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Research paper



Institutional Governance Perspectives of Carbon Emission Disclosures among Electricity Companies in Asia

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Abstract

On the basis of institutional governance perspectives, it examines internal and state factors influencing the carbon emission disclosures among 75 electricity companies in Asia. It content analysed the annual reports and stand-alone sustainability reports for the year 2013. Overall, the findings suggested that the adoption of GRI Sustainability Reporting Guidelines and a country's strength of law enforcement and commitment towards the environment had a significant influence on the extent of carbon emission disclosures. Other variables – environmental management system, environmental committee, voluntary participation in CDP programmme, corporate governance, and country's legal origin – are not significant. Considering electricity industry and Asian region are among the main contributors to the global carbon emissions, there is a pressing need for the leaders within the industry and across the countries to institute mechanisms to combat climate change including through making corporate disclosures mandatory.

Keywords: *Asia; Carbon emission disclosures; Climate change; Electricity companies; Institutional governance*

1. Introduction

The annual publications by the International Energy Agency on CO_2 emissions highlighted several important findings. Firstly, use of energy represents 68% of the source of greenhouse gas (GHG) emissions. Secondly, over 75% from GHG emissions from the energy use are attributed to carbon dioxide (CO_2). Thirdly, electricity (and heat) industry accounted for 42% of CO_2 from fuel combustion. Fourthly, over two-thirds of global CO_2 emissions for 2015 were originated from just ten countries in which six of them are Asian, namely China (ranked 1st), India (3rd), Japan (5th), Korea (7th), Islamic Republic of Iran (8th), and Saudi Arabia (10th) [1]. Controlling CO_2 emissions is of paramount importance to curb climate change issues [2]. Therefore, it is interesting to examine the initiatives and performance of Asia's electricity companies on this matter through the assessment of corporate disclosures made publicly available by the companies.

Despite its significant contribution to carbon emissions that further intensify the climate change problem, there have been a scant attention in the literature as to how electricity companies reported on carbon emissions information. Prior literature has examined this issue among companies in the US [3], the European region [4], and Malaysia [5]. Additionally, even though there are cross-country comparative studies conducted by [6] and CDP [7],[8], there are some weaknesses inherent in these studies in which this study intends to address. In essence, Asia's electricity generation companies make up small proportion of the sample and the data are outdated. Besides, [6] attempted to investigate factors influencing the level of carbon disclosure using legitimacy theory. However, without any incidents that can cause legitimacy threats (e.g. oil spills, lawsuits, consumer boycotts), it is less likely for legitimacy theory to provide the explanation for reporting behavior [9],[10]. Furthermore, according to [11], equally important is to analyse the internal context of organisations that could influence corporate social and environmental reporting. In this regard, other theories including institutional governance theory/perspective could be used to explain the reporting behaviour [12].

Institutional governance theory stems from the concept of institutional governance system which refers to "the configuration of state and private organisations and institutional arrangements that impact and create mechanisms by which economic and social outcomes in nations are produced" [13, pg. 416]. In the context of corporate reporting, the extent, type, and nature of information disclosed are deemed to be subjected to the institutions governing the practice. [14] further classified the institutional arrangements into four types of governance, namely corporate, state, joint and market.

The objective of the study is to examine institutional governance factors influencing the extent of carbon emission disclosures among electricity companies in Asia. For this present study, it focuses on corporate governance (referred to by [12] as internal governance) and state governance. The research is pertinent for several reasons. It contributes to the dearth of literature in carbon disclosure particularly on electricity companies in Asia and on overcoming the overreliance on legitimacy theory to explain the reporting practices. Besides, it indicates the necessary governance mechanisms for effective carbon emission disclosures. The low extent of carbon disclosure also demands the policy makers in Asia to revisit the need to make disclosure mandatory so as to ensure corporate accountability and reduce problems related to climate change.

The remainder of the paper is structured as follows. Section 2 discusses the related literature and hypotheses development. Section 3 describes the research methods. Section 4 presents the findings, while Section 5 concludes.

