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Ratmono, Dwi; Darsono, Darsono; Cahyonowati, Nur et al.

## Article

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#### Provided in Cooperation with:

International Journal of Energy Economics and Policy (IJEPP)

*Reference:* Ratmono, Dwi/Darsono, Darsono et. al. (2022). Greenhouse gas emission accounting disclosure, corporate characteristics and governance : an empirical investigation on Indonesian firms. In: International Journal of Energy Economics and Policy 12 (6), S. 86 - 95.  
<https://econjournals.com/index.php/ijeep/article/download/13487/6993/31584>.  
doi:10.32479/ijeep.13487.

This Version is available at:  
<http://hdl.handle.net/11159/593815>

#### Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics  
Düsternbrooker Weg 120  
24105 Kiel (Germany)  
E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)  
<https://www.zbw.eu/econis-archiv/>

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# Greenhouse Gas Emission Accounting Disclosure, Corporate Characteristics and Governance: An Empirical Investigation on Indonesian Firms

Dwi Ratmono\*, Darsono Darsono, Nur Cahyonowati, Triana Chaerun Niza

Department of Accounting, Faculty of Economics and Business, Universitas Diponegoro, Semarang, Central Java, Indonesia.

\*Email: [dwi.ratmono2@gmail.com](mailto:dwi.ratmono2@gmail.com)

Received: 26 June 2022

Accepted: 14 September 2022

DOI: <https://doi.org/10.32479/ijeeep.13487>

## ABSTRACT

Currently the world is facing global warming, one of the causes of which is greenhouse gas (GHG) emissions. For these reasons, the disclosure of GHG emission information is one of the interesting accounting research areas. However, previous research generally focused on developed countries with inconsistent findings. In this sense, this study aims to contribute to GHG disclosure by analyzing the characteristics of firms as determinants of GHG emission disclosure in a developing country, Indonesia. This study also analyzed the role of corporate governance consisting of the structure of the board of commissioners and the effectiveness of the audit committee in moderating the effect of corporate characteristics on GHG emission disclosure. The sample consisted of 69 firms-years companies listed on the Indonesia Stock Exchange (IDX). The results of testing with Partial Least Squares-Structural Equation Modeling (PLS-SEM) showed that the structure of the board of commissioners; consisting of indicators of independence, women representation, and the number of members of the board of commissioners; strengthened the leverage effect on GHG emission disclosure. The results of the moderation test also showed that the effectiveness of the audit committee can encourage firms with high leverage and poor performance to reveal more GHG emissions.

**Keywords:** Greenhouse Gas Emissions Disclosure, Size, Leverage, Profitability, Governance

**JEL Classifications:** M41, Q54, Q56

## 1. INTRODUCTION

One of the problems in sustainability issues is global warming and climate change which continues to threaten the future of the world. Stakeholders have asked the government to develop regulations on greenhouse gas (GHG) emissions. Global warming is caused by an increase in GHG emissions in the air layer close to the Earth's surface (atmosphere). This GHG consists of several elements, namely carbon dioxide (CO<sub>2</sub>), nitroxide (N<sub>2</sub>O), methane (CH<sub>4</sub>) and other elements. Several studies have also shown evidence of the effect of GHG on global warming. Liao et al., (2015) state that companies where in their operations use non-renewable natural potential, namely companies that use fossil fuels such as

natural gas, oil, coal and other materials can contribute to GHG emissions. Increased attention in this issue led to the issuance of several regulations on GHG disclosure. This has an impact on the corporate strategy in managing environmental issues including its disclosure in order to improve the corporate image and obtain legitimacy from stakeholders.

GHG emissions have altered the atmospheric balance and caused greenhouse effects that have an impact on increasing temperature on earth. GHG come from human activities such as the use of fossil fuels, decomposition of organic matter, industrial activities and the use of fertilizers. GHG levels in the atmosphere are increasing substantially with the industrial revolution, resulting in the need

for more intensive efforts in dealing with global warming (Fabrício et al., 2022). GHG disclosure is not mandatory as with traditional financial statements but is a voluntary practice. The absence of legal obligations in GHG disclosure encourages the establishment of various institutions and programs to control GHG emissions such as the carbon disclosure project (CDP worldwide) in the UK and Kyoto Protocol.

