# Carbon Performance, Green Strategy, Financial Performance Effect on Carbon Emissions Disclosure: Evidence from High Polluting Industry in Indonesia

Yuliana Yuliana[1*], Linda Kusumaning Wedari[2]

[1] Accounting Department, School of Accounting – Master of Accounting, Bina Nusantara University, Jakarta Barat 11530, Indonesia

[2] Accounting Department, School of Accounting, Bina Nusantara University, Jakarta Barat 11530, Indonesia

Corresponding Author Email: yuliana011@binus.ac.id

**ABSTRACT**

The purpose of this study is to investigate the impact of carbon performance, green strategy and financial performance on carbon emissions disclosure based on GRI 305: Emissions, of five polluting industrial sectors in Indonesia during period of 2017 to 2020. Factors affect carbon disclosure show conflicting results like positive, negative, and also no affect. All these findings in this paper may provide a new insight about what factor that affect pollutant industry disclose their carbon information. Pollutant industry are the main source of carbon pollution, therefore they have an important role about environment responsibility. Content analysis and OLS regression are used in the analysis, and find that green strategy and financial performance give impact on carbon emissions disclosure. However, carbon performance, does not impact on carbon emissions. It seems that companies in the polluting industrial sectors in Indonesia implement green strategy and still focuses on financial performance. Nevertheless, the carbon mitigation concern is low since there is no mandatory for Indonesian companies to measure dan report their carbon emissions.

## 1. INTRODUCTION

Greenhouse gas (GHG) emissions are one of the factors contributing to global warming [1]. The average level of carbon dioxide ($CO_2$) increased from 407.9 parts per million (ppm) in 2018 to 410.5 ppm in 2019, contributing to the greenhouse effect [2]. Greenhouse effect is a phenomenon that happens when gases in the Earth's atmosphere trap the Sun's heat [3]. As a consequence, 2019 has become the second warmest year on record, after 2010 as the hottest decade on record [4]. The increase in temperature provoke more natural disasters, such as drought and forest fires [5]. There has been an upward trend in the incidence of natural disasters, from 1,694 cases in 2015, which then continued to increase to 4,650 cases in 2020 [6]. This extreme climate change may caused by increased carbon dioxide (hereafter-$CO_2$) emissions.

One of the countries around the world with the highest carbon emissions is Indonesia. In 2015, Indonesia became the world's fourth-largest emitter of greenhouse gases. It has the 16th largest economy in the world and the largest in Southeast Asia [7]. GHG levels in Indonesia have been rising over the last decade. Indonesia's greenhouse gas (GHG) emissions in 2018, increased by 313.47% from 1990 levels [8]. The majority of $CO_2$ emissions come from the use of fossil fuels, which transportation industry is still to be dominant [9]. The use of fossil fuels is the most harmful [10], because the combustion of fossil fuels can generate air pollution due to gas emissions released, mostly in the form of $CO_2$. Furthermore, coal mining industry of Indonesia, released carbon emissions 25.4-26.6 t-$CO_2$/ha, this number means that coal mining industry contributes for more than 98% of total emissions [11].

In total, Indonesia produces 600Mt $CO_2$e yearly of greenhouse gas emissions from energy production and consumption, of which 40 Mt $CO_2$e comes from the cement industry [12]. Therefore, it is now urgent to reduce the amount of $CO_2$ released into the atmosphere [13].

The high contribution of carbon emissions in each sector encourages high polluters companies in Indonesia to have corporate accountability activities to address the climatic and environmental crises they have created and reflected it in their disclosure of carbon emissions. Some companies in Indonesia have already completed sustainability reporting in their corporate reporting, despite the fact that the regulation does not mandate public corporations to publish their report [14]. In Indonesia, Regulation Financial Service Authority (OJK) (OJK stands for Otoritas Jasa Keuangan or also known as Financial Service Authority. OJK regulates and supervises financial service activities in the banking, capital market, and non-bank financial industry sector [15]). Number 51/POJK.03/2017 states that a sustainability report must be prepared and submitted by the public companies in Indonesia to the OJK no later than 30 April of the following year [16]. However, due to the spread of the coronavirus, OJK adjusted the regulations. The preparation of the sustainability report, which should have been implemented in 2020, has been delayed to 2021 and should be submitted to the OJK no later than 2022, according to OJK Circular Letter Number 4/SEOJK.04/2022 [17].

