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## Carbon Emissions Disclosure as Mechanism to Increase Environmental Performance and Control of Idiosyncratic Risk: How They Impact Firm Value

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**Abstract:** This research attempts to investigate the predictive effect of carbon emissions disclosure on firm value both directly and through environmental performance and idiosyncratic risk. With data collected from all non-financial high-profile companies listed on the Indonesia Stock Exchange and testing through path analysis, findings reveal that carbon emissions disclosure has a positive significant effect on environmental performance, but not on idiosyncratic risk and firm value. Further statistics testing showed that both idiosyncratic risk and environmental performance have a positive and significant effect on firm value. We also used Sobel testing to test mediation role of environmental performance and idiosyncratic risk on the effect of carbon emissions disclosure on firm value. The results show that environmental performance plays a mediating role whereas idiosyncratic risk does not. The implications of this research study are discussed from both theoretical and managerial perspectives.

**Keywords:** carbon emissions disclosure, environmental performance, firm value, idiosyncratic risk.

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## INTRODUCTION

In today's competitive business environment, corporate sustainability and firm value have become more strategically significant. Maximizing firm value is extremely important for the company, because by maximizing firm value means also maximizing the prosperity of shareholders who are important things to be achieved by the management of the company. Maximizing shareholder prosperity can be translated into maximizing the stock price of the company (Ronald et al., 2019). High company value is an achievement for company owners, because with high company value will be followed by high shareholder prosperity. However, maximizing the prosperity of shareholders, a company does not only focus on maximizing profitability at the expense of the environment or society (Lazonick & O'sullivan, 2000).



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Gray et al. (1987) revealed that the growing public awareness of the company's role in the community gave birth to criticism because the activity of the company creates pollution and waste so that the company has no sense of responsibility and awareness of the environment will lower community confidence. Regulations issued by the Indonesian government such as article 4 Presidential decree No. 61 year 2011, mention that the business actors also participate in the efforts to reduce greenhouse gas emissions. Kuo et al. (2012) stated that efforts to reduce carbon emissions made by the company as a form of corporate social responsibility in the environmental sphere can be known from the carbon emission disclosure.

The disclosure of carbon emissions in Indonesia is still voluntary disclosure and practice is still uncommon by business entities. The lack of disclosure of carbon emissions can decrease community confidence. Carbon emissions disclosures can benefit the company because investors tend to invest in companies having good business ethics, good employee practices, care for environmental impacts, and have the responsibility of corporate social responsibility with stakeholders (Patten, 1990, 2002; Plumlee et al., 2015) showing that greenhouse gas emissions disclosures positively affect firm value. However, the research results of Stanny and Ely (2008) and Matsumura et al. (2014) show a negative connection between the disclosure of carbon emissions using carbon disclosure project (CDP) data and the stock price of the company.

Dialogue relations between corporations and stakeholders can be built through the disclosure of carbon emissions (Adam & McNicholas, 2007). Developing the trust of corporate stakeholders through environmental disclosure can assist to reduce idiosyncratic risk (Hasseldine et al., 2005). Benlemlih and Girerd (2017) and Jo and Na (2012) show high corporate social responsibility (CSR) disclosure will lower idiosyncratic risk. However, Humphrey et al. (2012) did not find any CSR relations against idiosyncratic risk.

The disclosure of carbon emissions that can develop trust with corporate stakeholders can assist to reduce idiosyncratic risk potentially arising from the company's own community conflicts (Hasseldine et al., 2005). Developing the trust of stakeholders will build a better company's reputation to impact the company's value (Daromes & Gunawan, 2020; Little & Little, 2000). Naomi (2011) suggests that idiosyncratic risk as measured by Fama-French three-factor models has a positive return on stock. However, Murhadi (2013) indicates a negative relationship between idiosyncratic risk as measured by the capital asset pricing model (CAPM) on the return of shares.

A research study on environmental performance and carbon emissions disclosure has been conducted by Saka and Oshika (2014), which suggests that environmental performance has no influence on the disclosure of carbon emissions. According to Verrecchia (1983) with discretionary disclosure explaining that good environmental actors believe that expressing their performance means describing good news for market participants. However, Qian and Schaltegger (2017), stating that previous studies focusing on good environmental performance would be expressed by the company, while poor environmental performance would be less disclosed or undisclosed at all.

