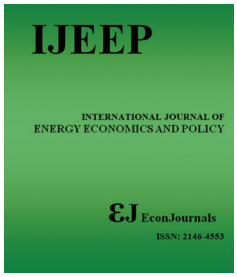

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The Effect of Industrial Type, Environmental Performance and Leverage on Carbon Emission Disclosure: Evidence from Indonesian LQ45 Companies

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ABSTRACT

This study aims to examine and look for empirical evidence related to the determinants that influence the carbon emissions disclosure. The factors tested in this study include industrial type, environmental performance, leverage, and profitability. This research method uses a quantitative approach. The source of data in this study uses secondary data, namely data from sustainability reports and annual reports. All LQ45 index businesses listed on the Indonesia Stock Exchange are the study's population, and purposive sampling is used. This study uses tests such as descriptive statistical analysis, classical assumption test, hypothesis testing and multiple linear regression analysis. The results of this study indicate that the industrial type and CEO tenure have no effect on carbon emission disclosures, while leverage, profitability, environmental performance, CEO gender and technology for disclosure have a negative effect on carbon emission disclosures. This first study factors effect carbon emission disclosure in emerging countries.

Keywords: Carbon Emission Disclosure, Type of Industry, Leverage, Profitability, Environmental Performance
JEL Classifications: D21, G2, G4, H32, L2

1. INTRODUCTION

Global warming is still a severe problem or threat to the environment because its impact can reduce the quality of life now and in the future. It can occur as a result of two main factors: Industrial activities that change how forests function and the usage of fossil fuels like coal, natural gas, and oil, which are air pollution sources (Stolyarova, 2013). In line with the rapid growth of the industry, the retention of carbon and other greenhouse gases tends to increase over time (Martinez, 2005).

Indonesia is the world's fourth-largest emitter per capita after China, the United States, and the European Union (Jaggi and Freedman, 2011). The ministry of energy and mineral resources (2013) states that a large portion of the emissions are caused by industry, which accounts for 70% of all energy consumption and uses fossil fuels. The main sources of emissions in developing nations, including Indonesia, are mining industries that produce commodities like coal, oil, and gas.

The community and its stakeholders will accept companies that disclose their operational activities. Companies that disclose carbon emissions are primarily from industries whose operational activities significantly impact the environment. However, the disclosure of carbon emissions in Indonesia is still voluntary, and the practice is still rarely done by business entities. To comply with ISO 14064-1

guidelines, only a very limited amount of greenhouse gas emissions, including carbon emissions, are currently disclosed. Companies that disclose their carbon emissions must take into account a number of factors, such as gaining the trust of stakeholders and avoiding risks, particularly for those that emit greenhouse gases, such as higher operating costs, decreased demand, reputational risk, legal proceedings, fines, and penalties (Berthelot and Robert, 2011). Based on data from Rhodium in 2021, it estimates greenhouse gas emissions across the economy to increase by 6.2% compared to 2020, which saw a sharp decline in emissions due to the Covid-19 economic shutdown. However, emissions in 2021 will remain 5% below 2019 levels. According to the Rhodium report, coal use is the biggest driver of rising emissions (Edition. CNN, 2022). While this is happening, the analysis shows that worldwide energy-related carbon dioxide emissions increased 6-36.3 billion tonnes in 2021, the highest level ever, as the global economy rebounds well from the Covid-19 crisis and largely relies on coal to fuel that growth. IEA According to IEA calculations, the rise in global CO_2 emissions of more than 2 billion tonnes is the biggest in absolute terms in recorded history. In spite of the most significant increase in renewable energy output, the recovery in energy demand in 2021 was exacerbated by unfavorable weather and energy market conditions, particularly a surge in natural gas prices, which led to more coal being burned (IEA, 2022).

The goal of this study is to investigate the elements that affect how LQ45 enterprises in Indonesia disclose their carbon emissions. Industry type, environmental performance, leverage, and profitability are among the variables this study investigated. This study uses LQ45 companies as research objects to obtain company data from various sectors. The LQ45 company is a group of 45 Indonesian stock exchange stocks that have the most liquid stock transactions. It is anticipated that academic contributions to this study will contribute additional overt empirical data supporting the disclosure of carbon emissions in subsequent studies. The practical application of this research for company management is thus anticipated to prompt corporations to explore implementing carbon emission disclosures generally and to pay more attention to Indonesia's difficulties with carbon emissions. In addition, this research can also help investors consider making the right investment decisions in companies that are more concerned with environmental issues.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1. Carbon Emissions Disclosure

Carbon gas emissions are gases released from the combustion of compounds containing carbon, for example, CO2, which is exhaust gas from burning gasoline, diesel, wood, leaves, LPG gas, and other fuels that contain many hydrocarbons (compounds containing hydrogen and carbon) (Trenberth et al., (2003); Linggasari, (2015). One of the most significant contributors to carbon emissions is the company's operational activities and this activities causes environmental pollution such as climate change, air pollution, and others. Disclosure of carbon emissions is a voluntary disclosure made by companies that are included in the annual report on company activities related to carbon emissions.

2.2. Type of Industry

The type of industry divides the industry into two categories, namely carbon-intensive companies and non-carbon-intensive companies. The carbon-intensive industry produces significant carbon emissions, so it has a relatively large impact on environmental pollution. In contrast, a non-carbon intensive industry is an industry that produces small carbon emissions so that it has a relatively small impact on environmental pollution (Choi et al., 2013).

2.3. Environmental Performance

According to Suratno et al. (2006), the company's environmental performance is the company's performance in creating a suitable environment. Environmental performance is made in the form of a rating by an institution related to the environment (Wibisono, 2013). The Ministry of the Environment's PROPER rating evaluation is used to gauge environmental performance. According to the Ministry of the Environment's annual report, the company's compliance performance is evaluated in PROPER based on how well it performs in meeting the various legal and regulatory requirements that are relevant to it as well as how well it performs in carrying out various environmental management-related activities that are not yet compliance requirements.

2.4. Profitability

According to Munawir (2012:33), profitability shows the company's ability to generate profits during a specific period. Hanafi and Halim (2009) define the profitability ratio as a ratio that measures the company's ability to generate profits (Profitability) for a certain level of sales, assets, and capital stock. A company's profitability is measured by its success and ability to use its assets productively; thus, its profitability can be known by comparing the profits earned in a period with the total assets or the company's total capital. Simamora (2000) describes profitability as a critical measure of a firm's overall success. Companies with a high level of profitability every year tend to use their capital compared to using debt (Kesuma, 2009).