Pollution control has been prioritized by all authorities worldwide [18]. Companies are expected to take part in reducing the climate and greenhouse gas emissions [19]. disclosure may be utilized to create pressure and incentives for

companies since regulatory agencies and society become indirect regulators and supervisors of companies in improving their carbon performance [20, 21]. In Indonesia, most companies adopt the GRI 305 index as the basis for environmental disclosure, specifically carbon emissions disclosure [22]. GRI 305: Emissions is a standard for companies in reporting their impacts related to emissions, and how these impacts are managed [23]. Each item in GRI 305 may be used by a variety of businesses, ensuring an unbiased evaluation of companies' carbon disclosure [24].

Based on prior studies on the factors affect carbon disclosure show conflicting results. There is a positive effect between carbon performance and carbon disclosure [25]. Company with superior carbon performance published voluntary carbon disclosure to obtain stakeholder credibility. While researches [26-28] show a negative relationship between carbon performance and carbon disclosure. Companies with poor carbon performance provide more information to minimize the possibility of legal expenses arising from stakeholder complaints, customers' boycott, or regulator's penalty, when the company's business operations resulting in environmental negative impact.

Environmental issues have become serious problems that make stakeholders monitor corporate preventive actions related to the environment [29]. The stakeholder's strong demands for environmentally friendly industry become big pressure for companies to implement green practices [30]. Carbon emissions mitigation pressure encourages Indonesian public companies to implement green strategy, which is a plan containing actions to support global sustainable development, includes efficient resource management and reduction of the carbon footprint of the company's waste generation [31]. Green strategy can also be defined as a company plan that includes pollution avoidance as well as clean products, services, and technology [32]. There is a positive relationship between a green strategy and carbon disclosure [19], which are firms that implement a green strategy may be considered as proactive companies in combating climate change by controlling and lowering carbon emissions. In the contrary, Masoumik et al. [33] found no significant mediating effect between green strategy and carbon disclosure. This might be because the green strategy may provide financial benefits to the company, such as green products with premium price. Companies can gain a competitive advantage that provides financial benefits from its green strategy. Even though green strategy is beneficial but it does not mean that the company is truly concern on the environmental issue. In the contrary, company with green strategy implementation tend to highlight their financial performance than their environmental performance and may practice greenwash [34].

Opposite results [35, 36] that the relationship between the company's financial performance and the company's carbon disclosure is positive since firms with high levels of financial performance are expected to participate in carbon emissions mitigation. While financial performance has only a partial effect after obtaining marginal advantages until a certain point [37].

Several factors have been recognized as having an impact on both the positive and negative disclosure of carbon emissions. The conflicting results have motivated this study to choose a number of variables to find out what influences carbon emissions disclosure. Therefore, this study aims to determine the effect of carbon performance, green strategy and financial performance through carbon emissions disclosure in high polluters Indonesian companies.

The remainder of this article is organized as follows. The next section presents information about the hypothesis development and method that describes the sample selection, variables, model being used. The third section reports the results followed by a discussion section. The last section provides a summary and conclusion.

## 2. HYPOTHESIS DEVELOPMENT AND METHOD

### 2.1 Hypothesis development

Several previous studies examined factors that influence carbon emissions disclosure, with mixed results. The majority of carbon emissions come from industrial activity therefore it is important for companies to participate in low-carbon environments in order to gain and maintain its legitimacy from the public or society in which they operate [38]. Legitimacy is considered as a social contract between the company and the society, which makes companies need to pay attention about the values of justice in order to be accepted in society [39]. This is consistent with legitimacy theory, which states that an organization can sustain when society thinks that the company already runs based on a proper value system [40]. For example, companies can use their reports to give the positive impression of being environmentally responsible in order to get social acceptance [41].

Companies with good carbon performance tend to disclose more information in order to improve their image, differentiate themselves from bad performers, and maintain their company's presence in the community [34]. Furthermore, carbon performance in current year can influence the extent of carbon disclosure in the following year, as companies may need some time to prepare and publish it [20]. Meanwhile, companies with poor carbon performance may conceal the fact that their carbon performance declined compared to the prior year. This is in line with the findings of studies [21, 42-44], that show there is a relationship between carbon performance and company's carbon disclosure. Based on that description, the following hypotheses can be assumed:

$H_1$: Carbon performance (t) give positive impact on company's carbon disclosure in the following year (t+1).

