



The Effect of Company Size and Independent Commissioner Composition on Carbon Emissions Disclosure Before and After the Carbon Tax Regulation News

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Abstract

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This study aims to evaluate the influence of company size and the composition of independent commissioners on the level of carbon emissions disclosure. The research subjects include companies in the energy, transportation, and construction sectors in Indonesia. The sample consists of 19 companies listed on the Indonesia Stock Exchange (IDX) during the period 2018–2023, with a total of 114 annual observations. The sample selection was conducted using purposive sampling. The analysis methods employed include multiple linear regression and paired sample t-tests, with data processing conducted using SPSS software version 25.0. The multiple linear regression test was supplemented with descriptive statistical analysis, classical assumption tests, and hypothesis testing, while the paired t-test was accompanied by normality and homogeneity tests. The research findings indicate that company size and the composition of independent commissioners significantly influence carbon emissions disclosure, both before and after the announcement of carbon tax regulations. Additionally, there are significant differences in the level of emissions disclosure between the periods before and after the announcement of such regulations.

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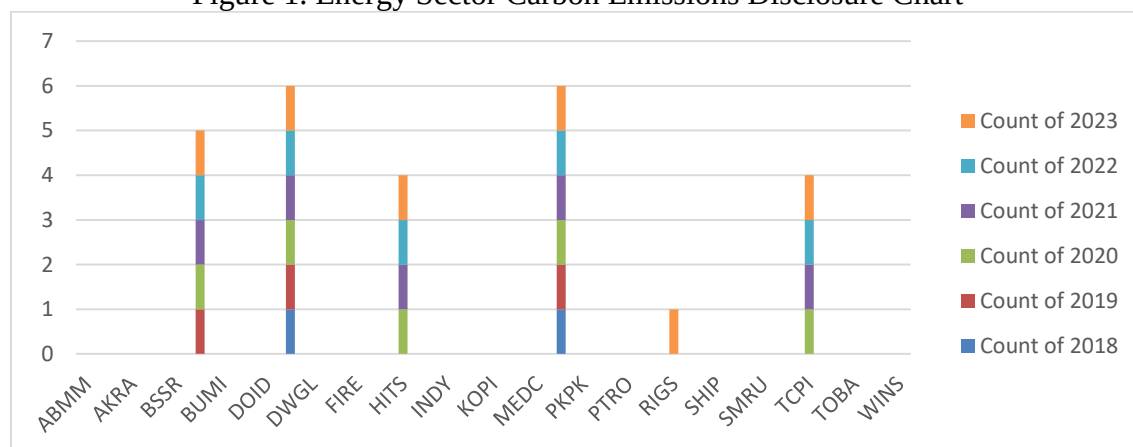
INTRODUCTION

Climate change is a significant global environmental issue, including in Indonesia. BMKG data (2021) shows rainfall anomalies and extreme temperatures, with maximum temperatures reaching 38°C in 2023. These conditions impact public health and are exacerbated by air pollution. Global warming is mainly triggered by carbon emissions

(CO₂) due to anthropogenic activities such as fossil fuel combustion and deforestation (Houghton, 2005). The IPCC report by Calvin et al., (2023) mentions a global temperature increase of 1.1°C compared to the pre-industrial era, with projections that it could exceed the safe threshold of 2°C without serious mitigation efforts (BBC Indonesia, 2009). The increase in carbon emissions that continues to occur from year to year reinforces the trend of increasing global temperatures. The greater the volume of emissions, the higher the Earth's temperature.

Indonesia's commitment to emissions control is reflected in Presidential Regulation No. 61/2011 (RAN-GRK), which targets a 26% reduction in emissions independently and up to 41% with international support from the 2020 BAU scenario. PSAK No. 1 (revised 2019) encourages companies with significant environmental impacts to prepare sustainability reports, but disclosure of carbon emissions is still minimal and voluntary. In the energy sector, only 6 out of 37 companies (2018-2023) report carbon emissions.

