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The content and determinants of greenhouse gas emission disclosure: Evidence from Indonesian companies

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Abstract

This paper examined the content and determinants of greenhouse gas (GHG) emission disclosure practices. This study found that the number of firms disclosed is increased from 42.9% in 2011 to 48.1% in 2014. The assessment of risks and opportunities of climate change theme is the most disclosed item. Miscellaneous industries disclosed more GHG emission information compared with any other industry. The results also show that profitability, leverage, company size, and industry are significant determinants that can explain the extent of GHG emission disclosure. The findings of this study indicated that GHG emission disclosures are used as a mechanism to reduce pressures from stakeholders. This study contributes to the GHG emission disclosure literature by providing patterns and determinants of companies' GHG emission disclosure in an emerging country.

KEYWORDS

carbon disclosure, climate change, greenhouse gas, Indonesia

1 | INTRODUCTION

Currently, companies worldwide have gradually started considering the substantial risk of climate change, both the direct physical impact on their businesses and climate change policies that change consumption patterns (Luo, Tang, & Lan, 2013). Several countries such as the European Union, the United States, Canada, Japan, South Korea, and New Zealand have committed to reducing greenhouse gas (GHG) emissions (including carbon emissions) by issuing mandatory regulations for companies to disclose information related to GHG emissions (World Resources Institute, 2015). The Australian government introduced a National Greenhouse and Energy Reporting Act as a framework for reporting GHG emissions (Choi, Lee, & Psaros, 2013). Under the Companies Act 2006 (Strategic and Directors' Reports) Regulations 2013, the U.K. government requires companies to report their annual GHG emissions in their directors' report. In contrast to Indonesia, there has never been a specific regulation that mandates to disclose GHG information. The Government Regulation Number 47 (2012) only requires companies running their business activities in the field and/or related to the natural resources to implement social and environmental

responsibility (Article 74, paragraph 1). Also, the Law Number 17/2004 and Presidential Decree Number 61/2011 only determine regulation regarding a national action plan for reducing the six GHGs as targeted by the Kyoto Protocol, namely, carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulphur hexafluoride (SF₆), perfluorocarbons, and hydrofluorocarbons. Although there have been some mandatory regulations related to reporting GHG emissions in some developed countries, nonetheless, disclosure practices are still incomplete (Liesen, Hoepner, Patten, & Figge, 2015), and their comprehensibility is still questionable (Kolk, Levy, & Pinkse, 2008), especially in Indonesia, where the GHG reporting is still unregulated and voluntary.

Most previous studies of GHG emission disclosure have been conducted in developed and Western countries, such as Australia (see Andrew & Cortese, 2011; Choi et al., 2013; Hrascky, 2012; Li, Eddie, & Liu, 2014; Rankin, Windsor, & Wahyuni, 2011; Wang, Li, & Gao, 2014), the United Kingdom (Baboukardos, 2017; Chithambo & Tauringana, 2014; de Aguiar & Bebbington, 2014), the United States (see Kim & Lyon, 2011; Lewis, Walls, & Dowell, 2014; Stanny, 2013; Stanny & Ely, 2008), and Canada (see Ben-Amar & McIlkenny, 2014). Choi et al. (2013) analysed the reactions of Australia's largest 100

companies during the period 2006–2008 when the Australian government announced a series of regulations regarding GHG emission disclosure; they found that the level of disclosure was 46.0%. Using 210 firms listed on the U.K. Financial Times Stock Exchange, Chithambo and Taurigana (2014) showed that the extent of GHG emission disclosure was 38.5%.

In developing and Asian countries, most studies of GHG emission disclosure were conducted in China (see He, Tang, & Wang, 2013; Li, Yang, & Tang, 2015). Chu, Chatterjee, and Brown (2012) found that 61% of the Top 100 A-share issuing companies on the Shanghai Stock Exchange disclosed GHG emission information with the mean of disclosure that is 24.9%. Peng, Sun, and Luo (2015) examined 1,744 of China's nonfinancial A-share listed companies listed on both the Shenzhen and Shanghai Stock Exchanges from 2008 to 2012. They found that the proportion of firms reporting carbon-related information in their corporate social responsibility (CSR) reports increased from 19.9% in 2008 to 26.5% in 2012. However, the extent of GHG disclosure is only 5%. On the basis of these studies, it may indicate that the extent of GHG disclosure in developed countries is higher than in developing countries.