2.5. Leverage

According to Choi et al. (2013), Leverage is a comparison between total debt and company assets. Leverage indicates the percentage of the use of funds from creditors to finance the company's assets, so the company's decision is very dependent on the leverage conditions experienced. Leverage shows the proportion of company funding that is financed with debt. The company will try to provide the broadest possible information regarding the condition of the company to its creditors. It is hoped that creditors will know and understand the company better concerning the credit provided. The higher the level of corporate leverage, the greater the possibility of wealth transfer from long-term creditors to shareholders and managers. So, to influence this, companies must make more complete disclosures to meet the information needs of long-term creditors (Nugraheni et al., 2002; Meiryani et al., 2023).

2.6. CEO Characteristics

Chief Executive Officer (CEO) is the highest position in a company. Investors will consider investing in the company if investors believe in the leadership of the CEO to develop a company that is

profitable for the company (Li et al., 2016). The CEO plays a very important role in increasing the success of the company. The CEO is expected to be able to cope with environmental pressures. The role of the CEO is not only responsible for financial success but also for success in non-financial performance so that the company's presence is safe in the environment of stakeholders and other stakeholders. The CEO must make strategic decisions in dealing with the company's environmental problems. The characteristics of the CEO used in this study are the length of office (tenure), and the gender of the CEO. Research conducted by Shen (2003) reveals that CEO characteristics are one of the most important aspects of corporate governance.

2.7. Technology for Disclosure

According to Carpenter (2001) in Dawkins and Fraas (2011) explains that increasing media coverage of environmental and climate policies increases the role of non-governmental organizations such as NGOs, which in turn indicates a shift in public opinion. This means that media coverage can influence public attitudes towards the company which in turn can influence stakeholders. It is possible that the role of media coverage simultaneously determines the company's disclosure strategy. The media has a part to play in keeping track of the actions of businesses that can have an impact on climate change and lowering carbon emissions. As a result of receiving news from the media, stakeholders are better able to understand their surroundings and form opinions about the news (Linggasari, 2015).

2.8. Research Model

The research framework/research model related to the relationship between research variables will be illustrated in Figure 1, as follow:

2.9. Hypothesis Development

The research problem formulation, which has been presented as a series of questions, has a temporary solution in the form of the hypothesis.

2.9.1. The effect of industry type on disclosure of carbon emissions

Industries in the public spotlight are industries whose business operations produce high levels of carbon emissions and environmental pollution (Pennington et al., 2004). In research conducted by Van De Burgwal and Vieira (2014) in Nugraha (2015), it is explained that companies with a higher environmental impact must report more information than companies with a low environmental impact. According to Choi et al. (2013) in Jannah and Muid (2014) and Andriyani, R., Khafid, M (2014), the voluntary disclosure of carbon emissions will be more significant in companies that are intensive in producing emissions such as energy, transportation, materials, and utilities. As a result, businesses that produce a lot of carbon emissions will typically report this information. The following assertion can be made in light of the given description:

H_1: The type of industry has a significant effect on carbon emissions disclosure.

2.9.2. The effect of leverage on carbon emission disclosure

Management of companies with a high level of leverage will reduce the disclosure of environmental responsibility related to carbon emissions so that they are not in the spotlight for debtholders (Suhardjanto and Choiriyah, 2010). Companies with high leverage will focus more on paying off their obligations than voluntary disclosures (Jensen & Meckling, 1976). Due to the limited allocation of funds owned by the company, it must determine these funds to pay off all obligations or make voluntary disclosures. Research conducted by Ghomi and Leung (2013) and Jannah and Muid (2014) states that leverage has a negative effect on the disclosure of carbon emissions. Based on this description, the following hypothesis is formulated:

H_2: Leverage has a significant effect on carbon emissions disclosure.

2.9.3. The effect of profitability on carbon emission disclosure

A company's likelihood of disclosing environmental information will increase with its financial health. Profitable companies are more vulnerable to the public, so interested parties may be interested in how the company generates profits (Berthelot and Robert, 2011); (Chithambo, 2013). It leaves companies facing public pressure about how they can make a profit can use disclosure of information. According to Clarkson et al. (2008), companies that generate profits are more likely to make environmental disclosures. Based on this description, the following hypothesis is formulated:

H_3: Profitability has a significant effect on carbon emissions disclosure.

2.9.4. The effect of environmental performance on carbon emission disclosure

Dawkins and Fraas' (2011) study demonstrates a favorable correlation between environmental performance and environmental disclosure of greenhouse gas emissions, including carbon emissions. Companies with low environmental performance will not disclose information to avoid harmful exposure, while companies with good environmental performance will differentiate themselves by voluntarily disclosing information about their company's performance. Information disclosed by the company can provide benefits for the company because it can increase the value of the company, According to Prafitri and Zulaikha (2016), who cite Luo et al.'s (2013) study, businesses with strong carbon performance are more likely to declare their disclosure of carbon emissions. Based on this description, the following hypothesis is formulated:

H_4: Environmental performance has a significant effect on carbon emissions disclosure.

2.9.5. The effect of CEO characteristics on carbon emission disclosure

2.9.5.1. CEO gender

In general, women and men seem to have different values in terms of social responsibility. Various studies have identified the effect of board gender on corporate social obligations; having more female directors is positively related to disclosure of corporate

Table 1: Variable operationalization

No	Variable	Indicator	Scale
		Dependent variable	
1	Carbon emission disclosure	CED = (∑di / M) × 100% Description: CED=Carbon emission disclosure∑di=Total score of 1 obtained by the company M=Maximum item total that can be disclosed	Ratio
		Independent variable	
2	Industrial type	A fake variable is used to measure the industry type. sectors that produce carbon emissions intensively are assigned a number 1, while non-intensive sectors are assigned a number 0.	Nominal
3	Leverage	Leverage = $\frac{Total\ Liabilities}{Total\ Asset}$	Ratio
4	Profitability	Return on Asset = $\frac{Total\ profit\ before\ tax}{Total\ Asset}$	Ratio
5	Environmental Performance	Referring to the PROPER color rating obtained by the company, as follows: 0=not a participant 1=Very bad/black color 2=bad/red color 3=good/blue color 4=very good/green color 5=very good/golden color	Interval
6	CEO Characteristics	Gender=Dummy 0 if the CEO is a woman, 1 if a man. Tenure=Number of years the CEO has served in the company.	Nominal
7	Technology for Disclosure	If the company discloses carbon emissions through technology media, it will be given a value of 1, if the company does not disclose carbon emissions through technology media, it will be given a value of 0.	Nominal

social responsibility (Abu Qa'dan et al., 2019), (Biswas et al., 2018); and (Naseem et al., 2017). Research conducted by Liao et al. (2014) found a significant and positive relationship between gender diversity and disclosure of carbon emissions. In this case, it is expected that companies with boards with gender and nationality diversity will successfully implement carbon emission reduction practices and communicate their activities to stakeholders (Cahya, B. T., 2016). The research hypothesis is formulated as follows:

H_5: CEO Gender has a significant effect on Carbon Emission Disclosure.