Clarkson et al. (2010) expressed that a voluntary disclosure of the environment is crucial for investors to assess the operating impact and environmental performance of the company in the future. Disclosure will provide insight to investors to assess the company through accurate assessment of the company's environmental risks. Patten (2002) shows the results of a negative carbon emissions disclosure against the company's environmental performance. But the research results of Tang and Luo (2014) and Qian and Schaltegger (2017) showed that carbon emissions disclosure could improve the company's environmental performance.

Companies having a high level of environmental performance will be positively responded by investors through the increase in the company's share price (Almilia & Wijayanto, 2007). Hariati and Rihatiningtyas (2015) and Anggreini (2015) show positive environmental performance results against the company's value. However, Pratiwi and Setyoningsih (2014) demonstrated environmental performance had no effect on the company's

value. Hariati and Rihatiningtyas (2015) stated that a company, which is obedient in conducting environmental management is one of the factors encouraging investors to invest in a company with good environmental performance, thereby impacting firm's value improvement.

This study is a development of the research by Plumlee et al. (2015), which examines the disclosure of carbon emissions, environmental performance to the company's value. However, this study focuses on disclosing carbon emissions and the addition of two intermediate variables, namely idiosyncratic risk and environmental performance toward the company's value. The difference with Plumlee et al. (2015) lies in the use of carbon emissions disclosure variables as independent variables with the consideration of high carbon emissions disclosures can boost the company's environmental performance increases (Qian & Schaltegger, 2017).

## METHODS

Population is the total number of groups of individuals that will be examined and investigated. The population in this study is non-financial high-profile companies listed on the Indonesia Stock Exchange (IDX) during the 2013–2017 period. The data required is an annual report issued by the company for 2013–2017.

The sample is part of the population that is considered to represent its characteristics. The sample used in this study was selected using the purposive sampling method. This method selects research samples that meet certain criteria in accordance with the research objectives. The criteria used to determine the sample are as follows:

- (1) Non-financial high-profile companies listed continuously on the IDX during the 2013–2017 period and have a closing date on December 31.
- (2) During the period of 2013–2017 the company issued a complete annual report and in rupiah currency.
- (3) The company issues policies related to carbon/greenhouse gas emissions or disclose carbon emissions disclosure items.

The type of data used in this study is documentary data, namely non-financial high-profile companies on the IDX which published annual reports for the period 2013–2017. The data source used in this study is secondary data. Secondary data is data obtained indirectly through intermediary media obtained and recorded by other parties. In this study, data sources came from the IDX ([www.idx.co.id](http://www.idx.co.id)), IPOT, and the Ministry of Environment ([www.menlh.go.id](http://www.menlh.go.id)).

Carbon emission disclosures are disclosures to assess an organization's carbon emissions and set targets for reducing these emissions. The area of carbon emission disclosure items was measured using an index developed by Choi et al. (2013) constructed from a CDP request sheet. If the company discloses the items in accordance with what is determined, it will be given a score of 1, whereas if the specified item is not disclosed, it will be given a score of 0. Then the score of 1 is totaled and divided by the maximum number of items, which can be disclosed and then multiplied by 100%. Thus, the carbon emission disclosure formula developed in this study is

$$CED = \left( \frac{\sum di}{M} \right) \times 100\%$$

Information:

CED is the carbon emission disclosure,  $\sum di$  is the total overall score of 1 obtained by the company, and  $M$  is the maximum total items that can be disclosed (18 items).