Some previous studies have also investigated determinants of GHG emission disclosure. Borghei-Ghomi and Leung (2013) found a significant relationship between company characteristics, corporate governance, and GHG emission disclosure in Australia. Using U.K. companies, Chithambo and Taurigana (2014) examined factors that affect the disclosure of GHG emissions; their results showed that corporate governance characteristics affected GHG emission disclosure. In Asia, He et al. (2013) suggested that carbon performance and cost of capital have a significant influence on GHG emission disclosure for companies listed on Standard & Poor's 500 that participated in the Carbon Disclosure Project. Although previous studies have investigated factors influencing GHG emissions, few studies have detailed content of GHG emission disclosure and focused on internal contextual factors such as firm size, profitability, leverage, industry, and ownership in developing countries (Ali, Frynas, & Mahmood, 2017), especially in Indonesia. This study is the first to explore the content and determinants of GHG emission disclosures in Indonesia. Indonesia presents an interesting case in which to explore the pattern and determinants of GHG emission disclosures. Indonesian companies, for some time now, have been facing a number of factors exposing them to CSR practices. These include the issues of poverty alleviation, health and safety of the environment, pollution, deforestation, social and political insecurity, and the high needs for direct foreign investment (Djajadikerta & Trireksani, 2012, p. 22). In spite of these problems, since 2013, the Indonesian government has continuously released GHG regulations as a commitment to reducing GHG emissions and improved sustainable development and a contribution towards overcoming global warming. The findings of the study offer both theoretical and practical insights into the extent and pattern of GHG emission disclosures and what factors determine disclosure. The research questions addressed in this study are (a) what is the extent and pattern of GHG emission disclosure and (b) whether firm's factors influence the extent of GHG emission disclosure.

The remaining parts of the paper proceed as follows: The next section reviews the theoretical framework. Section 3 explains the

GHG emission regulation in Indonesia. Section 4 presents the hypothesis development. Research method is provided in Section 5. Section 6 presents the discussion and the results of the analysis. Finally, Section 7 presents the conclusion and limitations of the research.

2 | THEORETICAL FRAMEWORK

Freeman (1984, p. 46) defines stakeholders as groups or individual in company that can influence or be influenced by the activity of the company. One of the principles of stakeholder theory is that everyone should take responsibility for the impact of their respective deeds towards others (Gray, 2001). A company's existence is affected by stakeholders' support; the viability of an enterprise relies on the support of its stakeholders. The more powerful the stakeholders, the greater a company's effort to adapt to the corporate environment (Parmar et al., 2010). Gray, Kouhy, and Lavers (1995) argued that the stakeholder theory can be tested through content analysis of a company's annual reports; this is the most efficient way for organisations to communicate with stakeholders. Therefore, GHG disclosure is considered a part of the dialogue between companies and stakeholders.

Legitimacy theory asserts that organisations continually seek to ensure that they are perceived as operating within the bounds and norms of their respective societies (Suchman, 1995, p. 573). According to Deegan (2002), legitimacy and status are conditions that occur when a company's value system is congruent with the value system of the larger social system in which the company operates. The legitimacy of the company is threatened when there is a real or potential difference between these two value systems. A theoretical construct known as the "social contract" is central to legitimacy, which relies on the notion that the legitimacy of a business entity to operate in society depends on an implicit social contract between a business entity and society (Lindblom, 1994, p. 2). Therefore, an organisation's survival might be threatened if society perceives that the organisation has breached its social contract (Guthrie & Parker, 1989). Qian and Schaltegger (2017) argue that companies are regarded as adaptive entities reacting to social and environmental pressures, such as GHG emissions. GHG disclosures thus may be used as a powerful medium to influence the perceptions of stakeholders and thereby contribute towards the maximisation of earning potential (Gray, Javad, Power, & Sinclair, 2001, p. 329).

Institutional theory is a branch of legitimacy theory that describes the institutional pressures faced by organisations. As a result of these pressures, organisations tend to be similar in shape and practices (DiMaggio & Powell, 1983; Islam & Deegan, 2008). According to Cahaya, Porter, Tower, and Brown (2012, p. 115), institutional theory has two dimensions: isomorphism and decoupling. In the context of this study, isomorphism relates to the ways in which institutional setting affects GHG disclosures. Deegan (2009) suggests that decoupling occurs when the practice of GHG disclosure creates a different image of environmental responsibility activities, programmes, and policies among stakeholders. Moreover, Deegan (2009) states that isomorphism comprises three processes: coercive, mimetic, and normative. According to DiMaggio and Powell (1983), coercive isomorphism

refers to situations where institutional practices, such as GHG disclosures, arise from stakeholder pressure. Mimetic isomorphism refers to situations where an organisation mimics the practices of other institutional organisations, which often happens for competitive advantage. Finally, normative isomorphism refers to pressures arising from the norms of groups, for example, a manager is pressured to implement a certain institutional practice (DiMaggio & Powell, 1983).