2.9.5.2. CEO tenure

Research conducted by Goldman and Slezak (2006) states that tenure impacts CEO leadership. CEO tenure will affect the good and bad of the director in leading the company. Research conducted by Lewis et al. (2014) explains that the longer the tenure, the CEO will have more experience and knowledge in understanding the company's conditions and is judged to be more able to cope with the conditions of the company's social environment. The longer the CEO has served, the more CED will be disclosed than the new one who has no experience (Ulupui et al., 2020). The research hypothesis is formulated as follows:

H_6: CEO Tenure has a significant effect on the disclosure of carbon emissions.

2.9.6. The effect of technology for disclosure on carbon emission disclosure

Internet media (web) is a powerful form of media that is supported by a growing number of internet users. Public attention on a corporation is primarily focused on the media (Yao et al., 2011; Irmawati., 2011). It is intended that through promoting corporate social responsibility online, the public will be made aware of the company's social initiatives. According to Munif et al. (2010), companies can disclose CSR activities through various media (Guthrie and Parker.,1989). Technology is used by companies to report on company activities, for example, by using the company's website as a facility to convey information to the public or company stakeholders.

The research hypothesis is formulated as follows:

H_7: Technology for disclosure has a significant effect on the disclosure of carbon emissions.

3. RESEARCH METHODOLOGY

3.1. Sample and Data Analysis Method

The quantitative technique used in this research method is expressed as numbers or values that can be scaled. This study also employs various models for linear regression analysis. As panel data, ordinal least squares (OLS) are used in this study to analyze the data (Ghozali., 2007). The study's secondary data

source is the sustainability report and annual reports that were reviewed, released, and traded on the Indonesia Stock Exchange between 2016 and 2020. The research data used in this article was downloaded from the www.idx.co.id website.

The population used is all LQ45 index companies listed on the Indonesia Stock Exchange in 2016-2020, which have published their financial reports. The total population in this study was 57 companies. The researcher used the research method, namely the purposive sampling technique, with the following criteria:

1. LQ45 companies were listed on the Indonesia Stock Exchange (IDX) from 2016 to 2020.
2. The sample used is LQ45 companies that have participated in the Company Performance Assessment Program in Environmental Management (PROPER) registered at the Ministry of Environment in 2016-2020.
3. LQ45 companies that publish audited annual reports that explicitly disclose carbon emissions (covering at least one policy related to carbon/greenhouse gas emissions or disclosing at least one item of carbon emission disclosure) during the period 2016-2020

The data processing technique will be carried out using the SPSS 23 application. This method uses descriptive statistical analysis, classical assumption test, hypothesis testing, and multiple linear regression analysis.

3.2. Variable Operationalization

Operationalization of variables is needed to determine the indicators of the variables in the study so they can be measured. In this study, there are two independent variables: Industrial Type, Leverage, Profitability, Environmental Performance, CEO Characteristics and Technology for Disclosure, while the dependent variable is Carbon Emission Disclosure. In more detail, the operationalization of the variables in this study can be seen in the Table 1:

4. RESULTS AND DISCUSSION

4.1. Overview of Sample Companies

The method used in this research is a quantitative research method using secondary data. The study was conducted on LQ45 companies listed on the IDX (Indonesian Stock Exchange) in the 2016-2020 period with a sample of 27 companies. The sample selection was carried out using the purposive sampling method, namely, taking samples determined from several criteria following the required sample requirements. During the sample selection process, several companies did not meet the criteria for assessment. Sample criteria can be seen in Table 2, as follow:

4.2. Descriptive Statistics

In this study, the variables used are carbon emission disclosures as the dependent variable and then industrial type, leverage, profitability, and environmental performance as independent variables. The following are the outcomes of statistical calculations based on data processing with the SPSS application:

Table 3 shows that the amount of data used (N) from this research is 135; this number is based on the results of selecting a sample

Table 2: Sample criteria

No	Criteria	Total
1	LQ45 companies listed on the IDX in the 2016-2020 period	57
2	LQ45 companies that do not publish audited annual financial statements for the period 31 December 2016-2020	4
3	LQ45 companies that do not publish sustainability reports in the 2016-2020 period	26
Total		27

Table 3: Descriptive statistics

	Descriptive statistics				
	n	Minimum	Maximum	Mean	Std. deviation
IND_TYPE	135	0.00	1.00	0.5185	0.50152
LEV	135	0.02	1.90	0.5896	0.27041
ROA	135	−0.10	0.47	0.0553	0.08226
ENV_PER	135	0.00	5.00	2.0519	1.92128
GENDER	135	0.00	1.00	0.9185	0.27459
TENURE	135	1.00	28.00	4.7778	5.55793
TECH_DISC	135	0.00	1.00	0.9704	0.17019
CED	135	0.00	0.44	0.2054	0.13095
Valid n (listwise)	135				

of 27 companies that were put together over 5 years. The variable carbon emission disclosure has a range of 0.00-0.44, a mean of 0.2054, a standard deviation of 0.13095, and a range of 0.00-0.44. The average value above shows that the company discloses two items out of a total of 18 items based on the Carbon Disclosure Project (CDP) index. The most disclosures during the 2016-2020 research year were carried out by Aneka Tambang Tbk, with eight items.

This type of industry variable is measured using a dummy variable where a value of 1 is for companies that are included in emissions-intensive industries such as mining, transportation, agriculture, and manufacturing, while a value of 0 is for companies engaged in services, finance, trade, and others. The type of industry variable has four values: 0.00 for the minimum, 1.00 for the maximum, 0.5185 for the average, and 0.50152 for the standard deviation. The average value of 0.5185 illustrates that as many as 51.9% of companies are included in the emission-intensive industries, namely companies engaged in energy, transportation, raw materials, and utilities.

The leverage variable has an average value (mean) of 0.5896 with a standard deviation of 0.27041 and a minimum value of 0.02, Semen Indonesia Tbk, and a maximum value of 1.90 Bumi Resources Tbk. According to Kasmir (2008) in Pasaribu and Idris (2015), the industry standard for this research ratio, which uses debt to asset ratio, is 35%. The average value of 58.96% shows that it is above the industry standard-the lower the ratio, the better the company's financial condition.

The profitability variable has a minimum value of −0.10, namely Bumi Resources Tbk, and a maximum value of 0.47, namely Unilever Indonesia Tbk, and an average value of 0.0553 and a

standard deviation of 0.08226. Judging from the average value of 5.5%, the value above is from the ROA standard, which indicates that the company's financial performance is in good condition.