Green strategy defined as an action plan implemented by companies to manage sustainable resources [32]. Companies can use energy and resources efficiently in its production process and business operation that eventually may save money [31]. As a result, the company's carbon emissions are affected and decreased by this energy efficiency.

According to stakeholder theory, external stakeholder groups (government, debtors, consumers, and society) exert strong influence on companies through social pressure or public policies such as the Kyoto Protocol [45] (Kyoto protocol is an international agreement about climate change by committing industrialized countries to limit and reduce $CO_2$ and greenhouse gases (GHG) initialized by United Nations [32]). This policy encourages companies to minimize emissions production in order to gain public legitimacy [39]. One of the company's ways to reduce emissions is by implementing a green strategy. As a result, the reduction in carbon emissions motivates the company to disclose its performance, which may have an impact on the carbon emissions disclosure in the following year because the company wants to show success in implementing the

company's green strategy through its good carbon performance. This is in line with the findings of studies [19, 46, 47], that relationship between green strategy and company's carbon disclosure exist. Given this, the following hypotheses can be assumed:

H₂: Green strategy (t) give positive impact on company's carbon disclosure in the following year (t+1).

The company's financial performance reflects the condition of its finances and can be used as a benchmark for the company's future business viability [48]. Stakeholders may see companies with good financial performance as having more resources, which enables them to make greater contributions in resolve social and environmental issues [49]. According to stakeholder theory, the success of a business is determined by how well management maintains relationships with key stakeholder groups (customers, employees, suppliers, communities, and others) and meet stakeholder's expectation [50]. Based on this theory, the company's responsibility is not only about profit maximization but also pays attention to the expectations and demands of non-shareholder stakeholder groups [51].

Good financial performer may increase stakeholders' expectations on the company's environmental performance. As a result, the business may respond to these stakeholders' expectation by communicating its environmental performance in the following year with disclose carbon emissions produced by the company's business operations. This is in line with the findings of studies [49, 52, 53], that show there is a relationship between financial performance and company's carbon disclosure. Based on that description, the following hypotheses can be assumed:

H₃: Financial performance (t) give positive impact on company's carbon disclosure in the following year (t+1).

## 3. RESEARCH METHODOLOGY

This study was quantitative analysis using multiple ordinary least squares (OLS) regression to examine the relationship between variabel. The population of this study consists of industrial polluting companies listed on the Indonesia Stock Exchange (IDX) from 2017 to 2020. The industries that pollute the most, according to Clarkson et al. [25], include pulp and paper, chemicals, oil and gas, metals and mines, and utilities. Because the research includes four years, the overall sample will be 132 observations. However, because several companies do not publish sustainability reports or have comprehensive information in one year's report, the number of observations left is only 70, which are related to 33 companies.

The dependent variable in this study is carbon disclosure emissions, which are proxied by GRI 305 (emissions) using the value from the following year (t+1). This index is used since companies in Indonesia are guided by GRI criteria when it comes to environmental disclosure, particularly carbon emissions [21]. Each item in GRI 305 is suitable for all types of sectors, therefore the assessment of carbon disclosure is not biased [52].

The independent variables in this research include carbon performance, green strategy, and financial performance. Carbon performance is calculated by dividing total carbon emissions from scope 1 by total sales, which shows the company's production efficiency [26, 53-55]. The green strategy variable was assessed by assigning a score of 1 or 0 on a disclosure checklist with 17 items [46]. The net profit margin (NPM) indicator is used to assess financial performance [56, 57]. Net profit margin is calculated by dividing net income by sales revenue.

This study also included several control variables, including firm size, management ownership, independent commissioners, and the board of directors' background. The company's size represents by the total value of its assets [58]. Managerial ownership is proxy by dividing the total number of shares owned under management by the total number of shares outstanding [59]. Independent commissioner is proxies by the number of independent commissioners divided by the total number of commissioners [60]. Finally, the board of directors' background represents the ratio between the number of board members with economic and business education and the total number of board members [19, 61].