This study is motivated by several concerns. First, this study analyzes GHG accounting disclosure in the context of Indonesia, an emerging economy country, while previous research generally focused on the practice of GHG disclosure in developed countries (Rankin et al., 2011; Chu et al., 2013; Liao et al., 2015; Ben-Amar et al., 2017). Second, previous research generally examined the relationship between GHG emission disclosures and company characteristics, such as size, profitability, leverage, and so on with inconsistent findings (Prado-Lorenzo et al., 2009; Chithambo and Tauringana, 2014; Gonzalez-Gonzalez and Zamora-Ramírez, 2016). For example, findings on the relationship between profitability and disclosure of GHG emissions have not provided consistent evidence. There are research results that provide empirical evidence of a positive relationship (Matisoff et al., 2013; Stanny, 2013; Luo and Tang, 2014; Akbaş and Canikli, 2019), negative (Freedman and Jaggi, 1988; Prado-Lorenzo et al., 2009), and insignificant (Ben-Amar et al., 2017; Cotter and Najah, 2012; Bewley and Li, 2000).

If the relationship between the two variables is inconsistent then it indicates the possible role of moderation variables (Hair et al., 2017). Motivated to explain the inconsistency of previous research findings, this study considers the characteristics of corporate governance as a moderating variable. Several previous studies have investigated the effect of corporate governance characteristics (e.g., board size, board independence, and board committees) on GHG disclosure (Liao et al., 2015; Ben-Amar et al., 2017). However, there is mixed empirical evidence from the results of the previous study. In addition, research testing board gender diversity and GHG disclosures is also still limited (Liao et al., 2015; Ben-Amar et al., 2017; Hollindale et al., 2019; Kılıç and Kuzey, 2019). Therefore, the motivation of this study is to fill this gap in the previous literature by exploring whether a significant association exists between the level of GHG disclosure and corporate characteristics moderated by the board structure (e.g., board independence, board gender diversity, and board size,) and the effectiveness of the audit committee. Moreover, with regard to the characteristics of the audit committee, there has not been a prior study that analyzed the impact of the effectiveness of audit committee on GHG disclosures. This gap has created the motivation to research the moderating role of effectiveness of audit committee on GHG disclosures.

## 2. LITERATURE REVIEW

### 2.1. Legitimacy Theory

This study bases on the theory of legitimacy to develop a model of the relationship between corporate characteristics and disclosure of GHG emissions moderated by governance. The theory of legitimacy states that A firm will always try to find

ways to keep the operations carried out within the norms and limits that apply in society (Rokhlinasari, 2007). The theory of legitimacy bases on the “social contract” between the company and the society in which the company operates and uses existing economic resources. However, there are often differences of interests between the company and the community around the company’s operational environment. When there are differences of interest and views, this will bring up the legitimacy gap (Lindawati and Puspita, 2015). When there is a legitimacy gap, the company will find a way to change the public’s perception of the company. If it is related to the environment, it can disclose corporate social responsibility related to the environment in the company’s operational area, one of which is the disclosure of GHG emissions.

### 2.2. GHG Emission Control Practices in Indonesia

Indonesia is among the 8 largest contributors to GHG emissions according to the World Resources Institute (Damassa et al., 2016). In Indonesia’s First Biennial Update Report submitted to the UNFCCC in 2016, total GHG emissions in Indonesia in 2012 were estimated to reach 1.454 million metric tons. Most GHG emissions come from land use and debt fires which reach 48% of total GHG emissions generated, while 35% comes from the energy sector. The rest resulted from the IPPU, the agricultural sector and waste (Wijaya et al., 2017). In responding to this problem, the Government of Indonesia has issued Presidential Regulation of the Republic of Indonesia Number 61 of 2011 concerning the National Action Plan for the Reduction of Greenhouse Gas Emissions or also called RAN-GHG. This regulation is used by the community, business actors, and the government in the planning and implementation of businesses to reduce GHG emissions. In RAN-GHG, there is a target of reducing national GHG emissions by 26% with its own efforts and reaching 41% if it gets assistance from the international with a record of Business as Usual (BAU) conditions in 2020. Indonesia is also planning for post-2020, which will reduce GHG emissions by 29% unconditionally to 41% conditionally by 2030.

The increase in GHG emissions cause global warming. Indonesia is one of the countries that contributes fairly high GHG emissions. But the Indonesian government is sharing ways to reduce GHG emissions. As stated in Law No. 17 of 2004 concerning Ratification of the Kyoto Protocol to The United Nations Framework Convention on Climate Change. The Kyoto Protocol is used to regulate GHG emissions resulting from human activities, so that GHG concentrations in the atmosphere can be stable and not harmful to the Earth’s climate system.

Disclosure of GHG emissions in Indonesia is part of voluntary disclosure or voluntary reports, so that not many companies disclose this information in their reports (Anggraeni, 2015). Nevertheless, information about the company’s strategies and activities, the impact of the company’s activities on GHG emissions, and the company’s efforts to reduce GHG emissions are very important for stakeholders in decision making. Companies that usually reveal about GHG emissions are companies engaged in the mining, forestry, agriculture, and production sectors. As the report revealed by Samidjo and Suharso (2017), it is estimated

that 2/3 of contributors to GHG emissions are companies in the industrial, energy, electricity, and transport sectors. While the other 1/3 comes from companies in the forestry, agriculture, and waste sectors.