3 | INDONESIAN REGULATION OF GHG EMISSIONS

In Indonesia, regulation related to social and environmental issues started in 2007 when the government released the Company Law Number 40/2007 and the National Action Plan on Climate Change (NAPACC) programme. The Company Law Number 40/2007 stipulated that companies running their business activities in the field and/or related to natural resources implement social and environmental responsibility (Article 74, paragraph 1). Any company that does not perform this obligation will be sanctioned in accordance with the provisions of the legislation (Article 74, paragraph 3). In 2008, the National Council on Climate Change was formed as a forum to communicate climate change issues to stakeholders. Complementing this commitment, the Presidential Regulation Numbers 11/2011 and 71/2011 were released. According to this regulation (Number 11/2011), the national action plan consists of three actions for emissions reduction targets and industry sector targets: strategies, programmes, and activities contributing to emission reduction and authorities responsible for programmes and activities. Meanwhile, the implementation of a GHG inventory aimed to provide information periodically about the level, status, and trends of changes in emissions and GHG absorption, including carbon deposits at the national level, provinces, and counties. However, such these regulations only set policies regarding the commitment to reduce the GHG emissions, not for reporting. There is no a specific government regulation that govern the GHG emission reporting.

4 | RESEARCH HYPOTHESIS

4.1 | Profitability

Profitability is a company's ability to earn income or profit within a specific period using all capital owned (Pahuja, 2009). Companies with high profitability will be considered good prospects for the future, because high levels of profitability demonstrate a company's efficiency and the survival of a company. Many previous studies from multitheoretical perspectives have suggested that profitability is positively related to the extent of environmental disclosure (Adams & Hardwick, 1998; Ben-Amar & McLkenny, 2014; Calza, Profumo, & Tutore, 2014; Cormier, Magnan, & Van Velthoven, 2005; Liesen et al., 2015; Tagesson, Blank, Broberg, & Collin, 2009). Liu and Anbumozhi (2009) suggest that companies in a good financial position tend to disclose more environmental information. Stanny and Ely (2008) argue that firms that are more profitable would be likely to want to disclose GHG emissions more to convey positive outlook to

investors. Moreover, the better the financial performance of a company, the greater a company's financial ability to include carbon emission reduction strategies into their business strategies (Cormier & Magnan, 1999). Firms that are more profitable have more resources to engage in GHG emission reduction and disclosure. Good companies in their financial performance will be able to avoid losses due to their involvement in the GHG emission activities, and at the same time, it can give a positive signal to stakeholders. On the basis of this evidence, the following hypothesis is proposed:

H1 *Firms with higher levels of profitability will disclose more GHG emission information than firms with lower levels of profitability.*

4.2 | Leverage

Leverage is a ratio intended to measure how a company's assets are financed by both long-term and short-term debts (Pahuja, 2009). Previous studies have reported that the relationship between leverage and environmental disclosure is negative (Adams & Hardwick, 1998; Belkaoui & Karpik, 1989; Brammer & Millington, 2004; Giannarakis, 2014; Liu & Anbumozhi, 2009). Andrikopoulos and Krikliani (2013) found that companies with higher leverage tend to decrease the GHG emission disclosure as preparation to provide disclosure is costly. Consistent with Andrikopoulos and Krikliani (2013), Luo et al. (2013) argue that firms with high leverage and interest payments will be more cautious in revealing expenses related to GHG emission precautions and, therefore, will limit their ability to execute strategic GHG emission reduction and disclosure. Chithambo and Tauringana (2014) suggest that companies that have lower debt tend to disclose GHG emission information because of motivation to send a signal to the market and to attract investors to invest in socially responsible companies. Firms that are higher leverage associated with an increase in the risk of bankruptcy. Therefore, managers may act to reduce the discretionary costs that are not related to main business activities such as GHG emission disclosure. By reducing the discretionary expenditures, company can avoid the risk of bankruptcy; thus, it can reduce pressures from stakeholders. The following hypothesis is proposed:

H2 *Firms with higher levels of leverage will disclose less GHG emission information than firms with lower levels of leverage.*