Using PROPER, the environmental performance variable is measured. Companies are ranked according to their environmental performance using one of five colors: gold (very good), green (very good), blue (good), and red (poor). Since numerous samples were dropped from the sample, there is no score one. The values are 0.00 for the lowest value, 5.00 for the highest, 2.0519 for the mean, and 1.92128 for the standard deviation. The sample of businesses in this survey, on average, obtained a decent rating, namely a blue PROPER rating, as shown by the average value of 2.0519.

CEO Gender and CEO Tenure are the two indicators used in this study for the CEO Characteristics variable. The CEO Gender variable's ranges from 0.00 to 1.00, on average, with a standard deviation of 0.27459 and a mean value of 0.9158. The CEO Tenure variable's values range from 1.00 to 28.00, with an average of 4.7778 and a standard deviation of 5.55793.

The Technology Disclosure variable's ranges from 0.00 to 1.00, on average, with a standard deviation of 0.17019 and a mean value of 0.9704.

4.3. Normality Test

In the normality test above using the Asymp.Sig approach. Based on Table 4, it shows that the significance value of Asymp. Sig. (2-tailed) >0.05. This indicates that the data meets the assumption of normality and can be determined to be normally distributed using the Kolmogorov-Smirnov test's decision-making criteria.

4.4. Heteroscedasticity Test

Based on testing on the SPSS application, the results of the heteroscedasticity test are shown in the Table 5, as follow:

The Gleijser test results in Table 5 show that the type of industry variable has a significance value of more than 0.05, which is 0.107. It means that the type of industry variable does not have heteroscedasticity problems. Then the leverage variable has a significance value of more than 0.05, which is 0.606. It means that the leverage variable does not have heteroscedasticity problems. Furthermore, the profitability variable has a significance value of more than 0.05, which is 0.218. It means that the profitability variable does not have heteroscedasticity problems. Then the environmental performance variable has a significance value of more than 0.05, which is 0.241. It means that the environmental performance variable does not have heteroscedasticity problems. The CEO gender variable has a significance value of more than 0.05, which is 0.937. It means that the CEO gender variable does not have heteroscedasticity problems. The CEO tenure variable has a significance value of more than 0.05, which is 0.209. It means that the CEO tenure variable does not have heteroscedasticity problems. Then the technology for disclosure variable has a significance value of more than 0.05, which is 0.957. It means that the technology for disclosure variable does not have heteroscedasticity problems.

Table 4: Normality test

One-sample kolmogorov-smirnov test	
	Unstandardized residual
n	135
Normal Parameters[a,b]	
Mean	0.0000000
Std. deviation	0.11022021
Most extreme differences	
Absolute	0.067
Positive	0.059
Negative	−0.067
Test Statistic	0.067
Asymp. Sig. (2-tailed)	0.200[c,d]

[a]Test distribution is Normal, [b]Calculated from data, [c]Lilliefors Significance Correction, [d]This is a lower bound of the true significance

4.5. Multicollinearity Test

The Variance Inflation Factor (VIF) and Tolerance values in the following table coefficients output are used to test for multicollinearity can be seen in Table 6, as follow:

Based on the results in the Collinearity Statistics section, all independent variables, namely industrial type, leverage, profitability, environmental performance, CEO gender, CEO tenure and technology for disclosure in the regression model above have a VIF value <10 and a Tolerance value >0.01. This means that the regression model formed does not have a multicollinearity problem, which means that this regression model is good to use because there is no correlation between each of the independent variables.

4.6. Multiple Linear Regression

Based on the results of the multiple regression equation output can be displayed in the following equation:

DA = 0.135 + 0.046IND_TYPE − 0.144LEV − 0.306ROA + 0.015ENV_PER – 104GENDER – 001TENURE + 223TECH_DISC

The constant of 0.135 states that if the independent variables of the industry type, leverage, profitability, and environmental performance are zero, the carbon emission disclosure will be worth 0.135.

The type of industry variable has a coefficient value of 0.046. It shows a positive influence between these variables on carbon emission disclosures by the value of the industrial type variable coefficient with the assumption that the other variables are zero or constant. The carbon emission disclosure variable will increase by 0.046.

The leverage variable has a coefficient value of −0.144. It shows that there is a negative effect between these variables on carbon emission disclosures, so it can be concluded that if the leverage variable increases by one unit with the assumption that the other variables are zero or constant, then the carbon emission disclosure variable will increase by −0.144.

The profitability variable has a coefficient value of −0.306. It shows that there is a negative influence between these variables

Table 5: Heteroscedasticity Test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.107	0.038		2.842	0.005
	IND_TYPE	0.023	0.014	0.188	1.624	0.107
	LEV	−0.012	0.023	−0.052	−0.517	0.606
	ROA	−0.085	0.069	−0.113	−1.238	0.218
	ENV_PER	−0.005	0.004	−0.144	−1.177	0.241
	GENDER	0.002	0.021	0.007	0.079	0.937
	TENURE	−0.001	0.001	−0.116	−1.262	0.209
	TECH_DISC	−0.002	0.032	−0.005	−0.054	0.957

Dependent Variable: RES_2

Table 6: Coefficients

Coefficients[a]								
Model		Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
		B	Std. error	Beta			Tolerance	VIF
1	(Constant)	0.135	0.069		1.971	0.051		
	IND_TYPE	0.046	0.026	0.175	1.764	0.080	0.564	1.774
	LEV	−0.144	0.042	−0.298	−3.435	0.001	0.743	1.346
	ROA	−0.306	0.126	−0.192	−2.433	0.016	0.895	1.117
	ENV_PER	0.015	0.007	0.214	2.028	0.045	0.500	1.998
	GENDER	−0.104	0.038	−0.219	−2.778	0.006	0.901	1.110
	TENURE	−0.001	0.002	−0.022	−0.277	0.782	0.890	1.123
	TECH_DISC	0.223	0.059	0.290	3.772	0.000	0.944	1.059

Dependent variable: CED

Table 7: Multiple linear regression

Coefficients[a]						
Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	Beta		
1	(Constant)	0.135	0.069		1.971	0.051
	IND_TYPE	0.046	0.026	0.175	1.764	0.080
	LEV	−0.144	0.042	−0.298	−3.435	0.001
	ROA	−0.306	0.126	−0.192	−2.433	0.016
	ENV_PER	0.015	0.007	0.214	2.028	0.045
	GENDER	−0.104	0.038	−0.219	−2.778	0.006
	TENURE	−0.001	0.002	−0.022	−.277	0.782
	TECH_DISC	0.223	0.059	0.290	3.772	0.000

a. Dependent Variable: CED

Table 8: Model summary

Model summary				
Model	R	R square	Adjusted R square	Std. error of the estimate
1	0.540[a]	0.292	0.252	0.11322

a. Predictors: (Constant), TECH_DISC, TENURE, ROA, GENDER, LEV, IND_TYPE, ENV_PER

on carbon emission disclosures, so it can be concluded that if the profitability variable increases by one unit with the assumption that the other variables are zero or constant, then the carbon emission disclosure variable will increase by −0.306.