Idiosyncratic risk is a specific risk for each company, therefore its movement is independent of market movements (Naomi, 2011). Goyal and Santa Clara (2003) state that idiosyncratic risk reflects specific information about the company and will fluctuate according to the information itself. This study uses an idiosyncratic risk measurement three-factor model developed by Fama and French (1993). The three factors Fama and French are beta, measured by market capitalization and book to market ratio. If sensitivity to three factors, namely  $\beta_i$ ,  $s_i$ ,  $h_i$  shows that all variations in the expected rate of return then  $\alpha$  is 0 (zero) for all securities and portfolios  $i$  (Fama & French, 1993). Thus, the formula Fama and French idiosyncratic risk three-factor models can be seen from the following equation:

$$R_{it} - R_{ft} = \alpha_i + \beta_{iM}(R_{Mt} - R_{ft}) + s_i \text{SMB}_t + h_i \text{HML}_t + e_{it}$$

Information:

$R_{it}$  is the stock return  $i$  in period  $t$ ,  $R_{ft}$  is the risk-free rate for period  $t$ ,  $\alpha_i$  is a constant,  $R_{Mt}$  is the market return in period  $t$ ,  $\text{SMB}_t$  is the difference between the return on small capitalized shares (small size) with large capitalized stocks (big size) in period  $t$ ,  $\text{HML}_t$  is the return difference on portfolios that have a high books-to-market ratio with a low book-to-market ratio in period  $t$ , and  $e_{it}$  is the error term.

According to Suratno et al. (2007), environmental performance is the company's performance in creating a good environment (green). The company's environmental performance is measured by the company's achievements following the PROPER program, which is one of the efforts made by the Ministry of Environment (KLH) to encourage corporate governance in environmental management through information instruments. Through PROPER, the company's environmental performance is measured using colors, ranging from the best gold, green, blue, red, to the worst black.

Firm value is the value that can be determined from the comparison of the results of company performance, firm value is seen from the maximization of shareholder wealth intended to maximize the company's stock price. The firm value used in this study was measured using Tobin's Q, which has been modified by Gaio and Raposo (2011) in the form of a Simple Q. The calculation formula is as follows:

$$Q_{it} = \frac{BVA_{i,t} + MVE_{i,t} - BVE_{i,t}}{BVA_{i,t}}$$

Information:

$Q_{i,t}$  is the value of Tobin's Q for company  $i$  in year  $t$ ,  $BVA_{i,t}$  is the book value of total assets for company  $i$  in year  $t$ ,  $MVE_{i,t}$  is the market value of equity for company  $i$  in year  $t$ , and  $BVE_{i,t}$  is the book value of equity for company  $i$  in year  $t$ .

On the basis of the research framework previously stated, the method chosen for data analysis in this study is path analysis using analysis of moment structure (AMOS) version 21. Path analysis is the development of a regression model used to test the fit of the correlation matrix of two or more models. In constructing path diagrams, the relationship between variables is revealed by the line of one arrow showing the causality (regression) relationship of an exogenous construct (independent variable) with an endogenous construct (dependent variable) based on the structure of the model. The path coefficient is a standardized regression coefficient. The path coefficient is calculated by making two structural equations, namely the regression equation showing the hypothesized relationship.

## RESULTS AND DISCUSSION

The population used in this study is non-financial high-profile companies listed on IDX, respectively from 2013 to 2017. The company was selected by purposive sampling method to produce as many as 27 companies with 135 sample observations and has passed the process of testing various assumptions of the model suitability test (goodness-of-fit model) to produce 100 observation samples tested using path analysis.

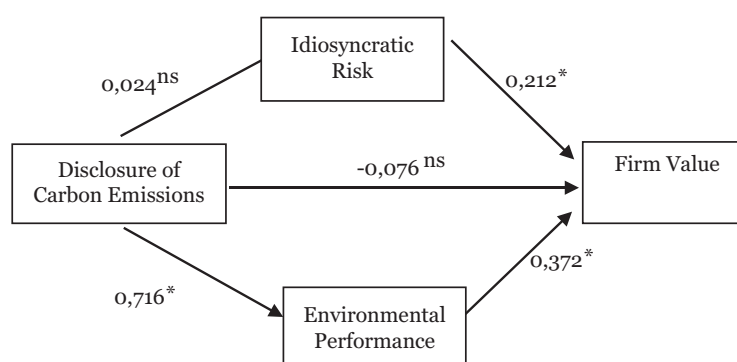
Goodness-of-fit model testing is conducted to test the suitability of the proposed model through various testing criteria. At this testing stage an evaluation of the suitability index and cut-off value is carried out, namely to test the correctness of the proposed model in order to be accepted or rejected based on various criteria found in the goodness-of-fit test. The overall goodness-of-fit test results can be seen in Table 1.