4.3 | Firm size

According to stakeholder and legitimacy theories, larger companies are under more public attention (Brammer & Millington, 2004; Dowling & Pfeffer, 1975). The larger the size of a company, the greater the number of stakeholders involved in the activities of the company, and they also have higher expectations regarding GHG emission practices (Cormier et al., 2005; Cormier & Gordon, 2001; Hackston & Milne, 1996). As a result, pressure from stakeholders is also higher (Brammer & Pavelin, 2004; Cho & Patten, 2007). Under such conditions, meeting stakeholders' demands is mandatory (Patten, 2002). GHG emission disclosure is a mechanism that can be performed by a company to reduce this pressure (Rankin et al., 2011). Therefore, large companies

will be more responsive to this demand of GHG emission disclosure in order to avoid conflict (Cormier et al., 2005; Kuo & Chen, 2013). Results of previous studies show a positive relationship between firm size and voluntary environmental disclosure (Ben-Amar & McIlkenny, 2014; Cormier & Magnan, 1999; Kim & Lyon, 2011; Kuzey & Uyar, 2017; Neu, Warsame, & Pedwell, 1998; Stanny & Ely, 2008). It is assumed that large companies have enough resources to meet the costs related to GHG emission disclosure. Assumptions have underlined that larger companies will disclose more information than smaller firms (Chithambo & Tauringana, 2014). The following hypothesis is proposed:

H3 Larger firms will disclose more GHG emission information than smaller sized firms.

4.4 | Industry type

Dye and Sridhar (1995) state that companies are more likely to disclose information in accordance with the characteristics of their industry. Previous studies suggested that companies belonging to high-profile industries tend to have a greater risk because they receive more attention from the wider community (consumer visibility), they engage in higher levels of competition (Roberts, 1992), and companies' activities tend to have a negative influence on the environment (Reverte, 2009). Alternatively, low-profile industries have lower consumer visibility, so companies' risks tend to be lower (Roberts, 1992). Some industries that generate high emission levels may face greater pressure from stakeholders and regulators compared with other industries. For example, a study conducted by Rankin et al. (2011) showed that companies belonging to the mining and energy industry provide more credible and consistent GHG emission information.

H4 Firms in sensitive industries will disclose more GHG emission information than firms within nonsensitive industries.

4.5 | Government ownership

Ownership structure is considered as a factor that affects disclosure of GHG emissions, as it represents the status of a company's capital. Previous studies suggest that companies that are majority owned by government are expected to be more concerned with social and environmental issues, such as GHG emission reduction (Amran & Devi, 2008; Haji, 2013; Tagesson et al., 2009). Calza et al. (2014) argue that pressures from government can influence managers on environmental issues. Their finding shows that there is a positive relationship between state ownership and environmental performance for European companies. The Indonesian government has released several laws and regulations related to environmental disclosure, such as Law Number 40/2007, for limited liability companies, Law Number 32/2009 for the protection and management of the environment, and the Minister of Environment Number/2011 regulation for a corporate performance-rating programme for environmental management. As the owner of a company, the government will be more concern with how the legislation released can directly affect a company (Habbash, 2016). Reid and Toffel (2009) argue that government

may act as change agents in setting a new legislation regarding GHG disclosure. Therefore, the propensity of managers to reduce pressure from government may be mitigated by communicating GHG emissions via disclosures.

H5 State-owned enterprises (SoEs) will disclose more GHG emission information than other firms.

5 | METHODS

5.1 | Sample and data collection

GHG emission data were sourced from publicly listed companies' 2011 to 2014 annual reports, and financial and accounting data were collected from the Bloomberg database. A baseline year of 2011 was selected because Government Regulation Number 61/2011 was released in this year. In 2011, 37 firms that disclosed GHG information met the criteria for sampling. Table 1 presents the sample selection.

Table 2 lists the study samples based on nine industry sectors according to the Indonesia Stock Exchange classifications: (a) agriculture, including plantations, animal husbandry, fisheries, and forestry; (b) mining, including coal mining, crude petroleum and natural gas production, metal and mineral mining, and land/stone quarrying; (c) basic industry and chemicals, including cement, ceramics, glass, porcelain, metal and allied products, chemicals, plastics and packaging, animal feed, wood industries, and pulp and paper; (d) miscellaneous

TABLE 1 Sample selection

Criteria	Year (2011–2014)				
	2011	2012	2013	2014	Total
Number of firms listed on Indonesia Stock Exchange	442	463	486	509	1,900
Number of financial firms	81	81	81	81	324
Firm consistently provides GHG information in annual reports since 2011	37	37	37	37	148
Percentage sample to total listed firm	10.24	9.68	9.13	8.64	9.39

Note. GHG: greenhouse gas.