The environmental performance variable has a coefficient value of 0.015. It shows a positive influence between these variables on carbon emission disclosures by the coefficient value of the environmental performance variable with the assumption that the other variables are zero or constant. The carbon emission disclosure variable will increase by 0.015.

The CEO gender variable has a coefficient value of −0.104. It shows that there is a negative influence between these variables on carbon emission disclosures, so it can be concluded that if the CEO gender variable increases by one unit with the assumption that the other variables are zero or constant, then the carbon emission disclosure variable will increase by −0.104.

The CEO tenure variable has a coefficient value of −0.001. It shows that there is a negative influence between these variables on carbon emission disclosures, so it can be concluded that if the CEO tenure variable increases by one unit with the assumption that the other variables are zero or constant, then the carbon emission disclosure variable will increase by −0.001.

The technology for disclosure variable has a coefficient value of 0.223. It shows a positive influence between these variables on carbon emission disclosures by the coefficient value of the technology for disclosure variable with the assumption that

Table 9: Partial hypothesis test

Coefficients[a]						
Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	Beta		
1	(Constant)	0.135	0.069		1.971	0.051
	IND_TYPE	0.046	0.026	0.175	1.764	0.080
	LEV	−0.144	0.042	−0.298	−3.435	0.001
	ROA	−0.306	0.126	−0.192	−2.433	0.016
	ENV_PER	0.015	0.007	0.214	2.028	0.045
	GENDER	−0.104	0.038	−0.219	−2.778	0.006
	TENURE	−0.001	0.002	−0.022	−0.277	0.782
	TECH_DISC	0.223	0.059	0.290	3.772	0.000

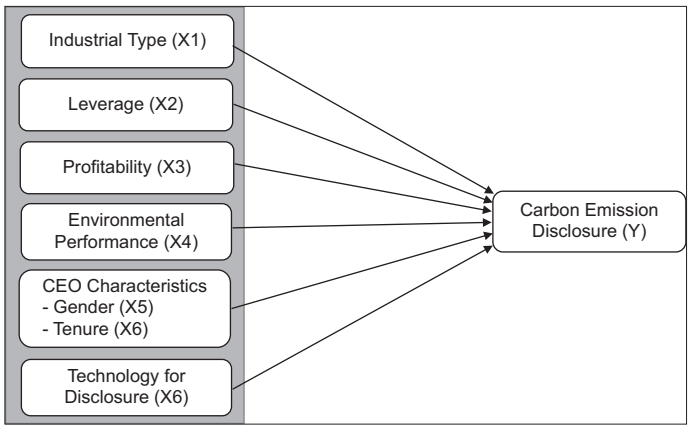
a. Dependent variable: CED

Table 10: Simultaneous hypothesis test

ANOVA[a]						
Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	0.670	7	0.096	7.466	0.000[b]
	Residual	1.628	127	0.013		
	Total	2.298	134			

a. Dependent variable: CED, b. Predictors: (Constant), TECH_DISC, TENURE, ROA, GENDER, LEV, IND_TYPE, ENV_PER

Figure 1: Research model



the other variables are zero or constant. The carbon emission disclosure variable will increase by 0.223.

Test result of multiple linear regression can be seen in Table 7, as follow:

4.7. Coefficient of Determination

The correlation coefficient (R), which is displayed in the Model Summary table, is 0.540. It implies that there is not a strong enough association between the independent variable and the dependent variable because there is a 54.0% correlation between the two variables. R square (R2), on the other hand, has a value of 29.2%. This number shows that 29.2% of the variation in the variable carbon emission disclosure can be explained by the independent factors in this study, which include industry type, leverage, profitability, environmental performance, CEO gender, CEO tenure, and technology for disclosure. On the other hand, there is still an 70.8% variation in the carbon emission disclosure variable, which is explained by other variables outside this study.

Test results of model summary can be seen in Table 8, as follows:

4.8. Hypothesis Test

4.8.1. Partial hypothesis test (t-test)

The t test was conducted to test the research hypothesis regarding the effect of each independent variable partially on the dependent variable. T-statistics is a value that is used to see the level of significance in hypothesis testing by finding the value of T-statistics through a bootstrapping procedure. In testing the hypothesis it can be said to be significant when the T-statistics value is greater than 1.96, whereas if the T-statistics value is less than 1.96 it is considered insignificant (Ghozali, 2016). Test results of partial hypothesis test can be seen in Table 9, as follows:

The significance value of the industrial type variable, as determined by the outcome of the t-test, is 0.080, which indicates that the significance value is >0.05, so H1 is rejected. The output results show that the industrial type variable has no significant effect on the carbon emission disclosure variable. Then the significance value of the leverage variable is 0.001, which indicates that the significance value is smaller than the 0.05 significance level, then H2 is accepted. The conclusion from the output results shows that the leverage variable has a significant effect on the carbon emission disclosure variable. Furthermore, the significance value of the profitability variable is 0.016, which indicates that the significance value is <0.05 significance level, so H3 is accepted. The conclusion from the output results shows that the profitability variable significantly affects the carbon emission disclosure variable. Then, the significance value of the environmental performance variable is 0.045, which indicates that the significance value is smaller than 0.05, so H4 is accepted. The output results show that the environmental performance variable significantly affects the carbon emission disclosure variable. The significance value of the CEO gender variable is 0.006, which indicates that the significance value is <0.05 significance level, so H5 is accepted. The conclusion from the output results shows that the CEO gender variable significantly affects the carbon emission disclosure variable. The significance value of the CEO tenure variable is 0.782, which indicates that the significance value is >0.05 significance level, so H6 is rejected. The output results indicate that there is no discernible relationship between the CEO tenure variable and the disclosure of carbon emissions. The significant level for the technology for disclosure variable is then 0.000, meaning that H7 is acceptable because the significance level is below than the 0.05 significance level. The conclusion from

the output results shows that the technology for disclosure variable significantly affects the carbon emission disclosure variable.

4.8.2. Simultaneous hypothesis test (f-test)

Based on the table above, it shows that the value of significance is 0.000 which is smaller than 0.05. This means that there is a simultaneous influence between industrial type, leverage, profitability, environmental performance variables, CEO gender, CEO tenure, and technology for disclosure, or at least one variable that has a significant effect on the variable carbon emission disclosure so that it can be said that the model is feasible.