This disclosure is made because companies in the mining, forestry, agriculture, and production sectors are companies that in their operations involve nature around them. The companies use new fossil fuels such as coal, petroleum, and natural gas as well as other fuels that produce carbon dioxide. Therefore, companies in these sectors seek to disclose GHG emissions as a way to fulfill the company's responsibility for the surrounding environment and also as a consideration for investors in the assessment of the company.

### 2.3. Hypotheses Development

Based on the theory of legitimacy, it is assumed that large-scale companies will get more attention and supervision from the public so as to cause more disclosure of environmental information including GHG disclosure (Cho and Patten, 2007). Larger firms tend to be under public scrutiny so that they have a higher propensity for environmental disclosure. In addition, larger companies have more resources to implement environmental programs. The argument about the positive effect of company size on GHG emission disclosure is based on the assumption of economies of scale related to information production cost (Akbaş and Canikli, 2019). In addition, transaction cost hypothesis also states that the larger the size of the firm, the greater the voluntary disclosure of information because the incentive for private information acquisition will be greater for large-scale companies. The results of previous studies indicate that corporate size has a positive effect on the amount of voluntary environmental information disclosed including GHG disclosure (Cormier et al., 2005; Liu and Anbumozhi, 2009; Clarkson et al., 2008; Freedman and Jaggi, 2005; Prado-Lorenzo et al., 2009; Chu et al., 2013; Akbaş and Canikli, 2019). From this description, the following hypothesis is formulated:

H<sub>1</sub>: Firm's size affects the level of GHG emission accounting disclosure.

In addition to size, leverage is a proxy characteristic of companies hypothesized to affect GHG disclosure. In the literature, there are both a positive and negative relationship between leverage which is an indicator of financial risk and GHG disclosure (Akbaş and Canikli, 2019). Based on agency theory, the amount of leverage is one of the factors related to the amount of information published as the impact of conflicts due to company funding from debt. In this case, companies that have more debt will have greater agency costs because there is a possibility of wealth transfer from debt holders to stockholders. By increasing the amount of information disclosed including disclosure of GHG emissions, companies can reduce the agency costs. Clarkson et al. (2008) showed a positive relationship between leverage and environmental information disclosure.

Another argument about the positive relationship between leverage and disclosure of GHG emissions is leverage is a proxy for various dimensions of firm risk (Hassan and Romilly, 2018). The greater the company's debt, the higher the monitoring of the business

because of the lower financial flexibility. Li et al. (2018) stated that highly leveraged firms are more likely to reveal more information about GHG emissions. Based on these assumptions, it can be argued that in order to compensate for its falling reputation due to many debts, highly leveraged firms tend to reveal the details of each increase in debt caused by a decrease in GHG emissions. However, there are contradictory arguments and empirical evidence that business with lack of financial resources is less likely to voluntarily disclose GHG information (Ben-Amar et al., 2017; Luo and Tang, 2015). On the other hand, Akbaş and Canikli (2019) found that leverage is not related to disclosure of GHG emissions. With differences in arguments and empirical evidence, this study proposes a two-way hypothesis:

H<sub>2</sub>: Leverage affects the level of GHG emission accounting disclosure.

Profitability is one of the characteristics of the company that is suspected to be a determinant of environmental information disclosure, including GHG emissions. Lang and Lundholm (1993) and Core et al. (1999) argue that firms with greater profitability tend to disclose the "good news" to the market, including environmental information. However, there are differences in perspectives and research results on the effect of profitability on GHG disclosure. There are two groups of findings from previous studies, namely one group supporting the argument that companies with high profitability do not require voluntary disclosure (Andrikopoulos and Kriklani, 2013). While other groups support the argument that high profits have a positive effect on voluntary disclosure of environmental information. Conversely, Freedman and Jaggi (1988) and Prado-Lorenzo et al. (2009) found an inverse relationship between profitability and GHG disclosure. These results indicate that companies with poor performance disclose large amounts of environmental information in order to make the company more attractive in the eyes of different stakeholders (Prado-Lorenzo et al., 2009).

Contrary to this, stakeholder theory states that there is a positive relationship between social disclosures and the economic growth of firms (Roberts 1992; Akbaş and Canikli, 2019). Some previous research provides empirical evidence that companies with large financial capabilities will tend to disclose more environmental information in order to align stakeholders' interests (for example: Matisoff et al., 2013; Stanny, 2013; Luo and Tang, 2014; Akbaş and Canikli, 2019). There are also some research results that do not find a relationship between GHG disclosure and profitability (Ben-Amar et al., 2017; Cotter and Najah, 2012; Chu et al., 2013). With differences in arguments and empirical evidence, this study proposes a two-way hypothesis:

H<sub>3</sub>: Profitability affects the level of GHG emission accounting disclosure.