Figure 1. Energy Sector Carbon Emissions Disclosure Chart



Source: Data processed by researcher (2024)

According to Berthelot & Robert, (2011) emissions disclosure aims to gain legitimacy and avoid risk. Although high costs are an obstacle, the trend shows that companies are starting to adapt. The Chairman of APBI, Pandu Sjahir, emphasized the importance of technologies such as Carbon Capture Utilization Storage (CCUS) and renewable energy. APBI is also working on carbon trading and carbon credit schemes to support the net zero emissions target in the next 2-3 years. In terms of regulation, Article 13 paragraph 5 of the HPP Law states that carbon tax is imposed on activities with emissions, with the basis of imposition in the form of the amount of emissions measured in Assigned Amount Units (AAU). This provision shows the Indonesian government's concrete efforts to control carbon emissions. This study examines the influence of company size and the composition of independent commissioners on the disclosure of carbon emissions, based on the legitimacy theory that large companies tend to be more transparent to fulfill social responsibility.

Many factors can influence the disclosure of carbon emissions, namely the first is company size. Companies with large assets are generally considered as large companies because they have strong financial capacity, wider access to capital markets, and better ability to obtain funding (Sartono, 2001). It is said that company size can affect the level of carbon emissions. The larger the company, the higher the potential emissions

generated, resulting in pressure to demonstrate environmental responsibility through disclosure of carbon emissions (Akbaş & Canikli, 2019; Widhya & Saptiwi, 2019).

Second, the composition of commissioners plays a role in encouraging the implementation of good corporate governance principles, especially in ensuring transparency, accountability, and the interests of all stakeholders (Sulistyanto, 2018). An adequate composition of independent commissioners is believed to be able to increase the credibility of the company, especially through disclosure in annual reports and sustainability (Roman Cahaya, 2011; Trufvisa & Ardiyanto, 2019).

The research is different from previous studies, because in this study researchers conducted two tests at once, namely multiple regression analysis and paired sample t-test. In addition, the selection of years varies, three years before and three years after the news of the carbon tax regulation. Therefore, this research is expected to provide better, comprehensive, and updated results with current environmental trends or needs.

LITERATURE REVIEW

Legitimation Theory

Legitimacy theory is widely used to explain why companies voluntarily disclose environmental information (Pellegrino & Lodhia, 2012). This theory states that companies must align their activities with the values, norms, and expectations of society in order to gain sustainable social support. According to Widhya & Saptiwi, (2019), legitimacy is built through a social contract between companies and society, in which society grants permission for the use of resources with the expectation that companies will conduct their activities in accordance with prevailing social norms.

Carbon Emission Disclosure

Sari & Budiasih, (2022) explains that carbon emission disclosure is evaluating the carbon emissions generated by the organization and setting emission reduction goals. Carbon emissions are the release of greenhouse gases into the atmosphere, mainly due to human activities such as the burning of fossil fuels in the industrial sector (Martinez L., 2005). These gases include CO₂, CH₄, N₂O, HFCs, PFCs, and SF₆, with carbon dioxide (CO₂) being the largest contributor, accounting for about 67% of total global emissions (Fernando & Hor, 2017). This increase in emissions has a major impact on global warming and ozone destruction, encouraging companies, especially large emitters, to strengthen their commitment to sustainability. One form is sustainability reporting as a form of environmental transparency and accountability. In this study, carbon emission disclosure is measured using the results of the Carbon Emission Disclosure (CED) percentage, because the calculation using the CED checklist system is expected to describe the company's transparency in disclosing carbon emissions. In other words, the high CED score reflects the company's level of transparency in disclosing carbon emission information in the annual or sustainability report (Darus et al., 2019).

$$CED = \frac{\text{Number of items disclosed}}{\text{Total disclosure index}} \times 100\%$$

Company Size

According to Gayatri & Suputra, (2013) Company size reflects the level of development and operational scale of a business entity, which is generally measured by indicators such as total assets, sales volume, or stock market value. Companies with large assets are generally considered large companies because they have strong financial capacity, broader access to capital markets, and better ability to obtain funding (Sartono, 2001). With reference to various views, the firm size variable in this study is measured using the natural logarithm of total assets, because total assets are considered the most representative indicator to describe the financial capacity and scale of the company (Asnawi & Wijaya, 2005).