**Table 1 Measurement of the Overall Goodness-of-Fit Model**

Measurement	Cut-Off Value	Result	Acceptance Rate
Chi-square	$\chi^2$ -Chi-square is expected <9.487729 DF = 4	0.910	Good
P-value	$\geq 0.05$	0.340	Good
GFI	$\geq 0.90$	0.995	Good
RMSEA	$\leq 0.08$	0.000	Good
AGFI	$\geq 0.90$	0.954	Good
TLI	$\geq 0.95$	1.007	Good
CFI	$\geq 0.95$	1.000	Good
NFI	$\geq 0.95$	0.990	Good

Source: Processed Data (2019)

After testing the suitability of the model (goodness-of-fit model), it can be tested on the hypothesis by using a regression model in path analysis to predict the relationship between exogenous and endogenous variables. Based on the results of data processing that has been obtained for this research model, the path diagram model is described in Figure 1.



**Figure 1 Path Chart Model**

Based on the above path analysis, the following standardized path coefficients are presented in the structural equation of this study (Table 2).

**Table 2 Standardized Value Path Coefficients**

Variable Combination	Estimation Coefficient	S.E	P	Information
Disclosure of carbon emissions→idiosyncratic risk	0.024	0.394	0.243	Not significant
Disclosure of carbon emissions→environmental performance	0.716	0.432	0.000	Significant
Idiosyncratic risk→firm value	0.212	0.175	0.022	Significant
Disclosure of carbon emissions→firm value	-0.076	0.984	0.569	Not significant

Source: Processed Data (2019)

The magnitude of the path coefficient showing the direct effect is obtained from the standardized coefficient beta based on the results of the t-statistic test of each variable, while the magnitude of the indirect effect is obtained by multiplying the path coefficient which exposes the direct effect of the exogenous variable on the mediating variable with the path coefficient showing the direct effect of the mediating variable for endogenous variables. The magnitude of the total effect is the sum of the magnitude of the direct effect and the indirect effect. Calculation of direct influence can be seen in Table 3.

**Table 3 Direct Effects of Research Variables**

Variables Combination	Direct Effect
Disclosure of carbon emissions→idiosyncratic risk	0.024
Disclosure of carbon emissions→environmental performance	0.716
Idiosyncratic risk→firm value	0.212
Environmental performance→firm value	0.372
Disclosure of carbon emissions→firm value	-0.076

Source: Processed Data (2019)

In the calculation of indirect effects, the value of each variable is multiplied, as can be seen in Table 4.

**Table 4 Indirect Effects of Research Variables**

Variables Combination	Calculation	Result
Disclosure of carbon emissions→firm value via idiosyncratic risk	$(0.024) \times (0.212)$	0.005
Disclosure of carbon emissions→firm value via proper	$(0.716) \times (0.372)$	0.266

Source: Processed Data (2019)

In calculating the total effect, the value of each variable is summed up, as can be seen in Table 5.

**Table 5 Effect of Total Research Variables**

Variables Combination	Calculation	Result
Disclosure of carbon emissions→firm value via idiosyncratic risk	$(0.005) + (-0.076)$	-0.071
Disclosure of carbon emissions→firm value via proper	$(0.266) + (-0.076)$	0.190

Source: Processed Data (2019)

One of the solutions to solve this problem is by using the Sobel test, which aims to obtain the significance value of the role of intermediary variables in a model. Table 6 is the result of calculating the role of intermediation variables from this research model.