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2. Literature Review and Hypotheses Development

According to [14], the perspective of institutional governance emerged a response to the weaknesses in the arguments two strands of literature. According to the strategic management literature, competitive advantage is determined by companies' internal capabilities, resources, and strategies as well as industry structures and characteristics. Conversely, the political economy literature emphasises on the influence of national governments and institutions in enhancing competitive capabilities. Combining these two perspectives, the institutional governance framework posits that the national industry and corporate competitiveness are as a result of both: (1) firm resources, capabilities, and strategies, (2) governments and institutions interventions [14]. Hence, the roles of four types of governance – market, corporate, state, and joint – are essential.

In the context of effective environmental reporting, institutional governance argues for the importance of internal corporate governance and the pressure from the state and market [13]. [12] examined the proclivity among the largest Australian companies to voluntarily disclose GHG information and the extent and credibility of information disclosed. They found that the disclosure is related to environmental management system (EMS) certification, adoption of Global Reporting Initiative (GRI) reporting guideline, voluntary involvement in Carbon Disclosure Project (CDP) survey, and quality of corporate governance. In another study, [15] analysed the website of 278 Malaysian public listed companies for their extent of environmental reporting. They found that EMS certification, environmental committee, environmental mission/vision statement, the publication of a sustainability report or compliance with GRI reporting guidelines, and corporate governance quality are significant determinants. However, both [12] and [15] did not focus on electric companies and are country specific.

For this present study, internal (corporate) governance system as tested by [12] are included, namely EMS certification, environmental committee, compliance to GRI recommendations, voluntary participation in CDP survey, and corporate governance quality. Since this study is cross country, it includes state governance variables. Following [16], this study considers a country's legal system and strength of law enforcement. Finally, in the context of environmental issue and reporting, it also incorporates national environmental performance index in the framework (see [6]). The next paragraphs will provide the arguments for each of the variables.

2.1. EMS Certification

Environmental management systems "involves the formal systems and database which integrates procedures and processes for the training of personnel, monitoring, summarising, and reporting of specialised environmental performance information to internal and external stakeholders of the firm" [17, p. 332]. [17] also provided advantages of having an environmental management system (EMS). In essence, EMS helps business in the development, execution and effective monitoring of policies and goals; identification of legislative requirements and prioritisation of environmental impacts; the enhancement of employees' commitment and awareness; the improvement in the skills of employees; the establishment of a management process to audit and review; and the maintenance of effective communication with stakeholders. The benefits are even greater when an external organisation (e.g., ISO) certifies its EMS. This is so as certification requires the organisation to develop environmental targets, improve processes on a continuous basis, and participate in regular audits by the certifying body [18]. Communication to stakeholders, both internal and external, is one of the key pillars for certification [12]. Therefore, it is expected that companies with EMS certification to be more forthcoming in environmental reporting. This has been supported by empirical findings by [19],[12],[18],[20], and [21]. Thus, the following hypotheses are developed:

$H1_a$: The voluntary established environmental management system (EMS) is positively associated with greater extent of carbon emission disclosures

$H1_b$: The certification of environmental management system (EMS) by ISO 14001 is positively associated with greater extent of carbon emissions disclosures

2.2. Environmental Committee

Establishing a specific organisational structure in dealing with environmental issues such as environmental committee enables the organisation to oversee environmental policy [22], monitor its impacts to ecology [23][24], and consistently manage its relationship with key stakeholders [25][26]. As the purpose of the committee establishment is to focus on managing the environmental issues and impacts of the business, they are expected to have a better understanding of the imperative of reporting on the environment to their public, government, and other groups of stakeholders [12] and thus require the management to be more accountable (on environmental matters) in order to protect the company's reputation [24]. Consistent with the arguments above and the findings of previous studies [27],[28],[19],[29],[30],[31], the following hypothesis is developed:

H2: The existence of an environmental committee is positively associated with greater extent of carbon emissions disclosures