TABLE 2 Sample by industry

Sector	Industry classification	2011–2014	
		N	%
1	Agriculture	20	13.5
2	Mining	36	24.3
3	Basic industry and chemicals	44	29.7
4	Miscellaneous industries	4	2.70
5	Consumer goods industries	12	8.10
6	Property, real estate, and building constructions	8	5.40
7	Infrastructure, utilities, and transportation	12	8.05
8	Trade, services, and investment	12	8.05
	Total	148	100

industries, including machinery and heavy equipment, automotive and components, textile and garments, footwear, and cables; (e) consumer goods industries, including food and beverages, tobacco manufacturers, pharmaceuticals, cosmetics, and houseware; (f) property, real estate, and building constructions; (g) infrastructure, utilities, and transportation, including energy, toll roads, and airports; (h) financial; and (i) trade, services, and investment, including wholesale, retail trade, restaurants, hotels, and tourism. For this study, the financial sector was excluded. The financial sector was excluded as this study has an independent variable, namely, leverage. The high leverage in nonfinancial sector may indicate that the company has financial distress problems. However, in financial sector, high leverage is common, and it does not indicate a problem. Therefore, the conclusion of the finding of this study may be bias regarding the negative relationship between leverage and the extent of GHG emission disclosure if the financial sector was included as the sample.

As shown in Table 2, basic industry and chemicals represent the largest sample with 44 firms (29.7%). This is followed by the mining industry, 36 firms (24.3%), and the smallest group is miscellaneous industries, four companies (2.7%).

5.2 | Variable measurement and analysis

Consistent with previous studies of GHG emission disclosure, a content analysis method was used to extract the GHG emission information from the annual reports. Measurements of GHG emission disclosure refers to items developed by Choi et al. (2013) and used by (Kalu, Buang, & Aliagha, 2016). The use of a checklist item is based on the consideration that those items represent the Carbon Disclosure Project questionnaires and are appropriate for GHG emission regulations in Indonesia. The dependent variable is measured using the unweighting disclosure index approach. In an unweighted index, each disclosure item is deemed equally important, and therefore, each item is awarded the same score when it is disclosed; this technique is considered far less subjective than a weighted index and is more relevant to all companies (Cooke, 1989, 1993). The score was 1 if the company disclosed information as determined by the checklist items, and 0 was assigned if it was not disclosed. Table 3 provides the disclosure checklist items.

This study employed multivariate regression analysis, which is used to examine the influence of independent variables on a dependent variable. This analysis also measures the strength of a relationship between these variables, and it shows the direction of the relationship. The regression equation is

$$\text{GHGDisc} = \beta_0 + \beta_1\text{PROF} + \beta_2\text{LEV} + \beta_3\text{SIZE} + \beta_4\text{INDUSTRY} + \beta_5\text{GOVOWN} + \epsilon,$$

where profitability (PROF) is measured as the ratio of earnings after tax divided by the total assets; leverage (LEV) is measured as the ratio of total debt divided by the total assets; firm size (SIZE) is measured by a logarithm of the total assets; and industry membership (INDUSTRY) is measured by a dummy variable, which takes the value 1 if the firm is categorised as a sensitive industry and 0 otherwise. Following the previous studies, in this study, agriculture, mining, basic industry, and

TABLE 3 GHG emission disclosure checklist

GHG emission category	Coding	GHG emission details
CC	CC1	1. Assessment of risks and opportunities
	CC2	2. Financial implications
GH	GH1	3. Methodology for calculation
	GH2	4. External verification
	GH3	5. Total emissions
	GH4	6. Disclosure by scope
	GH5	7. Disclosure by source
	GH6	8. Disclosure by facility or segment
	GH7	9. Historical comparison of emissions
EC	EC1	10. Total consumed
	EC2	11. Disclosure consumption from renewable source
	EC3	12. Disclosure by type, facility, or segment
RC	RC1	13. Plans to reduce GHG emissions
	RC2	14. Targets for GHG emissions
	RC3	15. Reductions achieved to date
	RC4	16. Costs of future emissions factored in capital expenditure planning
AC	AC1	17. Explanation of where responsibility lies for climate change policy and action
	AC2	18. Mechanism by which board reviews company progress on climate change actions

Note. 1 = if item disclosed; 0 = otherwise; GHG disclosure index (GHGDisc) = number of items disclosed by firm divided by total items (18 items). GHG: greenhouse gas; CC: climate change: risks and opportunities greenhouse gas emissions; GH: greenhouse gas emissions; EC: energy consumption; RC: greenhouse gas reduction and cost; AC: greenhouse gas emission accountability. Source: Choi et al. (2013).

chemicals were categorised as sensitive industries (Moroney, Windsor, & Aw, 2012) because their activities modify the environment (resources), and they are more closely monitored for environmental performance, whereas miscellaneous industries, consumer goods, property, real estate, and building constructions, infrastructure, utilities, transportation, trade, services, and investment were included as nonsensitive industries, and government ownership (GOVOWN) was measured by a dummy variable, which takes the value 1 if the firm is an SoE and 0 for other firms.