**Table 6 Results of Calculation of Significance Value of Indirect Testing (Sobel Test)**

Variable Combination	Estimation Value	Standard Error	p Value of Sobel Test
Disclosure of carbon emission→firm value via idiosyncratic risk	0.960; 0.400	0.394; 0.175	0.09551074
Disclosure of carbon emissions→firm value via proper	4.414; 0.448	0.432; 0.160	0.00692481

Source: Calculations with the aid of program statistics calculators version 3.0 BETA (2019), <http://www.danielsoper.com/statcalc3/calc.aspx?id=31>

Based on the calculation results of the Sobel test in Table 6 things can be explained as follows:

1. B1. The indirect effect of carbon emissions disclosure on firm value via idiosyncratic risk has a  $p$ -value (two-tailed probability) Sobel test of  $0.09551074 > \alpha 0.05$ .
2. The indirect effect of carbon emissions disclosure on firm value via environmental performance has a  $p$ -value (two-tailed probability) Sobel test of  $0.00692481 < \alpha 0.05$ .

Hypothesis testing is done by comparing the  $p$ -value with a significance level ( $\alpha$ ) of 0.05. If the  $p$ -value  $< \alpha 0.05$  then  $H_0$  is rejected and  $H_1$  is accepted. Conversely, if  $p$ -value  $> \alpha 0.05$  then  $H_0$  is accepted and  $H_1$  is rejected. The results of testing the hypotheses in this study are summarized in Table 7.

**Table 7 Hypothesis Testing Results**

Variables	Hypothesis Testing Results
H1: Disclosure of carbon emissions→idiosyncratic risk	Rejected
H2: Disclosure of carbon emissions→proper	Accepted
H3: Disclosure of carbon emissions→firm value	Rejected
H4: Idiosyncratic risk→firm value	Accepted
H5: Proper→firm value	Accepted
H6: Disclosure of carbon emissions→firm value via idiosyncratic risk	Rejected
H7: Disclosure of carbon emissions→firm value via proper	Accepted

Source: Processed Data (2019)

On the basis of the results of the path analysis in Table 7, hypothesis 1 is rejected. This shows that the disclosure of carbon emissions has a positive and not significant effect on idiosyncratic risk. This research study shows that the higher the disclosure of carbon emissions, the idiosyncratic risk will increase, but does not have a strong influence.

Disclosure of carbon emissions such as revealing the total carbon emissions that have been generated by companies can be negative information to the public because of the environmental damage caused by the company. Naomi (2011) states that idiosyncratic risk reflects specific information and strategies about the company and will fluctuate according to the information itself.

This research is in line with the research of Humphrey et al. (2012), who stated that the higher CSR carried out by companies, the idiosyncratic risk would increase, but the influence of CSR on idiosyncratic risk was not strong because the British state which adopts the common law legal system is more concerned with investors than its stakeholders whereas in this research study is in the condition of Indonesia as a developing country, in the stage of issuing various national policies to address climate change, policies to address climate change related to the use of renewable energy are still not strong in Indonesia.

In this study the effect of carbon emissions disclosure is less strong on idiosyncratic risk. This shows that not all companies disclose the total carbon emissions produced by the company. Most of the companies in this sample disclose carbon emissions in the form of controlling emissions produced by the company (such as emissions from combustion boilers), describing the actions companies will take to address risks, plans or detailed strategies to reduce carbon emissions so that this indicates responsibility and environmental care carried out by the company. Therefore, the possibility of stakeholders responding positively to the company for environmentally responsible actions is expected. However, high-profile companies not only have a high level of sensitivity to the environment, but also companies have a strong level of competition as well.

Stakeholder theory extended by Jonas (1984) states that companies expanding environmental disclosure demonstrate corporate responsibility not only to conventional stakeholders, but also to nature and future generations as well. Environmental disclosure as a dialogue between the company and its stakeholders to balance the conflict between stakeholders and the company (Adam & McNicholas, 2007).

The results in Table 7, hypothesis 2 is accepted. This shows that the disclosure of carbon emissions has a positive and significant impact on environmental performance. The higher the disclosure of corporate carbon emissions, the environmental performance of the company will increase. Companies that take action to address the risks of climate change, detailed plans and strategies to reduce carbon emissions illustrate the company's responsibility for actions related to climate change and the actions companies will take to address them will reflect the business ethics carried out by the company. Environmental performance indicators in the form of PROPER can describe how the company's environmental performance in managing the environment is in accordance or not in accordance with applicable regulations through ranking. Good environmental performance in PROPER which shows the compliance rating on the disclosure of carbon emissions can be seen from the control of emissions produced by the company (such as emissions from boiler combustion. While the poor performance in PROPER shows that the rating is not obedient to the disclosure of carbon emissions can be seen from the company conduct environmental management that is not in accordance with applicable regulations as well as the quality of the dust collector chimney showing the level of particulates released into the air is still far below the permitted threshold value.