4.9. Hypothesis Testing and Discussion

4.9.1. Type of industry has a significant effect on carbon emissions disclosure

The type of industry variable's significance value is 0.080 according to the output of the t-test, which means that it is more significant than 0.05. It demonstrates that the carbon emission disclosure variable is not significantly impacted by the kind of industry variable. It implies that the considerable impact of the industrial type theory on carbon emission disclosures is disproved. The findings of this analysis corroborate those of studies by Luo et al. (2012) and Jannah and Muid (2014), which found no relationship between industry type and disclosure of carbon emissions. Companies that intensively produce carbon emissions have not fully implemented government regulations related to reporting carbon emissions.

4.9.2. Leverage has a significant effect on the carbon emissions disclosure

Given that the significance value for the leverage variable is smaller than the 0.05 significance level and the t-test output results show this, H2 is accepted. The inference drawn from the output results demonstrates that the leverage variable significantly influences the disclosure of carbon emission variables. According to Choi et al. (2013), businesses with significant leverage prefer to pay off their debts to voluntary disclosures. Therefore, a company's disclosure of carbon emissions decreases as its leverage increases, but a company's disclosure of carbon emissions increases as its leverage decreases. For upcoming debt assessments, creditors will put pressure on businesses to disclose environmental risks in yearly reports (Clarkson, 2008). According to Mujiyono and Nany (2010), companies with significant leverage typically have greater responsibility to satisfy the informational needs of creditors. Research by Ghomi and Leung (2013) and Jannah and Muid (2014) supports the findings of this study that leverage has a detrimental impact on the disclosure of carbon emissions.

4.9.3. Profitability has a significant effect on the carbon emissions disclosure

The profitability variable's significance value is 0.016, which means that it is less significant than the 0.05 significance level, according to the output of the t-test, and H3 is thus accepted. Conclusion drawn from output results: The carbon emission disclosure variable is greatly influenced by the profitability variable. According to Choi et al. (2013), companies with good financial conditions can pay for the additional resources needed for voluntary reporting and better disclosure of carbon emissions to gain societal legitimacy and reduce negative images from external parties. High operational activity, such as manufacturing and sales activity, is reflected in high profitability. The amount of industrial activity results in a lot of carbon emissions. Profitability then serves as a gauge for the amount of carbon emissions produced. To reduce this pressure, companies can disclose their actual carbon emissions (Pratiwi et al., 2021). Research by Pratiwi et al. (2021), which demonstrates how profitability influences the disclosure of carbon emissions, supports the findings of this study.

4.9.4. Environmental performance has a significant effect on the carbon emissions disclosure

The significance value of the environmental performance variable is 0.045, which means that it is less significant than 0.05, according to the output of the t-test. This demonstrates that the carbon emission disclosure variable is significantly influenced by the environmental performance variable. Thus, the idea that environmental performance has a considerable impact on disclosures of carbon emissions is acknowledged. The information needs of stakeholders that are more transparent and reliable in their environmental disclosure will be met by businesses that invest in environmental performance management. Environmental disclosure is a "social contract" technique, according to Cai et al. (2016); Edmans (2011); Chapple and Moon (2005), to build a positive business image and acquire credibility with the community so that sustainability will last for a long time. Due to their strong commitment to environmental issues, these demands may force businesses to implement initiatives to reduce carbon emissions, boost employee engagement, lower turnover, switch suppliers, invest in environmentally friendly products, and improve safety procedures (Ioannou and Serafeim, 2017). Therefore, the requirements for environmental disclosure might operate as a motivator for businesses to alter their managerial procedures in order to become more effective and productive (Rezaee, 2016).

4.9.5. CEO gender has a significant effect on the carbon emissions disclosure

Based on the results of the t-test output, the significance value of the CEO gender variable is 0.006, which indicates that the significance value is less significant than 0.05. This shows that the CEO gender variable has a significant effect on the carbon emission disclosure variable. This means that the hypothesis that CEO gender significantly affects carbon emission disclosures is accepted. The active involvement of women on the board can contribute to goal setting and corporate social responsibility disclosure. Based on the results of research by Hadya and Susanto (2018), gender diversity has a positive influence on CSR disclosure.

4.9.6. CEO tenure has a significant effect on the carbon emissions disclosure

Based on the results of the t-test output, the significance value of the CEO tenure variable is 0.782, which indicates that the significance value is >0.05. It shows that the CEO tenure variable has no significant effect on the carbon emission disclosure variable. It means that the CEO tenure hypothesis has a significant effect on carbon emission disclosures is rejected. Research

conducted by (Oware et al., 2020) says that CEOs with longer tenures will better understand the company's need to continue to convince shareholders of the company's responsibility to address environmental problems after its exploitation. In addition, institutional theory will force disclosure. Therefore, it is suggested that CEOs of companies with longer tenures will take less risk (Martino et al., 2020) in promoting SDG indicators and may explain the insignificant association.

4.9.7. Technology for disclosure has a significant effect on the carbon emissions disclosure

Based on the results of the t-test output, the significance value of the technology for disclosure variable is 0.000, which indicates that the significance value is less significant than 0.05. This shows that the technology for disclosure variable has a significant effect on the carbon emission disclosure variable. This means that the hypothesis that technology for disclosure significantly affects carbon emission disclosures is accepted. Media technology has an important role in communicating company information to the public, both financial performance, social aspects, and environmental aspects. This suggests that firms may be encouraged by the media to publicize their environmental sector actions in order to get the support of their stakeholders. According to research by Jannah and Muid (2014), Majid and Ghozali (2015), and Kusumah, et al. (2016), the media has an impact on disclosure of carbon emissions. The findings of this study are consistent with those findings. This shows that companies that get more attention on their activities from online media will increasingly show good company performance, especially in the environmental aspect through disclosure of carbon emissions (Ulfa and Ermaya, 2019).

5. CONCLUSION AND SUGGESTION

5.1. Conclusions

Based on the results of data analysis and discussion of this study, the conclusions generated are as follows:

1. The type of industry has no significant effect on carbon emission disclosures. It shows that companies that are included in the carbon-intensive industry do not necessarily make the entire disclosure of carbon emissions.
2. Leverage affects carbon emission disclosure. It shows that the size of the debt level will affect the contribution of the disclosure of carbon emissions.
3. Profitability has a significant positive effect on carbon emission disclosures. It shows that companies with high profitability influence their decision to disclose carbon emissions.
4. Environmental performance has a significant effect on carbon emission disclosures. It shows that the level of environmental performance affect the company's decision to disclose carbon emissions.
5. CEO gender has a significant effect on carbon emission disclosures. The active involvement of women on the board can contribute to goal setting and corporate social responsibility disclosure.
6. CEO tenure has no significant effect on carbon emission disclosure. CEOs with longer tenures will better understand the company's need to continue to convince shareholders of the company's responsibility to address environmental problems after its exploitation.
7. Technology for disclosure has a significant effect on carbon emission disclosure. This indicates that the media can encourage companies to publish their activities in the environmental sector to get a positive response from their stakeholders.