6 | RESULTS AND DISCUSSION

6.1 | Extent of GHG emission disclosure

Table 4 presents the percentage firm disclosed GHG emission items. Financial implications are the most disclosed items (86.5%, 94.6%, 97.2%, and 91.9%), followed by assessment of risks and opportunities (89.1%, 94.6%, 89.1%, and 86.5%), and the least disclosed item is the cost of future emissions factored into capital expenditure planning (0%). Choi et al. (2013) results are different; they found that the risk and opportunity of GHG emission item was the most disclosed. This finding may indicate different motivations for disclosing GHG emissions between companies in developed countries, such as Australia, and in an emerging country: Indonesia.

In terms of the percentage of items disclosed per theme by industry (Table 5), companies from the miscellaneous industries (75.0%) lead in disclose of GHG emissions, followed by mining industry

TABLE 4 Percentage firm disclosed each item

Coding	GHG checklist items	Percentage firm disclosed			
		2011	2012	2013	2014
CC	Climate change: risks and opportunities of GHG emissions	—	—	—	—
CC1	Assessment of risks and opportunities	89.1	94.6	89.1	86.5
CC2	Financial implications	86.5	94.6	97.2	91.9
GH	GHG emissions	—	—	—	—
GH1	Methodology for calculation	16.2	18.9	18.9	24.3
GH2	External verification	45.9	54.0	54.0	54.0
GH3	Total emissions	32.4	35.1	37.8	37.8
GH4	Disclosure by scope	43.2	51.3	48.6	51.3
GH5	Disclosure by source	43.2	51.3	48.6	48.6
GH6	Disclosure by facility or segment	13.5	16.2	16.2	16.2
GH7	Historical comparison of emissions	24.3	32.4	32.4	35.1
EC	Energy consumption	—	—	—	—
EC1	Total consumed	43.2	51.3	51.3	48.6
EC2	Disclosure consumption from renewable source	16.2	21.6	21.6	27.0
EC3	Disclosure by type, facility, or segment	37.8	51.3	51.3	48.6
RC	GHG reduction and cost	—	—	—	—
RC1	Plans to reduce GHG emissions	67.6	75.7	67.6	67.6
RC2	Targets for GHG emissions	32.4	37.8	35.1	37.8
RC3	Reductions achieved to date	43.2	43.2	43.2	40.5
RC4	Costs of future emissions factored in capital expenditure planning	0.0	0.0	0.0	0.0
AC	GHG emission accountability	—	—	—	—
AC1	Explanation of where responsibility lies for climate change policy and action	81.0	86.5	91.9	89.9
AC2	Mechanism by which board reviews company progress on climate change actions	56.8	64.9	59.5	59.5
Mean		42.9	48.9	48.0	48.1

Note. GHG: greenhouse gas; CC: climate change: risks and opportunities greenhouse gas emissions; GH: greenhouse gas emissions; EC: energy consumption; RC: greenhouse gas reduction and cost; AC: greenhouse gas emission accountability.

TABLE 5 Number of items disclosed per theme by industry

Industry classification	Percentage item disclosed per theme					Mean
	CC	GH	EC	RC	AC	
Agriculture	60.0	12.1	18.3	25.0	77.5	28.6
Mining	97.2	57.5	73.1	56.9	91.7	68.2
Basic industry and chemicals	94.3	25.0	31.1	31.3	68.2	39.9
Miscellaneous industries	100.0	64.3	66.7	75.0	100.0	75.0
Consumer goods industries	83.3	23.8	19.4	39.6	54.2	36.6
Property, real estate, and building constructions	50.0	0.00	0.00	0.00	50.0	11.1
Infrastructure, utilities, and transportation	100.0	51.2	44.4	45.8	83.3	57.9
Trade, services, and investment	100.0	31.0	22.2	33.3	54.2	40.3
Mean of total sample	85.6	33.1	34.4	38.4	72.4	52.8

Note. CC: climate change: risks and opportunities greenhouse gas emissions (2 items); GH: greenhouse gas emissions (7 items); EC: energy consumption (3 items); RC: greenhouse gas reduction and cost (4 items); AC: greenhouse gas emission accountability (2 items). Total items = 18; N = 148.