$$Ln = (\text{Total Company Size Asset})$$

Independent Commissioner Composition

Independent commissioners are external parties who have no affiliation with management and are tasked with overseeing the company's governance. According to Sulistyanto, (2018) disclosed that they play a role in promoting the implementation of good corporate governance principles, particularly in ensuring transparency, accountability, and the interests of all stakeholders. In accordance with the provisions, at least 30% of members of the board of commissioners must be independent (Samsul, 2006). Independent Commissioner Composition is measured using a ratio scale through the number of independent commissioners divided by the total number of commissioners. As their presence is important for maintaining objectivity, the measurement of Board of Independent Commissioners Proportion (BINDP) is considered more accurate and relevant than other measurement tools (Rifai, 2009).

$$\text{BINDP} = \frac{\text{Number of Independent Commissioners}}{\text{Total number of Commissioners}} \times 100\%$$

The Effect of Company Size on Carbon Emissions Disclosure

Freedman & Jaggi, (2005) examines that large companies are considered to have sufficient resources to bear the costs of pollution control and greenhouse gas reporting. Disclosure of carbon emissions refers to the reporting of carbon emissions to the atmosphere generated by the combustion of fossil fuels (Ecolife, 2022). Like research Akbaş & Canikli, (2019); Widhya & Saptiwi, (2019), states that there is a positive relationship between company size and disclosure of carbon emissions where in his research it is said that company size affects the disclosure of carbon emissions.

H1: Company size has a positive effect on disclosure of carbon emissions

Effect of Independent Commissioner Composition on Carbon Emission Disclosure

According to Jizi et al., (2014) the role of independent commissioners is not only focused on achieving profits, but also on increasing company value in the long term through strengthening transparency and information disclosure. This statement is supported by research Liao et al., (2014); Yunus et al., (2015), which shows that the

greater the composition of independent commissioners in a company, it can be proven that with a significant influence for companies in disclosing carbon emissions.

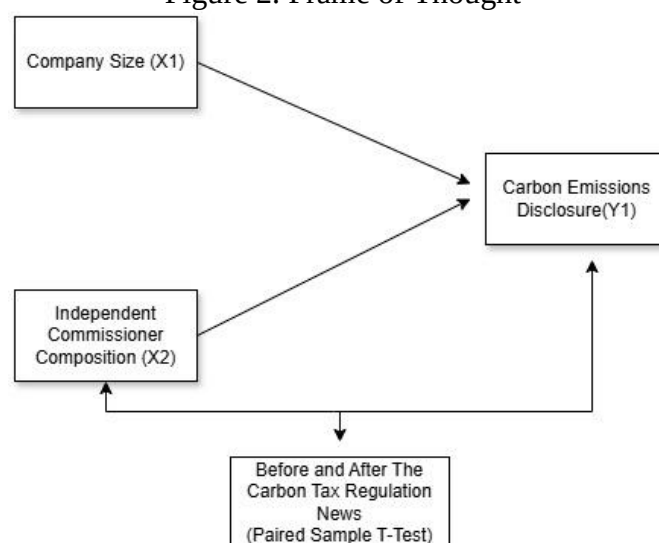
H2: Independent Commissioner Composition has a positive effect on carbon emission disclosure

Comparison of Carbon Emissions Disclosure Before and After the Carbon Tax Regulation News

According to Frankovic & Kolb, (2024) rising carbon prices provide an incentive for companies to reduce emissions. Adequate emissions disclosure also plays a role in reducing the cost of transitioning to a green economy. In line with that, Salmahabi Alliandra Putri et al., (2024) found that large-scale companies are more capable of building a reliable emissions reporting system, so they are more motivated to make accurate disclosures. Based on these assumptions, the hypothesis formulated is as follows. H3: Carbon Emissions Disclosure has a higher difference after the news of Carbon Tax Regulation.