5.2. Suggestions

1. Companies are expected to increase awareness and concern for the environment, which can be demonstrated by disclosing carbon emissions.
2. Stakeholders should monitor companies in disclosing carbon emissions so that companies will be encouraged to increase disclosure of carbon emissions further.
3. For further research, it can add other variables or samples and research populations, especially from carbon-intensive industrial companies.

REFERENCES

Abu Qa'dan, M.B., Suwaidan, M.S. (2019), Board composition, ownership structure and corporate social responsibility disclosure: The case of Jordan. Social Responsibility Journal, 15(1), 28-46.

Andriyani, R., Khafid, M. (2014), Analysis of the effect of leverage, firm size and voluntary disclosure on real activity manipulation. Accounting Analysis Journal, 3(3), 273-281.

Berthelot, S., Robert, A.M. (2011), Climate change disclosures: An examination of Canadian oil and gas firms. Issues in Social and Environmental Accounting, 5(1-2), 106-123.

Bisnis.tempo.co. (2022), US Fossil Fuel Emissions Coal Increased 2021 Climate. Available from: https://www.edition.cnn.com/2022/01/10/politics/us-fossil-fuel-emissions-coal-increased-2021-climate/index.html [Last accessed on 2022 April 15].

Biswas, P.K., Mansi, M., Pandey, R. (2018), Board composition, sustainability committee and corporate social and environmental performance in Australia. Pacific Accounting Review, 30(4), 517-540.

Borghei-Ghomi, Z., & Leung, P. (2013). An Empirical Analysis of the Determinants of Greenhouse Gas Voluntary Disclosure in Australia. Accounting and Finance Research, 2(1), 110–127. https://doi.org/10.5430/afr.v2n1p110.

Burgwal, D. Van De, & Vieira, R. J. O. (2014). Environmental Disclosure Determinants in Dutch Listed Companies. R. Cont. Fin-USO Sao Paulo, 25(64), 60–78. ISSN:1808-057X.

Carpenter, K.E. and Niem, V.H. (2001). The living marine resources of the Western Central Pacific Volume 1 : Seaweeds, corals, bivalves and gastropods. FAO Species Identification Guide for Fishery purposes. Rome.

Cai, L., Cui, J., Jo, H. (2016), Corporate environmental responsibility and firm risk. Journal of Business Ethics, 139(3), 563-594.

Chapple, W., Moon, J. (2005), Corporate social responsibility (CSR) in Asia a seven-country study of CSR Web site reporting. Business and Society, 44(4), 415-441.

Chithambo, L. (2013), Firm characteristics and the voluntary disclosure of climate change and greenhouse gas emission information. International Journal of Energy and Statistics, 1(3), 155-169.

Choi, B.B., Doowon, L., Psaros, J. (2013), An analysis of Australian company carbon emission disclosures. Pacific Accounting Review, 25(1), 58-79.

Clarkson, P.M., Li, Y., Richardson, G.D., Vasvari, F.P. (2008), Revisiting the relation between environmental performance and environmental