2.3. GRI Guidelines

There have been many reporting guidelines available to assist companies in preparing their social and environmental reports. The Global Reporting Initiative (GRI) sustainability reporting guideline is widely recognised as a reporting framework on sustainability performance [32] and has been considered in prior literature as an important component in their content analysis tools [33],[34],[35]. In regards to climate change issues, GRI provides detailed guidelines on the related indicators and management approaches. Due to this, it is expected that companies following GRI would tend to have more comprehensive carbon emissions disclosure. These arguments are further supported by the findings of [36], [37], and [15]. Taking all these factors into consideration, the following hypothesis is developed:

H3: Voluntary adoption of Global Reporting Initiative (GRI) guidelines is positively associated with greater extent of carbon emissions disclosures

2.4. CDP Survey

CDP is a London-based not-for-profit organisation which runs the global disclosure system that enables companies, cities, states and regions to measure and manage their environmental impacts. To date, it maintains a comprehensive collection of self-reported environmental data leading to climate change, water, and forests. Since 2002, CDP has invited the world's largest companies to participate in its annual surveys voluntarily. The surveys include a set of questionnaires soliciting the respondents (the companies) to describe, among other items, their position, strategies, initiatives, and performance in relation to CO_2 emissions and climate change. Their responses were then analysed, compiled, and published on the CDP website (except in cases where companies requested that the response not to be made public). As of 2015, CDP has attracted about 800 investors with US$95 trillion in assets and more than 5,500 companies to voluntarily report to them [38]. Although reporting to CDP, it is expected that it will have a spill over effect on the disclosure in other communication media including annual reports and stand-alone sustainability reports. It has been found that CDP became an important driver for firms to improve their reporting quality [39] as well as to have greater transparency between firms and the stakeholders, especially the investors [40].

This is consistent with Rankin et al. [12] who found that the credibility and extent of GHG disclosures among top Australian firms are related to public reporting to CDP. Therefore, it is hypothesised that,
H4: Voluntary disclosure to CDP is positively associated with greater extent of carbon emissions disclosures

2.5. Corporate Governance

Corporate governance is "the process and structure used to direct and manage the business and affairs of the company towards enhancing business prosperity and corporate accountability with the ultimate objective of realising long-term shareholder value, whilst taking into account the interests of other stakeholders" [41, p. 5]. It is expected that companies which are governed properly would have greater tendency to better match their corporate goals and objectives with the stakeholder expectations. This is possible as the aim of companies is to maximise shareholders' wealth. If the companies failed to manage the environmental issues properly, it could negatively impact its financial performance hence hurting the shareholders' returns. For example, Exxon Valdez had incurred approximately USD16.5 billion for the oil spill accident in Prince William Sound, Alaska. In Bhopal, India, the accidental release of methyl isocyanate gas to the atmosphere had caused the market value of Union Carbide's common stock to drop by one-third within five trading days [42]. In a more recent disaster, BP had incurred BP USD32.2 billion of pre-tax charge as a result of major oil spill in the Gulf of Mexico [43]. This argument is well supported by prior empirical research including [12][28],[36],[44],[45],[46],[47]. Therefore, the following hypothesis is developed:
H5: Corporate governance quality is positively associated with greater extent of carbon emission disclosures

2.6. Legal System

Following prior literature, firms operating in common law countries are deemed to be more shareholder-orientated firms. Conversely, firms operating in code law countries are more stakeholder-orientated. In essence, the a country's legal system has impacted its corporate governance structures, hence defined the nature of firm-stakeholders relationships [48],[49] and shape the business culture [16]. Consistent with the findings of [49] and [16], this study posits that,
H6: Companies domiciled in countries that are more stakeholder-orientated are associated with greater extent of carbon emissions disclosures