Based on the development of the hypothesis above, a framework of thought was formed in this study which is described in the following.

Figure 2. Frame of Thought



Source: Data processed by researcher (2024)

METHODS

This research uses a quantitative approach with the method applied is causal and comparative research. Causal research aims to determine the effect or relationship between two or more variables (Sugiyono, 2014). The application is to examine the effect of company size and the composition of independent commissioners on the disclosure of carbon emissions. While comparative research aims to determine the comparison of the existence of one or more variables in two or more different samples, or at different times. The application, namely before and after the implementation of carbon tax on energy, transportation and construction sector companies on the IDX for the 2018-2023 period. The population in this study includes energy, transportation, and construction sector companies listed on the Indonesia Stock Exchange (IDX) in the 2018-2023 period that

show environmental concerns (Darus et al., 2019). From this population, nineteen companies met the criteria and consistently submitted annual or sustainability reports, so the total data was 114 data. The criteria that must be met in sampling are as follows:

Table 1. Criteria for Sample Selection

No.	Sampling Criteria	Total
1	BEI energy, transportation, and construction sector companies above 2017	107
2	Companies with incomplete annual reports	(48)
3	No data available on carbon emissions disclosure	(40)
4	Number of Company Samples	19
5	Observation Period (2018–2023)	6 years
	Number of Research Sample Data (19 companies x 6 Years)	36

Source: Indonesia Stock Exchange (2025)

RESULT AND DISCUSSION

Result

Before testing hypotheses 1 and 2, all variables in this study first went through the classic assumption test stage. This test aims to ensure that the data used is free from violations of classical assumptions, so that the model obtained can be declared suitable for analysis (Ghozali, 2018). The classic assumption test includes testing normality, multicollinearity, autocorrelation, and heteroscedasticity (Sekaran & Bougie, 2016).

Table 2. Descriptive Statistics Test Results

	Descriptive Statistics				
	N	Min	Max	Mean	Std. Deviation
Company Size	114	14.56	32.45	23.516	5.52895
Independent Commissioners Composition	114	0.17	1.00	0.4497	0.13581
Carbon Emission Disclosure	114	0.00	0.89	0.4833	0.31097
Valid N (listwise)	114				

Source: Researchers' Data Processing Results (2025)

Statistical test results show the relationship between variables in describing data using measures such as average, standard deviation, variance, maximum and minimum values, sum, range, kurtosis, and skewness Ghozali & Ratmono, (2017) The company size variable shows a minimum number of 14.56 owned by PT Acset Indonusa Tbk in 2022, illustrating the low total assets of the company in that period. Meanwhile, the maximum number, namely 32.45, was obtained by PT Waskita Karya Tbk in 2018, which was caused by a significant increase in operating income so that it had an impact on total assets.

The independent commissioner composition variable shows a minimum value of 0.17, each documented in PT Rig Tenders Indonesia Tbk in 2021, PT Surya Semesta Internusa Tbk, and PT Total Bangun Persada Tbk in 2019, which reflects the low percentage of independent commissioners in the board of commissioners structure. The maximum value of 1.00 by PT Humpuss Intermoda Transportasi Tbk in 2023, where all members of the board of commissioners are independent commissioners.

The carbon emission disclosure variable has a minimum standard value of 0.00, achieved by PT Jaya Trishindo Tbk in 2018 because it did not disclose any of the 18

indicators measured, so its CED value is ranked the lowest. The maximum value of 0.89 was achieved by PT Dian Swastatika Sentosa Tbk (2022-2023), PT Perusahaan Gas Negara Tbk (2022-2023), PT Garuda Indonesia Tbk (2023), and PT Pembangunan Perumahan Tbk (2019-2023) with a total of 16 disclosure items fulfilled, reflecting a high level of compliance and transparency.