Companies with a high proportion of independent commissioner board members demonstrate the ability of a larger commissioner board to balance financial accountability with the environment and the company's short-term and long-term goals. Previous research also stated that the existence of an independent board of commissioners in the company is positively related to voluntary disclosure in general and also affects CSR and environmental



disclosure (Liao et al., 2015; Khan, 2016)). Previous research also revealed that independent commissioners would be more inclined to the public interest and shareholder interests, so that companies would disclose information related to the environment (Allegrini and Greco, 2013; Chau and Gray 2010; Kılıç and Kuzey, 2019).

The board of commissioners plays a role in monitoring and disciplining company management as a form of responsibility for the trust that has been given by the principal to the agent (Healy and Palepu, 2001). One of the characteristics that is often debated in the composition of the board of commissioners is gender diversity (Huse and Solberg, 2009). Because men and women are traditionally, culturally, and socially different. Previous research stated that women in general are more concerned with environmental issues than men (Wehrmeyer and Mcneil, 2000; Liao et al., 2015). The board of women commissioners will more easily accept regulations related to the environment. Research conducted by Bear et al. (2010) showed that the presence of women board members and commissioners increases the disclosure of the company's environment and CSR. Research by Liao et al. (2015) and Fabricio et al. (2022) also showed that the presence of female board members of commissioners was positively related to the disclosure of GHG emissions. So that it can be predicted that the existence of female board members in the composition of the company's board of commissioners can increase the tendency to disclose GHG emissions by the company.

The number of members of the board of commissioners in the company represents various kinds of knowledge and expertise in the board of commissioners. Peters and Romi (2012) said that companies that have a larger number of members of the board of commissioners will have more disclosures regarding GHG, this is supported by the results of other studies that showed that the number of members of the board of commissioners is positively related to the disclosure of GHG emissions (Chithambo and Tauringana, 2016). Some researchers also said companies that have more board members will tend to disclose information about the environment in more detail (Allegrini and Greco, 2013; Magnan et al., 2010; Ben-Amar and McIlkenny, 2015). This study argues that the structure of the board of commissioners consisting of the dimensions of independence, board diversity, and the number of members of the board of commissioners will strengthen the effect of size, leverage, and profitability on GHG disclosure. From this description, the following hypothesis is formulated:

H<sub>4a</sub>: Structure of the board of commissioners strengthens the effect of size on GHG disclosure.

H<sub>4b</sub>: Structure of the board of commissioners strengthens the effect of leverage on GHG disclosure.

H<sub>4c</sub>: Structure of the board of commissioners strengthens the effect of profitability on GHG disclosure.

One of the tasks of the audit committee is to review the financial information that will be issued by the company, whether it is financial statements, projection reports, or other reports related to the company's activities including disclosure of environmental information. This study argues that the effectiveness of an audit committee consisting of the dimensions of number of members,

frequency of meetings, and competence will strengthen the positive effect of corporate characteristics on GHG disclosure.

An audit committee with a large number of members will have a broad view and knowledge in looking at and supervising a case, such as cases related to environmental issues (Bedard et al., 2004). The large number of members of the audit committee will provide effectiveness in the task of supervising the audit committee on the disclosure of company environmental information. However, on the other hand, the large number of audit committee members can cause additional costs as well as the potential for poor communication and coordination within the audit committee (Li et al., 2012; Madi et al., 2014; Appuhami and Tashakor, 2016).

Appuhami and Tashakor (2016) have explained that the more frequent the frequency of audit committee meetings in a year will facilitate audit committees in the corporate social responsibility (CSR) disclosure oversight process. Audit committee can more easily find disagreements or issues that occur during the CSR disclosure process. So that CSR disclosures by companies can be relied upon.

The governance regulation in Indonesia regulates that the audit committee must have at least 1 member with an education and expertise in accounting and finance. If the audit committee does not have members with a financial background, it will have difficulty in detecting problems in reporting conducted by the firm. Allegrini and Greco (2013) reveal that with the existence of audit committee members who have financial and accounting competencies can make the company improve the company's environmental disclosure. Based on the above arguments, this study hypothesizes that the effectiveness of audit committees formed from the dimensions of number of members, frequency of meetings, and competence will strengthen the effect of corporate characteristics on GHG disclosure. From this description, the following hypothesis is formulated:

H<sub>5a</sub>: Effectiveness of the audit committee strengthens the effect of the size on GHG disclosure.

H<sub>5b</sub>: Effectiveness of the audit committee strengthens the effect of leverage on GHG disclosure.

H<sub>5c</sub>: Effectiveness of the audit committee strengthens the effect of profitability on GHG disclosure.

