106699	0.13475	H1 Rejected
Carbon Emission Disclosure	+	0.162478	0.043224	3.758954	0.0001	H2 Accepted

Variable	Prediction Coefficient	Std. Error	t-Statistic	Sig. (Two Tail)	Conclusion
Leverage	-0.119387	0.028007	-4.262798	0.0000	

Source: Data Processed by EViews 12, 2026

Based on the t test results in Table 10, it can be concluded that the results of the study show that the carbon performance variable has a significance value of $0.13475 > 0.05$, which is above the α value of 0.05, with a t-statistic value of -1.106699 and a negative coefficient direction of -0.003214. Therefore, H1 is rejected, meaning that the carbon performance variable does not have a positive effect on firm performance. This result is not in accordance with the proposed hypothesis, which states that carbon performance has a positive effect on firm performance.

The results of the study show that the carbon emission disclosure variable has a significance value of $0.0001 < 0.05$, which is below the α value of 0.05, with a t-statistic value of 3.758954 and a positive coefficient direction of 0.162478. Therefore, H2 is accepted, meaning that carbon emission disclosure has a positive effect on firm performance. This result is in accordance with the proposed hypothesis, which states that carbon emission disclosure has a positive effect on firm performance.

The Effect of Carbon Performance on Firm Performance

The first hypothesis in this study tests whether there is an effect of carbon performance on firm performance. Based on the results of the study, carbon performance does not have a positive effect on firm performance in Consumer Non-Cyclicals companies listed on the Indonesia Stock Exchange for the 2023-2024 reporting period. Therefore, the results of this study do not successfully prove and reject the initial hypothesis that was formulated.

As explained by the Ministry of Environment and Forestry, several harmful gases released by corporate and human activities from the earth into the atmosphere can cause the greenhouse effect in the atmosphere. In addition to production activities, gases generated from the combustion of fuel, oil, coal, and others are also classified as major polluting gases or carbon gases. Not all companies pay attention to the amount of carbon emissions they generate during a certain period (Putri, 2022). Therefore, such companies also do not have targets to reduce the amount of carbon emissions. A decrease in carbon emission performance is not able to improve company performance. This indicates that companies capable of producing low carbon emissions still do not necessarily succeed in generating large sales.

Legitimacy theory focuses on the responsibility of an entity to show that it operates in accordance with the framework and system that are consistent with the social environment in which it operates, whether legally binding or based on ethical values. This means that companies seek to ensure that their activities do not conflict with the social system in society so that they can be accepted by the surrounding community. However, high carbon emission performance generated by companies can damage corporate legitimacy because there is a gap between companies and society.

The results of this study are in line with previous research conducted by Putri and Murtanto (2023), which stated that carbon performance has no effect on corporate financial performance. The same result was also found by Busch and Bassen (2022), who stated that

carbon performance has no effect on firm performance. This indicates that companies in the energy, industrial, transportation, and infrastructure sectors do not heed the government's call to reduce negative environmental impacts, namely carbon emission reduction. This is because investment in renewable energy requires a large amount of funds, so companies tend to be reluctant to allocate funds for renewable energy. In addition, Busch and Bassen (2022) stated in their study that such corporate behavior is also caused by the absence of significant profitable impacts for companies that reduce carbon emissions, so many companies ignore this matter. However, this study rejects the findings of Trinks and Mulder (2020), which showed that carbon performance has a positive and significant impact on financial performance measured using Return on Assets, as well as the study by Yan and Zhou (2022), which revealed that carbon performance and technological innovation have a synergistic effect on firm performance in the energy sector.

The Effect of Carbon Emission Disclosure on Firm Performance

The second hypothesis in this study tests whether there is an effect of carbon emission disclosure on firm performance. Based on the results of the study, carbon emission disclosure has a positive effect on firm performance in Consumer Non-Cyclicals companies listed on the Indonesia Stock Exchange for the 2023-2024 reporting period. Therefore, the results of this study successfully prove and accept the initial hypothesis that was formulated.

This study is related to stakeholder theory, which states that companies, in carrying out their operational activities, need to pay attention to the interests of other parties and not only their own interests (Rahmanita, 2020). In maintaining business continuity, companies require support not only from shareholders but also from stakeholders. This is in accordance with the results of the study, which show that companies that voluntarily disclose carbon emissions can improve firm performance.

The results of this study also confirm legitimacy theory, which explains that companies in carrying out their operational activities must comply with and act in accordance with the values, norms, and regulations existing in society so that the company obtains legitimacy from the surrounding environment. One effort to obtain legitimacy is by disclosing information on operational activities that have an impact on the environment, namely carbon emission disclosure. Companies that receive good legitimacy tend to improve their reputation and positive corporate image, which overall will have an impact on increasing firm performance.

The results of this study are in line with previous research conducted by Khairunisa and Pohan (2022), which showed that carbon emission disclosure has a positive effect on corporate financial performance. Similarly, the study by Liu and Zhou (2023) stated the same result, namely that carbon emission disclosure can have a positive effect on corporate financial performance. Thus, the results of this study reject the study by Adrati and Augustine (2022), which showed that carbon emission disclosure does not affect firm performance, and the study by Safutri et al. (2023), which showed that carbon emission disclosure has no impact on financial performance.

Discussion of Control Variable

Leverage on Firm Performance

One of the control variables in this study is leverage. The test results show that the leverage variable measured using the Debt to Asset Ratio (DAR) has a negative and significant effect on firm performance. This means that the higher the leverage owned by the

company, the lower the financial performance will be. Conversely, companies with a low debt ratio will have higher financial performance as measured by ROA (Isbanah, 2015). The greater the company's debt, the more it affects profit because interest expenses increase. This is in accordance with legitimacy theory because uncontrolled leverage or higher leverage can increase the company's financial risk and raise concerns among various stakeholders. Companies that are overly burdened with debt will be considered risky, which can threaten their legitimacy in the eyes of the market, investors, and other related parties. The results of this study are in line with research conducted by Oktavoyana and Kurniati (2023), which showed that leverage has a negative effect on firm performance, as well as research conducted by Ernawati and Santoso (2021), which stated that leverage has a negative effect on firm performance.

CONCLUSION

Based on the results of the analysis and discussion regarding the effect of carbon performance and carbon emission disclosure on firm performance in the Consumer Non-Cyclicals sector listed on the Indonesia Stock Exchange during the 2023–2024 period, the conclusions are as follows:

1. Carbon performance does not have a positive effect on firm performance. This finding is in line with Putri and Murtanto (2023), who stated that carbon performance does not have a positive effect on firm performance. This difference in results may arise due to differences in samples and differences in the measurement of carbon performance by companies.
2. Carbon emission disclosure has a positive and significant effect on firm performance. This finding is in line with Khairunisa and Pohan (2022), who showed that carbon emission disclosure has a positive effect on firm performance. Companies that disclose carbon emissions can attract the attention of stakeholders and be perceived positively, thereby encouraging an improvement in firm performance.

Theoretically, this study contributes to the environmental accounting and legitimacy theory literature by providing evidence that carbon emission disclosure plays an important role in strengthening stakeholder trust and supporting firm performance. Practically, the findings offer insights for companies, investors, and regulators regarding the importance of transparent sustainability reporting and environmental disclosure practices. Given the study's limitations, including its focus on a single industry sector and the use of content analysis, future research is encouraged to include a broader range of industries, extend the observation period, and examine additional environmental-related variables such as green human capital, green innovation, and environmental performance to gain a more comprehensive understanding of sustainability-related factors affecting firm performance.

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