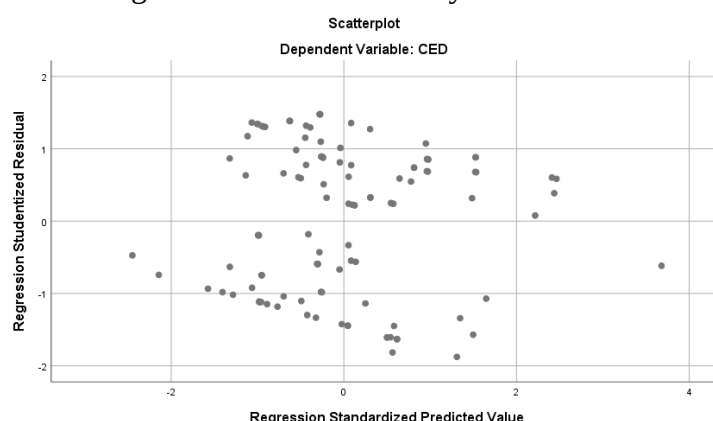
Table 3. Classical Assumption Test

Model	Multicollinearity Test	
	Tolerance	VIF
Company Size	0.976	1.025
Independent Commissioner Composition	0.976	1.025
Carbon Emissions Disclosure		
Auticorrelation Test (Run Test) : 0.924		
Asym. Sig. (2-tailed) Normality : 0.200		

Source: Researchers' Data Processing Results (2025)

Based on the results of the classic assumption test table 3 show that the Asymp.Sig.of the One-Sample Kolmogorov-Smirnov test is 0.200,, which exceeds the significance threshold of 0.05.

Figure 3. Heteroscedasticity Test



Source: Researchers' Data Processing Results (2025)

In the results of other assumption test, namely the heteroscedasticity test, it is considered free from heteroscedasticity because the points spread which can be seen through the scatter plot image above. Thus, it can be concluded the data in this study are normally distributed. In addition, the data has also met the requirements of the autocorrelation and multicollinearity tests, so it is suitable for use in further regression analysis.

Table 4. Model Fit Test Results

Model	B	Uji t
Constant	0.106	0.000
Company Size	0.001	0.000
Independent Commissioner Composition	0.699	0.001
Sig F Test	0.004	
R Square	0.955	
Carbon Emissions Disclosure		

Source: Researches's Data Processing Results (2025)

Based on Table. 4, the model feasibility test results show an R Square value of 95.5%, which indicates that the independent variables are able to explain the dependent variable by 95.5%, while the remaining 4.5% is influenced by other factors outside the model. The F statistical test results in a significance value of 0.0004, which is smaller than 0.05, so it can be concluded that Company Size and Independent Commissioner Composition simultaneously have a significant effect on Carbon Emissions Disclosure. In addition, the t-test results show that all independent variables have a significance value below 0.05, which means that all hypotheses in this study can be accepted.

Anaalysis Model Equation

$$\text{Carbon Emissions Disclosure} = 0.106 + 0.001X1 + 0.699X2 + e \quad (1)$$

Baes on the results in the Table 3, it can be concluded that if there is no influence from the independent variables, the initial value of Carbon Emissions Disclosure is 0.106. Each one-unit increase in the Company Size variable will lead to an increase in Carbon Emissions Disclosure by 0.001. Meanwhile, a one-unit increase in the Independent Commissioner Composition variable will lead to an increase in the value of Carbon Emissions Disclosure by 0.699.

After testing hypotheses 1 and 2, researches will conduct the next test, namely the paires sample t-test to answer hypotheses 3. The paired sample t-test is applied to assess whether there is a significant difference in the value before and after a certain treatment. In the research context, the test is used to compare conditions before and after the implementation of certain policies, and the test results are presented in the following table.