### 3. METHODOLOGY

#### 3.1. Population and Sample

This study analyzes GHG accounting disclosure with the population of non-financial companies listed on the IDX for a period of 3 years, 2018-2020. Non-financial firms in this study are companies located in several sectors outside the financial sector such as the agricultural sector, the mining sector, the property sector, real estate and construction, infrastructure, utilities, and transportation sectors as well as manufacturing companies consisting of the basic and chemical industry sectors, various industries and, the consumables industry. Companies located in the above sectors are companies engaged in sectors related to the environment and directly related to GHG emissions. Sample determination in this study used purposive sampling technique

with the criteria of non-financial companies listed on the IDX during the period 2018-2020 which revealed GHG emissions in annual report and sustainability report.

### 3.2. Measurement of Variables

The dependent variable used in this study was GHG accounting disclosure. The measurement used for this variable used an index based on previous research, namely research conducted by Bae et al. (2014). This measurement index was compiled based on the factors identified in the Request for Information sheet by the Carbon Disclosure Project (CDP).

In this disclosure index there are five main categories, namely climate change risks and opportunities, greenhouse gas emission calculation, energy consumption calculation, reduction of greenhouse gas and costs, and accountability for carbon emissions. Of these five categories then identified again so that it became more specific with 18 items. Measurements in this index used binary code value 1 which was given in each item if the company disclosed information related to the item, if it did not reveal then given a value of 0. Therefore, each company would get a maximum value of 18 if it revealed all items, and the minimum value was 0. The GHG disclosure index score was obtained by summing all items disclosed in each company or sample and then divided by the number of items which was 18.

The independent variable in the study was corporate characteristics consisting of company size, leverage, and profitability. Company size calculated using natural logarithms on total company assets (Liao et al., 2015). Leverage is a ratio that describes the cost of the company's operating activities that depend on the company's debt to creditors. Leverage was calculated by reference to Liao et al. (2015), i.e. the ratio of the company's total debt to total assets. Profitability was calculated by Return on Assets (ROA). ROA is a ratio to show the efficiency of the company's asset management to obtain profits or profits calculated by net profit after tax divided by total assets.

The moderation variable in this study consisted of the structure of the board of commissioners and the effectiveness of the audit committee. The structure of the board of commissioners is a formative latent variable with three indicators; namely independence, gender diversity, and the number of members. Board independence was calculated by the proportion of the number of independent commissioners divided by the total number of board members. Gender diversity was calculated by calculating the percentage proportion of the number of women commissioners in the composition of the board of commissioners of the company. The number of members of the board of commissioners was calculated based on the number of members of the board of commissioners in a given period.

The second moderating variable was the effectiveness of the audit committee which is also a formative latent variable with three indicators, namely the number of members, the number of meetings and competencies. Based on Appuhami and Tashakor (2016), the indicator of number of members was calculated by

summing all members of the company's audit committee. The frequency of meeting indicator was calculated by summing up all audit committee meetings conducted during a year. The competence indicator was calculated by the proportion of audit committee members who have financial competence divided by the number of all audit committee members.

### 3.3. Data Analysis

This study used the analysis technique of Partial Least Squares-Structural Equation Modeling (PLS-SEM). PLS-SEM was used with several considerations of its advantages (Hair et al., 2017; Kock, 2020):

1. Able to provide several fit model indicators that can be useful for comparing the best models between different models, including: Average Path Coefficient (APC), Average R-Squared (ARS), Average Adjusted R-Squared (AARS), Average Block Variance Inflation Factor (AVIF), Average Full Collinearity VIF (AFVIF).
2. Able to provide full collinearity test values that can be used to analyze vertical and lateral multicollinearity problems.
3. If there is a formative construct in the research model such as in this study, then only PLS-SEM can be used.

## 4. EMPIRICAL RESULTS

### 4.1. Descriptive Statistics

The population of this study was non-financial firms listed on the Indonesia Stock Exchange during 2018-2020 totaling 1,336 companies. Researcher did not use companies in the financial sector because they were not relevant to research related to the disclosure of GHG emissions. Companies related to GHG emissions are companies that are more in the non-financial sector. During the period of 2018 to 2020 there were 1,267 companies that did not disclose sustainability reports in a row. Sustainability report is needed in this study to determine the extent of disclosure related to GHG emissions carried out by the firms. Therefore, the selected sample was companies that disclosed sustainability reports. A total of 23 non-financial companies disclosed sustainability reports in 2018-2020. Overall, observations consisted of 69 firms-years as hypothesis testing data.