(68.2%), infrastructure, utilities, and transportation (57.9%), trade, services, and investment (40.3%), basic industry and chemicals (39.9%), consumer goods industries (36.6%), agriculture (28.6%), and property, real estate, and building constructions (11.1%). This finding is surprising. As explained above, that government regulation has released the limited liability Company Law Number 40/2007 and Government Regulation Number 47/2012. These regulations mandated that any

company that operates in a natural resource area will be obligated to report related corporate social environmental responsibility; this obligation was effective from April 2012. However, the finding of this study suggested that companies from nonsensitive industry (such as miscellaneous industries, infrastructure, utilities and transportation, trade, services, and investment) lead in providing GHG emission information.

TABLE 6 Descriptive statistics

Continuous variables					
Variables	N	Minimum	Maximum	M	SD
GHG disclosure	148	0.06	1.00	0.52	0.29
Profitability	148	-0.19	0.54	0.12	0.12
Leverage	148	0.01	3.20	0.88	0.71
Firm size (Ln)	148	20.25	26.19	23.31	1.23
Categorical variables					
Variables	N	%			
Industry	148	100.00			
1 = sensitive industry	96	64.86			
0 = other industry	52	35.14			
Government ownership	148	100.00			
1 = SoEs	28	18.91			
0 = other	120	81.09			

Note. GHG: greenhouse gas; SOEs: state-owned enterprises.

Descriptive statistics for continuous variables are shown in Table 6; they indicate that the mean of GHG emission disclosure is 50.0%, with a minimum of 6.0% and a maximum of 100%. The results show that there is a large gap in the mean of disclosures, which indicates that GHG emission disclosure exhibits extreme values and is heavily skewed. Overall, the mean disclosure is relatively high. The mean profitability suggests that the companies have relatively low financial performance: The minimum value is -19.0%, and the overall mean is 12.0%. The low profitability ratio may be a reflection of Indonesian economic financial hardship during the global financial crisis. The leverage ratio of the sampled firms is 88.0% indicating that sampled firms' leverages are relatively high; this may indicate that

creditors represent key stakeholders. For the categorical variables of industry type, 96 (64.9%) of the total 148 sampled companies were categorised as sensitive industries and 52 (35.1%) as nonsensitive industries. The results indicate that sensitive industries tend to provide more GHG emission disclosure than nonsensitive industries. Table 6 also shows that 28 (18.9%) of the sampled companies are owned by the Indonesian government and 120 (81.9%) are non-SoEs.

Table 7 shows the correlations between the variables; the directional correlations between dependent and independent variables are all below the critical limit of 0.80, and it is suggested that there is no multicollinearity problem between predictor variables.

A heteroscedasticity test suggests that a regression model does not contain heteroscedasticity if there is no significant relationship between the absolute value of residuals and independent variables. In this study, the level of significance for all independent variables was greater than 0.05. The result of the multicollinearity tests, consistent with Table 7, is shown in Table 8; the tolerance values for all variables are greater than 0.10, and all the VIF values are below 10. It was concluded that there was no multicollinearity problem in the regression model.

6.2 | Determinants of GHG emissions

Table 8 details the results of the multiple regression. Overall, the multiple regression shows that the model fits and is statistically significant: F statistic = 14.956 and p value = 0.000. The regression has an adjusted R^2 of 32.2%. The details of the hypotheses testing results are as follows: First, profitability is positively associated with GHG emission disclosure with a coefficient (p value) of 0.415 (0.017). Thus, H1 is supported. This finding suggests that a company's economic

TABLE 7 Pearson's correlations

Variables	1	2	3	4	5	6
GHG disclosure	1	0.254**	-0.226**	0.475**	0.215**	0.237**
Profitability	0.254**	1	-0.358**	0.059	-0.078	0.155
Leverage	-0.226**	-0.358**	1	0.021	0.052	-0.192*
Firm size	0.475**	0.059	0.021	1	0.079	0.259**
Industry	0.215**	-0.078	0.052	0.079	1	0.211*
Government ownership	0.237**	0.155	-0.192*	0.259**	0.211*	1

Note. GHG: greenhouse gas.

**Correlation is significant at the 0.01 level (two tailed). *Correlation is significant at the 0.05 level (two tailed).

TABLE 8 Regression results

Variables	Prediction sign	Coefficient regression	t	p value	Multicollinearity		Heteroscedasticity	
					Tolerance	VIF	t	p value
Constant		-2.049	-5.261	0.000	—	—	0.832	0.407
Profitability	+	0.415	2.407	0.017	0.939	1.065	-2.033	0.454
Leverage	-	-0.074	-2.418	0.017	0.855	1.170	0.470	0.639
Firm size	+	0.107	6.346	0.000	0.843	1.186	1.763	0.639
Industry	+	0.122	2.834	0.005	0.925	1.081	0.261	0.080
Gov.Own	+	0.013	0.239	0.812	0.846	1.183	1.474	0.143