Table 5. Uji Paired Sample T-Test

Model	Paired Sample Statistics Mean
Carbon Emissions Disclosure Pre Test	0.2854
Carbon Emissions Disclosure Post Test	0.6812
Asym. Sig. (2-tailed) Carbon Emissions Disclosure Pre-Post – Carbon Emissions Disclosure Post Test : 0.000	
Homogeneity Test (Bartlett Test) : 0.098	
Asym. Sig. (2-tailed) Wilcoxon Test: 0.000	

Source: Researches's Data Processing Results (2025)

Based on table 5 of the paired sample t-test results, it can be seen that the Wilcoxon test results, it can be seen that the Wilcoxon test results provide an asymp. Sig of 0.000 or smaller than 0.05 or 5% so it can be concluded that the data in the study are normally distribued. For the next test, the research has passed the Bartlett test, which is 0.098 greater than 0.05, which means that the group data variance is homogeneous.

Analysis Model Equation

$$H_a : \mu_1 \neq \mu_2$$

Based on the results of the Paired Sample t-test, it is known that the significance value of 0.000 or smaller than $\alpha = 0,05$, which means that there is a significant difference between the disclosure of carbon emissions before and after the carbon tax regulation news. The average disclosure of carbon emissions increased from 0.2854 before the policy was announced to 0.6812 afterward. This shows that companies started to increase their transparency and reporting of carbon emissions as a form of anticipation or response to the government's policy direction on carbon tax. Thus, the alternative hypothesis (H_a) is accepted, and it can be concluded that the news of carbon tax regulation has an impact on increasing carbon emission disclosure.

Discussion

The Effect of Company Size on Carbon Emissions Disclosure

The results show that the size of a company has a positive influence on the level of disclosure of carbon emissions. Company size is measured by total assets, sales level, and stock market value. Large companies generally have sufficient resources to bear the costs associated with reducing pollution sources and disclosing greenhouse gas emissions (Freedman & Jaggi, 2005). Disclosure of carbon emissions refers to the reporting of carbon emissions to the atmosphere resulting from the combustion of fossil fuels (Ecolife, 2022). Thus, the larger the size of a company, the higher the tendency to make such disclosures.

This result is reinforced by the research of Jannah & Muid, (2014), which shows a significant impact of the size of a company on the disclosure of carbon emissions.

Effect of Independent Commissioner Composition on Carbon Emission Disclosure

The results showed that the composition of independent commissioners in terms of a significant positive effect on the level of disclosure of carbon emissions. In other words, the greater the percentage of independent commissioners in a company, the result is that the company's tendency to disclose carbon emissions also increases. According to Dharmawan Krisna & Suhardianto, (2016) states that the increasing number of commissioners in the company structure will strengthen the monitoring function and encourage the implementation of activities that add value to the company. One form of corporate transparency is by submitting reports related to greenhouse gas (GHG) emissions, which can be an important consideration for stakeholders such as investors and creditors.

The findings in this study reinforce the results of existing studies by Liao et al., (2014); Yunus et al., (2015) showing that a large proportion of independent commissioners in a company, so also has a large influence on the disclosure of carbon emissions.

Comparison of Carbon Emissions Disclosure Before and After the Carbon Tax Regulation

The results showed a significant difference. This finding indicates that after the news of carbon tax implementation, companies have a tendency to actively and openly disclose information related to carbon gas emissions compared to the previous period. In the long run, the implementation of carbon tax is expected to stimulate companies to innovate in environmentally friendly technology. This not only contributes to emission reductions, but also strengthens the prospects for sustainable economic growth.

The results are in accordance with the research of Salmahabi Alliandra Putri et al., (2024) by stating that large-scale companies tend to have more and stronger financial

capabilities. Thus, they are able to invest in a more integrated and accurate emissions reporting system. This makes these companies more encouraged to submit carbon emission information more systematically and transparently.

CONCLUSION

The size of a company has a significant positive influence on the disclosure of carbon emissions. The larger the size of the company, the more activities carried out by the company, the more carbon emissions are generated, so the company will tend to disclose carbon emissions. Likewise, the composition of independent commissioners has a very significant positive influence on the disclosure of carbon gas emissions. The more composition or number of independent commissioners, the more active management is in disclosing carbon emissions. Then, the disclosure of carbon emissions has a significant value, which means that there are differences both before and after the carbon tax regulation. The existence of carbon tax regulations can trigger companies to actively participate in disclosing carbon emissions.

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