Table 1 presents descriptive statistics of the research variables. In Table 1, it can be seen that the average value of GHG emission disclosure is 0.4179 which shows the average disclosure made by a sample of companies in Indonesia of 41.79% of the total GHG emission disclosure indicators used. Based on these descriptive statistics, it can be concluded that the level of disclosure of GHG emissions in Indonesia is still relatively low. The average value of firm size (natural logarithm of total assets) shows a number of 30.637 with a smaller standard deviation value of 1.861, indicating that this variable has a small deviation value. Leverage was calculated by debt-to-equity ratio. The results of descriptive statistics show an average with a value of 50.185, indicating an average of company assets financed with debt of 50.19%. The results in Table 1 show the average profitability measured by ROA with a value of 7.6458, indicating that the firms' assets can generate an average profit of 7.65%. This statistic shows that the average sample of this

study has good profitability with positive ROA. However, there are companies with poor performance indicated by a minimum ROA value of  $-5.67\%$ .

The mean value in the variable of the proportion of women commissioner board members (BC Gender) shows a number of 0.0654, indicating a low proportion of women commissioner board members which is 6.54%. While the minimum value is 0% which indicates that many companies' commissioner boards do not have women commissioner board members. The mean of the variable proportion of independent commissioner board members (BC independency) is 0.3885, meaning that the companies have an average commissioner board proportion of 38.85%. The minimum value is 29.00%, this has approached the regulation on the Board of Commissioners and Directors for issuers and public companies in Indonesia (POJK Number 33/POJK.04/2014) which states that members of the board of commissioners consisting of more than two people, the number of members of the board of independent commissioners must be at least 30% of the total number of members. The variable of the number of members of the board of commissioners (BC size) show a mean of 6.5652 greater than the standard deviation value of 1.736. The minimum value is number 3, which means that there are companies with the smallest number of members of the board of commissioners, namely only 3 members. So it can be said that all companies in this research sample are in accordance with POJK Number 33/POJK.04/2014 which states that the board of commissioners must consist of two members of the board of commissioners, one of whom is an independent commissioner.

The average value of the variable number of audit committee members (AC size) shows a number of 3.4058 which means that the companies in this study sample have an average number of audit committee members of 3 people. The minimum value indicates the number 3 and the maximum indicates the number 6. Based on the results of the study, it can be said that all companies are in accordance with the regulations regarding audit committees in Indonesia (POJK Number 55/POJK.04/2015) which states that the audit committee consists of at least 3 people from independent commissioners and parties from outside the company. The average value of the frequency of audit committee meetings (AC meeting) in Table 1 shows a number of 14.029, which means that the companies in this research sample conducted an average audit committee meeting 14 times a year. POJK Number 55/POJK.04/2015 states that the audit committee must hold periodic meetings at least 1 time in

**Table 1: Descriptive statistics**

Variables	N	Min.	Max.	Mean	Std. Dev.
GHG Emission	69	0.11	0.72	0.4179	0.176
Firm's size	69	23.44	33.32	30.637	1.861
Leverage	69	13.31	76.82	50.185	17.48
ROA	69	-5.67	52.67	7.6458	11.15
BC gender	69	0.00	0.33	0.0654	0.098
BC independency	69	0.29	0.80	0.3885	0.110
BC size	69	3.00	12.00	6.5652	1.736
AC size	69	3.00	6.00	3.4058	0.734
AC meeting	69	4.00	47.00	14.029	12.07
AC expert	69	0.25	1.00	0.5377	0.192

3 months, which means that in one year the company should have held audit committee meetings 4 times. In accordance with the regulation, the minimum value is 4, which means that all companies in the research sample have at least held audit committee meetings 4 times a year. Financial competence of audit committee members (AC expert) is the last independent variable that describes the existence of audit committee members with financial competence. This is also regulated in Number 55/POJK.04/2015 which states that the audit committee must have at least one member who has expertise in accounting and finance. The minimum value shows a value of 0.25, which means that there are companies with a composition of members with financial competence in the audit committee of at least 25% of the total, so it can be said that all companies in this study sample have been in accordance with the regulations.

## 4.2. Results of Hypothesis Testing

The stages of hypothesis testing in PLS-SEM analysis include outer model and inner model tests. In the outer model test stage, an evaluation was carried out to assess the feasibility of the latent variable indicators. This study used latent/unobserved variables board of commissioner structure and audit committee effectiveness that was measured using formative indicators. Analysis of the measurement model can be utilized from the feasibility of the formative indicator by looking at the significance value of weight and co-linearity (variance inflation factor/VIF). The result of measurement model using WarpPLS 8.0 in Table 2 shows that P-value for weight significance of all indicators of formative variables  $<0.001$  and co-linearity of all formative indicators shows VIF value  $<3.3$ . Thus, measurement model has fulfilled the criteria for formative constructs.