The statistical tests performed in this work were descriptive statistics and classical assumption tests. Descriptive statistics include the amount, minimum and maximum value, average and standard deviation. To meet the requirements of linear regression analysis, a classic assumption test was performed. The multiple linear regression equation method adopted is as follows:

$$CD_{it+1} = \beta_0 + \beta_1 CP_{it} + \beta_2 GS_{it} + \beta_3 FP_{it} + \beta_4 FS_{it} + \beta_5 MO_{it} + \beta_6 IC_{it} + \beta_7 BoD_{it} + e_{it}$$

where,
$CD_{it+1}$ = Carbon Disclosure following year
$\beta 0$ = Constant or Intercept
$\beta 1 - \beta 3$ = Regression Coefficient
CP = Carbon Performance
GS = Green Strategy
FP = Financial Performance
FS = Firm Size
MO = Managerial Ownership
IC = Independent Commissioners
BoD = Board of Director Background
e = Error-term

## 4. RESULT AND DISCUSSION

### 4.1 Descriptive statistics

The descriptive statistics results are presented in Table 1.

The mean of CD is 17.26% revealing that the awareness of polluting industry in Indonesia is still low that about 80% more companies in the sample do not disclose carbon disclosure. The mean of independent variable CP is 0.000000000483, which means that in producing and selling one rupiah, the company produces scope 1 carbon emissions of 12,221,000 $kg/CO_2$ eq. Then, the mean score for the green strategy is 41.17%, indicating that more than half of companies have not begun to implement green strategy into the company's overall strategy. The variable FP has a mean of 6.74%, indicating that the sample companies do not incur losses when carrying out their commercial activities.

The variable control FS has a mean value of 30,99519 or approximately Rp. 26.098.052.000.000, which means the sample companies are large companies with total assets reach trillions of rupiah. Managerial ownership, as measured by the percentage of shares owned by the management has mean value of 0.39% revealing that the share of management ownership in the sample companies is small (below 1%). The

average ratio of independent commissioners to the total number of commissioners on the boards is 0.38, indicating that more than one-third of all commissioners are independent. The mean of BoD is 46.69%, implying that slightly less than 50% of the sample companies' board director has an economic and business background.

The Pearson correlation is shown in Table 2. The results show that the highest value correlation was between GS-CD with the coefficient corresponding value of 0.5565. None of the correlations between independent variables are at levels that would cause multicollinearity. The highest variance inflation factors are checked and indicate that the highest value for VIF was 1.25 of CP. Therefore, multicollinearity is not at a problematic level.

## 4.2 Regression result

The regression model is used an ordinary least squares (OLS) model, and the results are presented in Table 3. It can then be seen that the coefficient of determination '(adjusted R-square)' is 0.3616. This shows that the variable dependent and independent can explain by the model of 36.16%. In comparison, the remaining 63.84% is explained by other variables not included in this study.

The p-value shows that the variables of GS and FP (0.000 and 0.050, respectively) are associated positively and statistically significant at the 5% level ($p < 0.05$). These results are consistent with hypotheses 2 and 3. Whereas, the coefficients and p-value for CP are positive but not statistically significant at 5%. Therefore, carbon performance has no impact on the company's carbon disclosure in the following year. It can be concluded that the first hypothesis (H1) is rejected, and support the second hypothesis (H2) also the third hypothesis (H3). Furthermore, the control variable FS has a positive coefficient and statistically significant at the 1% level ($p < 0.01$), while the other control variables (MO, IC and BoD) have a negative coefficient and not statistically significant at any level. Therefore, only the variable control FS has an influence on carbon disclosure in the following year.

**Table 1.** Descriptive statistics for dependent, independent, and control variables

| Variables | Mean | Std. Deviation | Min | Max |
|---|---|---|---|---|
| CD | 0.172 | 0.060 | 0.095 | 0.248 |
| CP | 4.83e- | 4.11e- | 1.28e- | 9.95e- |
| GS | 0.411 | 0.142 | 0.117 | 0.705 |
| FP | 0.067 | 0.055 | 0.008 | 0.142 |
| FS | 30.995 | 0.751 | 30.004 | 31.846 |
| MO | 0.003 | 0.005 | 0.000 | 0.012 |
| IC | 0.388 | 0.461 | 0.333 | 0.444 |
| BoD | 0.466 | 0.224 | 0.000 | 1.000 |