disclosure: An empirical analysis. Accounting, Organizations and Society, 33(4-5), 303-327.
Dawkins, C., Fraas, J.W. (2011), Coming clean: The impact of environmental performance and visibility on corporate climate change disclosure. Journal of Business Ethics, 100(2), 303-322.
Edmans, A. (2011), Does the stock market fully value intangibles? Employee satisfaction and equity prices. Journal of Financial Economics, 101(3), 621-640.
Ghozali, I., Chariri, A. (2007), Accounting Theory. Vol. 3. Semarang: Diponegoro University Publishing Agency.
Ghozali, Imam. 2016. Multivariete Analysis Application With IBM SPSS 23 Program (Edition 8). VIII print. Semarang: Diponegoro University Publishing Agency.
Goldman, E., Slezak, S.L. (2006), An equilibrium model of incentive contracts in the presence of information manipulation. Journal of Financial Economics, 80(3), 603-626.
Guthrie, J., Parker, L.D. (1989), Corporate social reporting: A rebuttal of legitimacy theory. Accounting and Business Research, 19(76), 343-352.
Hadya, R., Susanto, R. (2018), Model hubungan antara keberagaman gender, pendidikan dan nationality dewan komisaris terhadap pengungkapan corporate social responsibility. Jurnal Benefita, 3(2), 149-160.
Hanafi, M.M., Halim, A. (2009), Financial Statement Analysis. 4th ed. Yogyakarta: YKPN.
Iea.org. (2022), Global CO2 Emissions Rebounded to Their Highest Level in History in 2021. Available from: https://www.iea.org/news/global-co2-emissions-rebounded-to-their-highest-level-in-history-in-2021 [Last accessed on 2022 April 15].
Ioannou, I., Serafeim, G. (2017), The Consequences of Mandatory Corporate Sustainability Reporting The Consequences of Mandatory Corporate Sustainability Reporting. Harvard Business School Research Working Paper. p11-100, 1-49.
Irmawati, D. (2011), The Influence of Size, Leverage, Profitability, and Managerial Ownership on Disclosure of Corporate Social Responsibility (Corporate Social Responsibility). Thesis. Semarang: Semarang State University.
Jaggi, B., Freedman, M., Martin, C. (2011), Global warming, Kyoto protocol, and the need for corporate pollution disclosure in India: A case study. International Journal of Business, Humanities and Technology, 1(3), 78-89.
Jannah, R., Muid, D. (2014), Analysis of factors affecting carbon emission disclosure in companies in Indonesia (empirical study on companies listed on the Indonesia stock exchange 2010-2012 period). Diponegoro Journal of Accounting, 3(2), 1-11.
Jensen, M.C., Meckling, W.H. (1976), Theory of firm: Managerial behavior, agency cost and ownership structure. Journal of Financial Economics, 3(4), 305-360.
Kesuma, A. (2009), Analysis of factors affecting capital structure and its influence on share prices of real estate companies that go public on the Indonesia stock exchange. Journal of Management and Entrepreneurship, 11(1), 38-45.
Kusumah, R.W.R., Manurung, D.T.H., Oktari, S.D., Husnatarina, F. (2016), Analysis of Factors Affecting Carbon Emission Disclosure (An Empirical Study at Companies Registered with Sustainability Reporting Award 2015). In: 8t Widyatama International Seminar on Sustainability.
Kasmir. (2008). Analysis of Financial Statements. First Edition. Jakarta. Rajawali Press.
Lewis, B.W., Walls, J.L., Dowell, G.W. (2014), Difference in degrees: CEO characteristics and firm environmental disclosure. Strategic Management Journal, 35, 712-722.
Li, F., Li, T., Minor, D. (2016), CEO power, corporate social responsibility, and firm value: A test of agency theory. International Journal of Managerial Finance, 12(5), 611-628.
Liao, L., Luo, L., Tang, Q. (2014), Gender diversity, board independence, environmental committee and greenhouse gas disclosure. The British Accounting Review, 30, 1-16.
Linggasari, Elsa. 2015. Pengaruh Karakteristik Perusahaan Terhadap Carbon Emission Disclosure (Studi pada Perusahaan Manufaktur yang Terdaftar di Bursa Efek Indonesia Periode 2011-2013). Diponegoro Journal of Accounting. 8(2). 1-18.
Luo, L., Tang, Q., Lan, Y.C. (2012), Corporate incentives to disclosure carbon information: Evidence from CDP global 500 report. Journal of International Financial Management and Accounting, 23(2), 93-120.
Luo, L., Tang, Q., Lan, Y.C. (2013), Comparison of propensity for carbon disclosure between developing and developed countries. Accounting Research Journal, 26(1), 6-34.
Majid, R.A., Ghozali, I. (2015), Analisis faktor-faktor yang mempengaruhi pengungkapan emisi gas rumah kaca pada perusahaan di Indonesia. Journal of Accounting, 4(4), 381-391.
Martinez, L.H. (2005), Post industrial revolution human activity and climate change: Why the United States must implement mandatory limits on industrial greenhouse gas emissions. Journal of Land Use, 20, 407-426.
Martino, P., Rigolini, A., D'Onza, G. (2020), The relationships between CEO characteristics and strategic risk-taking in family firms. Journal of Risk Research, 23(1), 95-116.
Meiryani., Shi-Ming Huang., ASL Lindawati., Agung Purnomo., Mochammad Fahlevi., Gazali Salim. (2023). Corporate Energy Management Disclosure : Empirical Evidence from Indonesia Stock Exchange. International Journal of Energy Economics and Policy. 13 (2), 516-525.
Ministry of Energy and Mineral Resources. (2013), Study of Energy Sector Greenhouse Gas Emission Inventory. Available from: http://www.prokum.esdm.go.id/publikasi/hasil%20kajian/tahun%202013/esdm%20grk%20final.pdf
Mujiyono, Nany, M. (2010), Effect of leverage, public shares, size and audit committee on the area of voluntary disclosure. Journal of Accounting Dynamics, 2(2), 129-134.
Munawir, S. (2012), Analysis of Financial Statements. Yogyakarta: Liberty.
Munif, A.Z., Prabowo, T.J.W. (2010), Faktor-Faktor Yang Mempengaruhi Indeks Pengungkapan Corporate Social Responsibility Di Indonesia (Studi Empiris Pada Perusahaan Non Keuangan Yang Listing di BEI), Skripsi. Semarang: Universitas Diponegoro.
Naseem, M.A., Riaz, S., Ur Rehman, R., Ikram, A., Malik, F. (2017), Impact of board characteristics on corporate social responsibility disclosure. Journal of Applied Business Research, 33(4), 799-808.
Nugraha, Gilang (2015) Guide to Basic Hematology Laboratory Examination. Jakarta: CV Trans Info Medika.
Nugraheni, Yekti Leo., Hartomo, Digdo O., and Pattworo, Harry P. 2002. Analysis of the Influence of Company Fundamental Factors on the Completeness of Financial Statements. Journal of Economics and Business Vol VIII. No. 1. Pp. 75-91.
Oware, K.M., Awunyo-Vitor, D. (2021), CEO characteristics and environmental disclosure of listed firms in an emerging economy: Does sustainability reporting format matter? Business Strategy & Development, 4(4), 399-410.
Pasaribu A, Firmansyah and Idris N. (2015). Analysis of Factors Influencing Dairy Cow Milk Production in Karo District, North Sumatra Province. Journal of Animal Husbandry Sciences Vol. XVIII No. 1: May 2015.
Prafitri, A., and Zulaikha. 2016. Greenhouse Gas Emission Disclosure Analysis. Journal of Accounting and Auditing, 13(1), 94114. https://ejournal.undip.ac.id/index.php/akuditi/article/view/13870.

Pennington, D.W., Pottingb, J., Finnveden, G. (2004), Life cycle assessment Part 2: Current impact assessment practice. Environment International, 30(5), 721-739.

Pratiwi, L., Maharani, B., Sayekti, Y. (2021), Determinants of carbon emission disclosure: An empirical study on Indonesian manufacturing companies. The Indonesian Accounting Review, 11, 197-207.

Rezaee, Z. (2016), Business sustainability research: A theoretical and integrated perspective. Journal of Accounting Literature, 36, 48-64.

Shen, W. (2003), The dynamics of the CEO-board relationship: An evolutionary perspective. The Academy of Management Review, 28(3), 466-476.

Simamora, H. (2000), Accounting: Business Decision Making Base, First Printing. Jakarta: Salemba Four.

Stolyarova, 2013. Carbon Dioxide Emissions, Economic Growth and Energy Mix: Empirical Evidence from 93 Countries. 9 (2). 78-88.

Suhardjanto, D., Choiriyah, U. (2010), Information GAP: Demand Supply carbon emission disclosure in Indonesia. Jurnal Keuangan dan Perbankan, 14(1), 36-51.

Suratno, I.B., Mutmainah, S. (2006), The influence of environmental performance on environmental disclosure and economic performance. Proceedings of SNA 9 Padang, 10(2), 1-20.

Trenberth, Houghton, and Filho. (2003). "The Climate Change System: an overview. In: Climate Change 2003, The Science of Climate Change." Contribution of Working Group I to the 2nd Assessment Report of the Intergovernmental Panel on Climate Change.

Ulfa, F. N. A., & Ermaya, H. N. L. (2019). Effect of Exposure Media, Environmental Performance and Industrial Type on Carbon Emission Disclosure. Pamulang University Scientific Journal of Accounting, 7(2), 149-158.

Wibisono, Y. (2013), Dissect the Concept and Application of CSR. Gresik: Fascho Publishing.

Yao, S., Wang, J., Song, L. (2011), Determinants of Social Responsibility Disclosure by Chinese Firms, Discussion Paper 72. United Kingdom: The University of Nottingham, China Policy Institute. p1-30.