**Table 2: Results of outer model**

Indicators	Weight	Type	P-value	VIF
BOC Independence	0.388	Formative	$<0.001$	1.035
BOC Size	0.534	Formative	$<0.001$	1.110
BOC Gender	0.527	Formative	$<0.001$	1.106
AC size	0.529	Formative	$<0.001$	1.204
AC Meeting	0.535	Formative	$<0.001$	1.210
AC Expertise	0.322	Formative	0.002	1.033

**Table 3: Model fit and quality indices**

Fit Indicators	Results	P-values	Criteria
Average Path Coefficient (APC)	0.216	P=0.015	P<0.05
Average R-Square (ARS)	0.502	P=0.001	P<0.05
Average Adjusted R-Square (AARS)	0.426	P=0.001	P<0.05
Average Block VIF (AVIF)	1.746		$\leq 5.0$
Average Full Collinearity VIF (AFVIF)	2.881		$\leq 5.0$
Tenenhaus GoF (GoF)	0.667		$\geq 0.36$ (large)
Simpson's paradox ratio (SPR)	0.778		$\geq 0.70$
R-squared contribution ratio (RSCR)	0.904		$\geq 0.90$
Statistical suppression ratio (SSR)	0.778		$\geq 0.70$

Table 3 presents the goodness of fit for the research model. The test results show that all goodness of fit criteria for PLS-SEM have been met. Therefore, the structural model data analysis can be continued with hypothesis testing.

Figure 1 presents the WarpPLS 8.0 output for the structural model test results.

Table 4 presents a summary of the results of hypothesis testing. The test results provide empirical evidence that hypothesis 1, namely firm’s size affects the level of GHG emission disclosure, is supported by a coefficient path of 0.344 and is significant with  $P = 0.001$ . Hypothesis 2, namely leverage affects the level of GHG emission disclosure, is supported by the coefficient path of  $-0.350$  and is significant with  $P < 0.001$ . Conversely, hypothesis 3 that profitability affects the level of GHG emission disclosure is not supported because P-value is not significant.

Of the three hypotheses moderated by the structure of the board of commissioners, only H4b is supported, namely the structure of the board of commissioners strengthens the effect of leverage on GHG emission disclosure (path coefficient  $-0.345$  and significant with  $P = 0.001$ ). While H4a and H4c are not supported by empirical evidence of the results of this study with a P-value of more than 0.10. While for hypothesis moderated by the effectiveness of the audit committee, H5b, namely the effectiveness of the audit committee strengthens the effect of leverage on GHG disclosure is supported (path coefficient 0.156 and significant in alpha 10% with  $P = 0.088$ ). Likewise, H5c namely the effectiveness of the audit committee strengthens the effect of profitability on GHG disclosure is supported (path coefficient  $-0.352$  and significant

with  $P < 0.001$ ). While H5a is not supported by empirical evidence of the results of this study with P-value of more than 0.10.

The result of this study indicates that firm’s size affects GHG emission disclosure in a positive direction. This study provides empirical evidence that supports the theory of legitimacy that larger companies tend to be under public scrutiny so that they have a higher propensity for environmental disclosure. In addition, larger companies have more resources to carry out environmental programs. The empirical evidence of this study is consistent with the results of previous studies that corporate size has a positive effect on the amount of voluntary environmental information disclosed including GHG disclosure (Cormier et al., 2005; Liu and Anbumozhi, 2009; Clarkson et al., 2008; Freedman and Jaggi, 2005; Prado-Lorenzo, 2009; Chu et al., 2013; Akbaş and Canikli, 2019).

The test results also provide empirical evidence that leverage has a negative effect on GHG emission disclosure. This finding contradicts the argument that high leverage firms will compensate for their falling reputation due to more funding from debt, with more GHG emission disclosure. Empirical evidence from this study suggests that companies with low debt actually reveal more GHG emissions. This finding supports previous research findings that leverage has a negative effect on GHG emission disclosure (Ben-Amar et al., 2017; Luo and Tang, 2015). This result may be caused by low debt companies have adequate financial capabilities in managing environmental activities including GHG emissions.

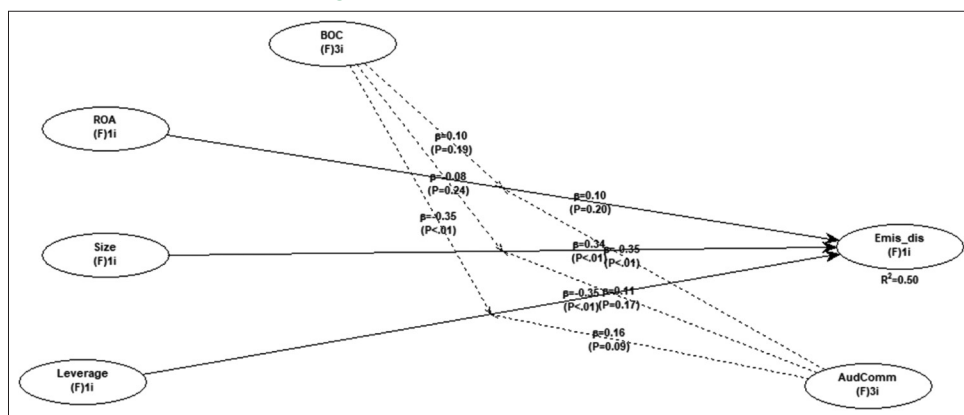
Empirical evidence from this study suggests that profitability has no effect on GHG emission disclosure. This finding supports the