**Table 2.** Pearson correlation matrix

| | CD | CP | GS | FP | FS | MO | IC | BOD |
|---|---|---|---|---|---|---|---|---|
| CD | 1.0000 | | | | | | | |
| CP | 0.1711 | 1.0000 | | | | | | |
| GS | 0.5565 | 0.3305 | 1.0000 | | | | | |
| FP | 0.1515 | -0.1638 | -0.0502 | 1.0000 | | | | |
| FS | 0.2537 | -0.1381 | 0.0260 | -0.0108 | 1.0000 | | | |
| MO | -0.0680 | 0.2215 | 0.0439 | 0.0548 | 0.0636 | 1.0000 | | |
| IC | 0.0111 | 0.1109 | 0.0581 | 0.0692 | 0.0310 | 0.2245 | 1.0000 | |
| BoD | -0.1892 | 0.0724 | -01232 | -0.0952 | -0.0629 | 0.1942 | 0.1460 | 1.0000 |

**Table 3.** OLS regression result for dependent, independent and control variables for H1, H2 and H3

| Variable | Coefficient | t-stat | Prob |
|---|---|---|---|
| CP | 0.0033 | 0..93 | 0.357 |
| GS | 0.2236 | 5.06 | 0.000 |
| FP | 0.2167 | 2.00 | 0.050 |
| FS | 0.2107 | 2.64 | 0.010 |
| MO | -1.3477 | -1.20 | 0.235 |
| IC | -0.1863 | -0.14 | 0.888 |
| BoD | -0.0191 | -0.70 | 0.486 |
| Observation | | | 70 |
| Highest VIF | | | 1.25 (CP) |
| Adjusted R2 | | | 0.36 |

## 4.3 Discussion

The results for OLS reveal that coefficients for CP are positive and not statistically significant at any level. These findings do not support Hypothesis 1 that carbon performance (t) give positive impact on company's carbon disclosure in the following year (t+1). This study result may occur because information related to carbon performance disclosed by Indonesian companies in their sustainability reports is still low. Lack of environmental awareness and knowledge, legal requirements, poor performance and fear of bad publicity for stakeholders maybe are the reason for low carbon disclosure [62]. In addition, carbon performance is only in accordance with one of the carbon disclosure measurement items (GRI 305: emissions), which the GRI standard has several indicator items. Our finding is also consistent with the existing studies conducted by study [27], which show that carbon performance has no significant effect on the disclosure of carbon emissions in companies in the material sector, consumer discretionary, energy and utilities. Therefore, this study cannot prove that the company's carbon performance has an impact on carbon disclosure in the following year.

The OLS result indicates that coefficients are positive and statistically significant at 1% for GS. These findings support Hypothesis 2 that green strategy (t) give positive impact on company's carbon disclosure in the following year (t+1). The result of this study are driven by factors such as public demand and pressure on companies related to the creation of a clean

environment. As in stakeholder theory, external stakeholder groups such as the government, debtors, consumers and the community exert a very strong influence through social emphasis or public policy [45]. The response of the company to these pressures is by implementing a green strategy in business to maintain its legitimacy through stakeholders. As a result, there is a decrease in the company's carbon emissions produced due to energy savings [31]. Then, to show that the company have met the social pressures and public policies, they will disclose its environmental performance in the sustainability report. These results are in line with research conducted by studies [19, 46, 47], which shows that there is a significant relationship between green strategy and corporate carbon disclosure. Therefore, this study gives evidence that the company's green strategy has an impact on carbon disclosure in the following year because the company will try to show the progress of implementing its green strategy in the next year's report.

The coefficients of FP are positive and statistically significant at 5% level. These findings support Hypothesis 3 that financial performance (t) give positive impact on company's carbon disclosure in the following year (t+1). Based on stakeholder theory, corporate responsibility does not only focus on profit maximization but also pays attention to the interests and expectations of non-shareholder stakeholder groups [51]. Stakeholders consider companies that have good financial performance be able to make positive contributions in social and environmental terms [49]. Then, the companies feel encouraged to make environmental disclosures as a way for companies in maintaining their relationships with stakeholders. These finding are consistent with study [48, 52, 53] show that there is a significant relationship between financial performance and corporate carbon disclosure.