The stakeholder theory states that companies will choose to voluntarily disclose their activities and information about their environmental, social and intellectual performance beyond their mandatory demands to meet their true expectations or be recognized by their stakeholders. Information about the company's environmental performance activities obtained by stakeholders will be a motivation for the company to improve its environmental performance.

The results of this study are consistent with Tang and Luo's (2014) study, which states that voluntary disclosure of carbon emissions can improve environmental performance. This research is also consistent with Qian and Schaltegger's (2017) study, which states that disclosure of carbon emissions is not only a tool for survival, but also has value if the benefits are used and internalized to drive emissions reductions and changes in performance, this applies to good business firms and the bad one.



The results in Table 7 that shows hypothesis 3 is rejected. This indicates that the disclosure of carbon emissions has a negative but not significant effect on firm value. The higher the disclosure of carbon emissions, the firm value will decrease, but does not have a strong influence.

The results of this study are not in line with stakeholder theory extended by Jonas (1984) stating that companies expanding environmental disclosure need to show corporate responsibility not only to conventional stakeholders, such as: shareholders, creditors, the public, and employees, but also in nature and future generations too. Companies, which are responsible for the impact of carbon emissions produced will receive a good response from the stakeholders. Although the results of this study are not in line with stakeholder theory, but in line with Hsu and Wang (2013), which states that investors do not like the information on climate change caused by the company because investors worry about the costs incurred by the company are greater than the return that will be gained by investors.

The disclosure of corporate carbon emissions shows the company's participation in reducing carbon emissions in the world, the company revealed various activities to reduce carbon emissions that have been generated. But in this condition the earth needs a long time to be repaired, so the company also incurred a very large cost to finance the company's operational activities in reducing carbon emissions. As a result, investors will not be interested in investing their capital in companies having high carbon emission disclosures so this will have an impact on the value of equity and declining firm value.

The results of this study are also in line with Stanny and Ely (2008) which states that the high proportion of large companies that do not voluntarily respond to the CDP questionnaire because current environmental information disclosure does not provide investors with necessary information about important business risks and companies it will choose to cover up information about its business, which causes high carbon emissions to protect the reputation and the company's stock does not deteriorate in the eyes of investors. According to Matsumura et al. (2014), companies disclosing their business operations that produce every thousand metric tons of carbon emissions will reduce firm value.

The results of this study indicate the effect of disclosure of carbon emissions is less strong on firm value. This indicates that the high-profile companies sampled in this study did not express how much carbon emissions were generated and did not reveal how much the costs incurred by companies in reducing carbon emissions. Most of these companies only reveal actions to address the risks of climate change, detailed plans and strategies for reducing carbon emissions, and controlling emissions produced by companies (such as emissions from boiler combustion). Costs disclosed by the company in the financial statements in the form of CSR costs which not only are from environmental factors, but from several other factors, such as: social, economic, and corporate politics.

Based on the results of the path analysis in Table 7, hypothesis 4 is accepted. This shows that idiosyncratic risk has a positive and significant effect on firm value. The higher idiosyncratic risk, firm value will increase. High-profile companies as samples in this study are companies receiving the attention of the community because the company's operational activities have a relationship with broad stakeholder interests. The spotlight from the public makes high-profile companies have the potential to have high idiosyncratic risk, such as having a high level of sensitivity to the environment, high political risk, or a strong level of competition (Roberts, 1992) so that companies need sustainability in carrying out their operations.