Note. $R^2 = 0.345$; adjusted $R^2 = 0.322$; $F = 14.956$; p value = 0.000; $N = 148$. Dependent variable: greenhouse gas emission disclosure; Gov.Own: government ownership; VIF: variance inflation factor.

performance is the most important factor when they are making decisions to engage in environmental responsibility, such as GHG reduction activities. Given the high numbers for environmental expenditure, companies that have low economic performance certainly will give top priority to improving their economic performance compared with environmental responsibility activities. The result implies that companies with greater profitability might have an incentive to reveal their good news to stakeholders; they are not only pursuing high profit but also showing they are responsible and compliant with regulations. By producing a higher volume of GHG emission information, companies can make themselves more attractive to various stakeholders, receive less pressure and complaints from communities, and may enhance the relationship with their stakeholders.

Second, the relationship between leverage and GHG emission disclosure is negative and significant (coefficient = -0.074 ; p value = 0.017). Hence, H2 is supported. This result suggests that companies with low leverage tend to reveal more GHG emission information. This is likely motivated by trying to improve the credibility of the company with investors, debtholders, and customers. By providing more relevant information, such as environmental expenditure incurred for GHG reduction activities, it will reduce pressure from stakeholders. In contrast, companies with high leverage tend to reduce GHG emission information. This is because if a company with high environmental liabilities disclosed more GHG emission information, it would reduce its cash flow that would in turn impact on its ability to pay debt (Cormier & Magnan, 1999).

Third, H3 predicted that there is a positive relationship between firm size and GHG emission disclosure (coefficient = 0.107 ; p value = 0.000), and thus, H3 is also supported. Companies that have high visibility have incentives and greater resources to reduce the risks of environmental damage arising from their activities. Companies that are large also have large capacities to shape the positive perceptions of the public and key stakeholders; their initiative to disclose GHG emission information is a form of environmental corporate responsibility. By doing so, a company can maintain their legitimacy.

Fourth, Table 8 indicates that there is a positive and statistically significant association between industry type and GHG emission disclosure (coefficient = 0.122 ; p value = 0.005). Hence, H4 is supported. This finding is in line with prior studies that reported that industry type, specifically sensitive industries, are more likely to generate GHG emission disclosure. This finding suggests that a key reason that sensitive industries make more GHG emission disclosures is to improve their accountability and visibility. Sensitive industries have a greater effect on their community, and therefore, they normally have a broader group of stakeholders to satisfy.

Fifth, there is a positive relationship between government ownership and GHG emission disclosure; however, the relationship is not statistically significant (coefficient = 0.013 ; p value = 0.239). Thus, H5 is not supported. In Indonesia, all companies whose shares are majority owned by the government are mandated by legislation and the minister of state-owned enterprise's regulations to engage in CSR activities. Because a company is owned by the state, the company may not need to report the activity of GHG emission reductions to key stakeholders such as the government, because SoEs are

protected by the state (Chu et al., 2012). In other words, environmental responsibility activities, such as GHG emission reduction, are aimed not at legitimacy and reducing pressure from the government but as a form of compliance with government regulation.

7 | CONCLUSIONS AND LIMITATIONS

This study examined the determinants of GHG emission disclosure of Indonesian publicly listed companies. The findings provide evidence that the company characteristics of profitability, leverage, size, and industry type are factors that determine companies' disclosures of GHG emissions. However, this study failed to provide empirical evidence that government ownership has a positive effect on enhancing public companies to disclose GHG emissions.

Thus, the results of this research are consistent with previous studies that demonstrated that disclosure of GHG emissions is a company's way of responding to stakeholder pressure and public visibility while providing legitimacy for their existence. This result implies that the application of stakeholder, legitimacy, and institutional theories can provide more insight into disclosure than the motivation of public Indonesian companies based solely on the consideration of costs and benefits, that is, the increased legitimacy and reduced pressures, of the activity disclosed.

This study has limitations. Although the implementation of GHG emission reduction has been mandated by the Indonesian government, this study only found about 10% of publicly listed Indonesian companies consistently disclosed information of GHG emissions during the research period (2011–2014). This is a challenge for the Indonesian government to continue pushing companies to provide GHG emission information in their annual reports. The use of a larger sample in future studies would provide more details of this finding. In addition, this study cannot determine the influence of government regulation on the level of GHG emission disclosure. Although the average disclosure levels were high, future studies need to assess the quality of the disclosure: whether it is merely symbolic or substantive. Overall, these results support the conclusion of Cormier et al. (2005); the disclosure of environmental information is driven by multi-dimensional factors.

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