In the results section, it can be seen that only the control variable FS has a positive and significant coefficient value. The influence of firm size on carbon disclosure is in line with research conducted by study [63]. Big companies are considered to have many business activities and have a greater impact on the environment. This image encourages big companies to disclose information related to the environmental impacts they cause, such as carbon disclosure. Furthermore, managerial ownership which has no impact on carbon disclosure is consistent with research by study [60]. This finding is probably caused by the sample companies that do not all have management ownership in it, therefore this variable is not able to affect the company's carbon disclosure. Independent commissioners do not impact carbon disclosures may be caused by the proportion of independent commissioners is much smaller than the general commissioners which may be caused they are not able to have a major influence in determining the disclosure of information such as carbon disclosures [64]. In addition, the results on the background of the board of directors that has no impact on the dependent variable are in accordance with research conducted by study [19], where the board of directors with an economic background is still focused on disclosing corporate financial information rather than environmental matters.

## 4.4 Robustness test

We tested the robustness of our results by adding control variables. Table 4 presents the robustness test, that return on asset (ROA) and debt to equity ratio (DtE) become additional control variables. Adding more control variables to a model is often expected to reduce bias and improve the results [65]. As a result of this study green strategy, and financial performance has a positive and statistically significant with carbon disclosure in the following year. In addition, firm size is positive and statistically significant at 5% level with carbon disclosure. Given this, the robustness test result supports the second hypothesis (H2) also the third hypothesis (H3). From the reported results, all the findings remain consistent with the previous analysis, which further indicates the robustness of our results.

**Table 4.** Robustness test adding control variables DtE and ROA

| Variable | Coefficient | t-stat | Prob |
|---|---|---|---|
| CP | 0.0029 | 0.83 | 0.412 |
| GS | 0.2514 | 5.37 | 0.000 |
| FP | 0.4488 | 2.80 | 0.007 |
| FS | 0.0178 | 2.00 | 0.050 |
| MO | -1.5166 | -1.36 | 0.180 |
| IC | -0.3823 | -0.29 | 0.772 |
| BoD | -0.0152 | -0.54 | 0.593 |
| DtE | 0.0016 | 0.19 | 0.850 |
| ROA | -0.7947 | -1.90 | 0.062 |
| Observation | | | 70 |
| Highest VIF | | | 2.44 (ROA) |
| Adjusted R2 | | | 0.37 |

## 5. CONCLUSIONS

This study extends previous studies of the factors affecting carbon emissions disclosure by investigating high polluters industries in Indonesia. The results show that green strategy and financial performance give positive impact on carbon disclosure in the following year, while carbon performance has no positive impact on carbon disclosure in the following year. Companies in Indonesia feel that they do not have the obligation to measure and report their carbon performance, therefore the company considers it unnecessary to reduce the production of carbon emissions due to their business operations.

The implications of this research can be used for regulators to make mandatory policies in increasing carbon emissions disclosure by companies based on the factors that affect the disclosure. Regulators will know the progress, steps and contribution of the company in reducing carbon emission production. In addition, this research has also implications for managers in a way of developing strategies for carbon emissions reduction such as implementing a green strategy.

There are two limitations to this study that could be addressed by future research. First, carbon disclosure is only measured using sustainability reports, while not all companies in Indonesia have published sustainability reports. Due to the lack of published sustainability reports, many observations or research samples lost. As a result, the study's findings may not represent the carbon disclosures on high polluting industry of Indonesia in general. Second, there is subjectivity in conducting a content analysis of carbon disclosure and green strategy variable. The scoring 1 and 0 on the two variables are simply based on the researcher's understanding by analyzing each indicator variable in accordance with the company's sustainability report. As a result, the scoring of the two variables may not be appropriate due to the possibility of the parts that could be skipped or subjectivity by researchers in

understanding and reviewing the company's sustainability report in as a whole.

Future research could expand the sample size and categorize it by industry type in Indonesia to obtain results that more represent the carbon disclosures of Indonesian companies in general. In addition, future research can also add another external variable that can influence carbon disclosure, such as economic, public, and regulatory pressure. Furthermore, future research could do comparison studies by analyzing the factors affecting carbon emissions disclosure in high carbon emitting countries such as China and America.

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