Companies demonstrating sustainability in carbon emission disclosures such as disclosing plans or detailed strategies to reduce carbon emissions and control emissions produced by the company can develop the social trust of stakeholders to the company as an environmentally friendly company. Increased investor confidence due to the prospect of company sustainability will increase the market value of the stock price and firm value's assets so that firm value's equity will rise. Investors will tend to maintain their investment in the company or even increase their investment so that there will be an increase in market value of the company's

stock price and the company receives many sources of equity funds from investors who increase the value of equity so this increases firm value.

In this study in line with stakeholder theory proposed by Freeman (1984) and Zsolnai (2006) states that companies are not entities that only operate for their own interests and are only profit-oriented, but the company must provide greater benefits for its stakeholders such as shareholders, society, creditors, employees, the universe, and present and future generations. Without the support of investors and stakeholders including the universe, society, and future generations, companies will experience difficulties in maintaining their survival in the future.

The results of this study are in line with the research by Naomi (2011), which states that the higher the idiosyncratic risk, the stock return will also increase because the idiosyncratic risk measurement tool in the form of company size and high value has an influence on high stock returns. Bali and Cakici (2008) states that companies having high idiosyncratic risk (large total variance) will also be demanded for high returns to cover risks due to imperfect diversification of investor portfolios, which is high on the company compared to other companies or investors with less varied portfolios.

On the basis of the results of the path analysis in Table 7, hypothesis 5 is accepted. This shows that environmental performance has a positive and significant influence on firm value. The higher the environmental performance, the firm value will increase.

This research is in line with Anggreini (2015) research which shows that companies, which can conduct ethical and responsible business with the community have an influence on investors who consider environmental issues related to the company's business sustainability. Hariati and Rihatiningtyas (2015) stated that companies, which are obedient in managing the environment are one of the factors that encourage investors to invest in companies with good environmental performance, thus impacting on increasing firm value.

The company's activities in the field of environmental preservation will bring a number of advantages if the company has carried out its operations in accordance with applicable environmental regulations. This causes the company to attract the attention of investors and the public. PROPER is a measure of environmental performance using ratings to show how much the company complies with environmental ministry regulations in managing the environment. Companies having ethics and responsibility for the environment, and environmental performance in accordance with applicable regulations can improve company and community relations so as to form a good corporate reputation and be responded positively by investors through increased share prices so that the company's equity value will rise and increase firm value, thus PROPER has a strong relationship to firm value.

The theory of legitimacy proposed by Deegan and Unerman (2006) states that the company continuously tries to ensure that its operations are in accordance with the norms, values, and beliefs of the social system, so that the company's activities can be accepted by outsiders. This shows that the existence of the company will continue if the company can carry out environmental activities, which are in accordance with the norms, values, and beliefs of the community. So that environmental performance that has been recognized by the community will increase the company's reputation and value.

Based on the analysis of indirect effects in Table 7 and the calculation of the significance value of the Sobel test, hypothesis 6 is rejected. This shows that idiosyncratic risk fails to mediate the effect of disclosure of carbon emissions on firm value.

This research is consistent with stakeholder theory from the perspective of Jonas (1984) that the existence and continuity of a company is strongly influenced by the support given by stakeholders to the company. The company is not an entity that only operates for its own interests and is only profit-oriented, but must provide benefits to its stakeholders which include shareholders, creditors, consumers, suppliers,

government, society, nature, and future generations. Without ongoing support by stakeholders, the company will have difficulty in maintaining business continuity (Chan et al., 2004).

Bad information obtained by stakeholders illustrates company information that fails to comply with environmental ministry regulations because it produces so much emissions. Poor information disclosed can pose risks (idiosyncratic risk) as well as encouragement from stakeholder supervision. Disclosure of carbon emissions by the company reveals how much emissions are caused by the company and the lack of indications from the committees responsible for actions related to carbon emissions so that this causes a negative response from stakeholders because the company has made great damage to nature by polluting without any the responsibility of the committee board so that a lawsuit arises from the community.

However, the results of this study found idiosyncratic risk failed to be a mediating variable, this indicates that bad information obtained by stakeholders from disclosure of carbon emissions causing conflict with the community cannot affect the company's long-term investors because of the loyalty and support of investors in the company (Godfrey, 2005). Loyalty and support from long-term investors arise because investors understand that the company has plans, detailed strategies and actions to reduce carbon emissions in accordance with applicable environmental regulations and the prospects for sustainability of the company. With the loyalty and support of investors, this can increase firm value's equity so that the company's value increases.