**Table 4: Results of hypothesis testing**

Structural/hypothesised paths	Parameter ( $\beta$ )	t-statistics	P-value	Conclusion
Size → GHG disclosure	0.344	3.203***	0.001	Supported
Leverage → GHG disclosure	-0.350	-3.260***	<0.001	Supported
Profitability → GHG disclosure	0.099	0.853	0.198	Not Supported
BOC*Size → GHG disclosure	-0.083	-0.706	0.241	Not Supported
BOC*Leverage → GHG disclosure	-0.345	-3.210***	0.001	Supported
BOC*Profitability → GHG disclosure	0.102	0.878	0.191	Not Supported
AC*Size → GHG disclosure	0.110	0.945	0.174	Not Supported
AC*Leverage → GHG disclosure	0.156	1.365*	0.088	Supported
AC*Profitability → GHG disclosure	-0.352	-3.283***	<0.001	Supported

\*Significant at alpha 10%, \*\*Significant at alpha 5%, \*\*\*Significant at alpha 1%

**Figure 1: Results of structural model**





argument that companies with high profitability do not require voluntary disclosure of environmental information (Andrikopoulos and Kriklani, 2013). These companies focus more on disclosing financial performance information to shareholders and potential investors. There are also some research results that do not find a relationship between GHG disclosure and profitability (Ben-Amar et al., 2017; Cotter and Najah, 2012; Chu et al., 2013).

The results of the moderation effect test showed that the structure of the board of commissioners; consisting of indicators of independence, women representation, and the number of members of the board of commissioners; strengthen the negative effect of leverage on GHG emission disclosure. Empirical evidence from this study suggests that adequate independence, representation of women, and number of commissioner board members will encourage companies with low debt to disclose more GHG emission information in order to maintain their legitimacy. Empirical evidence of this study shows that independence (Amran et al., 2014; Liao et al., 2015; Jaggi et al., 2018; Krishnamurti and Velayutham, 2018; He et al., 2019), women representation (Prado-Lorenzo and Sanchez, 2010; Liao et al., 2015; Ben-Amar et al., 2011); and the size of the board of commissioners (Tauringana and Chithambo, 2015; He et al., 2019) will encourage more GHG emission disclosure.

This study also analyses the moderating role of the effectiveness of audit committee in the relationship between company characteristics and GHG disclosure. The test results showed that there was a positive coefficient of interaction (0.156) and significant at alpha 10%. These results indicate that the effectiveness of audit committees consisting of size, meeting, and expertise indicators can encourage companies with high leverage to reveal more GHG emissions. The test results also showed that there was a negative interaction coefficient (-0.352) and significant at alpha 1%. These results indicate that the effectiveness of the audit committee can encourage companies with lower profitability to disclose more GHG emissions. These results indicate that audit committee can encourage companies with poor performance to disclose large amounts of environmental information in order to make the companies more attractive in the eyes of different stakeholders (Prado-Lorenzo et al., 2009).

## 5. CONCLUSION

This study shows empirical evidence that the average value of company sample on GHG emission accounting disclosure in Indonesia is 41.79% of the total GHG emission disclosure indicator used. Based on these descriptive statistics, it can be concluded that the level of disclosure of GHG emissions in Indonesia is still relatively low. The results of PLS-SEM testing show support for the legitimacy theory that size and leverage affect the level of disclosure of GHG emissions. The structure of the board of commissioners; consisting of indicators of independence, women representation, and the number of members of the board of commissioners; strengthen the negative effect of leverage on GHG emission disclosure. The result of the moderation test also shows that the effectiveness of the audit committee can encourage firms with high leverage and poor performance to reveal more GHG emissions.

Limitations of this study include the coefficient of determination test results showing that the variable carbon emission disclosure is only explained by 42.6% according to the adjusted R square results. This shows that there are other variables outside the research model that affect the disclosure of GHG emissions.

From the conclusions and limitations that have been stated, the researcher provides suggestions for future research, if the data is available, so that the number of samples of companies studied is increased and more varied in its industry to get more accurate results. Future research would be better if adding other variables that could affect the company's broad practice of disclosing GHG emissions.

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