Based on the analysis of indirect effects in Table 7 and the calculation of the significance value of the Sobel test in Table 13, hypothesis 7 is accepted. This shows that environmental performance successfully mediated the effect of disclosure of carbon emissions on firm value. This research is consistent with stakeholder theory proposed by Adam and McNicholas (2007), which states that the disclosure of financial, social, and environmental information is a dialogue between a company and its stakeholders. Information provided about company activities that can change stakeholder perceptions and expectations. Transparency of the company's annual report, causes stakeholders to have information about the company's environmental performance activities and the information disclosed can be good or bad information for stakeholders.

Poor performance can turn into good performance due to the supervision conducted by stakeholders on the company so that this makes the company motivated and motivated to improve the management of the company's environment in accordance with regulations made by the ministry of environment so that companies turning poor performance into performance both can attract the attention of stakeholders and improve the relationship between them (Qian & Schaltegger, 2017). A good environmental performance describes the company's environmental activities, which are in accordance with the values, norms, and trust of the community so that this can attract investors to invest in the company.

The success of the mediating role in this study shows that the existence of environmental performance is important in encouraging investors to invest in companies because good environmental performance reflects an increase in company compliance with environmental ministry laws, good corporate environmental management, reduced pollution and environmental damage, and increasing stakeholder confidence. Thus, companies, which consistently show environmental excellence in production, conduct ethical and responsible business to the community will receive a positive response by investors through rising share prices so that the company's equity value will also rise and increase firm value.

## CONCLUSIONS

This study was conducted to investigate the effect of disclosure of carbon emissions on the value of the companies tested both directly and through idiosyncratic risk and environmental performance. Based on the

data, we conclude the following things: First of all, carbon emission disclosure has positive significant effect on environmental performance, but not on idiosyncratic risk and firm value. Second, further statistics testing shows that both idiosyncratic risk and environmental performance have positive and significant effect on firm value. And the third, Sobel test showed that environmental performance plays a role in mediating, on the contrary, idiosyncratic risk has no mediating role.

The practical implications of this research are expected to provide consideration for the company to pay attention to the company's relationship with the surrounding environment because the disclosure of reducing carbon emissions by the company will be assessed as a sign of the company's seriousness in addressing the problem of global warming. This research can also provide input for users of financial statements, especially investors to pay attention to aspects of carbon emissions disclosure as a consideration in investment decision making. Specifically, for related institutions, in this case capital market regulators, among others, the Financial Services Authority (OJK), the results of this study can be used as a reference in formulating a policy to make disclosure of carbon emissions an obligation.

The theoretical implications of this study reinforce the stakeholder theory proposed by Freeman (1984) who explain that a good company will build a code of ethics that is not only concerned with the interests of shareholders, but also pays attention to the welfare of its stakeholders. To build relationships with its stakeholders the company needs to disclose financial, social and environmental information to show that the implementation of company activities has responsibilities not only to conventional stakeholders, but also the company also has contractual responsibilities with nature, society, and future generations (Jonas, 1984).

This study also reinforces the theory of legitimacy put forward by Gray et al. (1996) and Deegan and Unerman (2006), which emphasize the importance of community-oriented corporate management systems and adjusting the values of the company with the values existing in society because the company's operations are in accordance with norms, values, and the belief of the social system will be easily accepted by society and government.

This study has several limitations that need to be considered by subsequent researchers, namely: Measurement of carbon emission disclosures only comes from the company's annual report because not all companies publish sustainability reports as another source of environmental disclosure. Not all environmental performance as measured by the Corporate Performance Rating Program (PROPER) comes from the assessment of the Ministry of Environment because some high-profile companies do not register their companies in the program. Future research should consider measuring environmental performance by conducting a Green Industry assessment referring to three aspects consisting of the production process (aspect A), waste/emissions management performance (aspect B), and company management (aspect C). In addition, future studies should also examine carbon performance on disclosure of climate change.

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