2.7. Strength of Law Enforcement

According to [50], pressure for environmental responsibility from the public is deemed to be greater in an environment where there is a higher probability of additional regulations, including mandatory reporting laws. Consequently, the need to meet legal requirements and to prevent additional regulations were selected as one of the most important factors for environmental reporting [51],[52],[53],[54]. Large companies in UK were also found to have increased their GHG disclosures prior to the publication of 2009 DEFRA guidance [55]. Furthermore, regulatory enforcement was found to be related with firms voluntarily responding to an external carbon disclosure initiative [56], the extensiveness of firms' carbon disclosures [57], and firms' decision to have a third-party assurance for their sustainability reports [16]. Thus, the following hypothesis is developed:
H7: Countries' strength of law enforcement is positively associated with greater extend of carbon emissions disclosures

2.8. Commitment to the Environment

The establishment of relevant infrastructure and effective environmental protection is a must for countries that have expressed their commitment to an environmental charter or protocol. For example, countries that are committed to the Kyoto Protocol need to meet specific reduction targets for GHG emissions [58]. Likewise, commitment to the Sustainable Development Goals (SDGs) requires the participating countries to observe 17 goals set by the United Nations in year 2015 [59]. SDG no. 13 specifically relates to climate change. These commitments have been translated into specific initiatives that will have an impact on society and companies, especially on high polluting companies. [60] provided evidence that companies with high level of emissions whose home countries had ratified the Kyoto Protocol provided more extensive disclosures related to the Protocol [see also, 35]. [6] found companies domiciled in countries with higher environmental commitment, as measured by country's environmental performance index, have better quality of carbon and environmental disclosures. Accordingly, this study hypothesises,
H8: Countries' commitment towards the environment is positively associated with greater extent of carbon emissions disclosures

3. Research Methods

3.1. Sample Selection

The sample companies were selected from Thomson Reuters database. All companies from the following industrial codes make up the population of the study: 59101010 (electric utilities), 59101020 (independent power producers), and 59104010 (multiline utilities). Of the population, 137 companies were identified as operating in Asia. The list was further reduced to exclude companies that did not have electricity generation business (e.g., only involved in the transmission and/or distribution) and corporate reports in English and/or for the year 2013. This process has resulted into a final sample of 75 companies. Companies from India made up the largest proportion of the sample (29%), followed by China (16%), Japan (15%), the Philippines (11%), and Thailand (11%). There are also sample from Malaysia (9%), Hong Kong (5%), Singapore (3%), and South Korea (1%).

3.2. Data Collection Methods

Data were collected from several sources. Data for carbon emission disclosures (i.e. the dependent variable) were based on content analysis of annual reports and stand-alone sustainability reports of the sample companies for the year 2013. Content analysis is "a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use" [61, p. 18. Both annual reports and stand-alone reports were analysed to provide a more comprehensive picture of corporate disclosures [62]. However, websites were not considered for the location of carbon emissions information since not all companies maintained an up-to-date website and if they did, were not in English. The reports were downloaded from the stock exchanges' and/or companies' websites. The year 2013 was selected as the basis of analysis as it was the most recent data available at the time of research commencement..
Likewise, the institutional 'internal' governance factors including EMS certification, environmental committee, using GRI as the reporting guideline, voluntary involvement in CDP survey, and quality of corporate governance were based on the reports mentioned earlier and/or companies websites. The country classification for legal systems was obtained from the Central Intelligence Agency (CIA) database [63] which is available online. The strength of law enforcement is based on the work of [64]. Lastly, countries' Environmental Performance Index (EPI), as a proxy for their commitment towards environment was obtained from the

Yale University's website [65]. Control variables for the research were accessed from Thomson Reuters database.

3.3. Measurement of Variables

3.3.1. Carbon Emission Disclosures (*CAEMD*)

The carbon emission disclosures is measured by the disclosure index which is based on [57]. The index originated from the work of [66] which derived the items largely from the CDP Annual Information Request sheets. [66] developed an 18-item disclosure index and used a dichotomous scoring system (1=if disclosed, 0=not disclosed) and [57] refined the index to include two (2) items from [67] (the contribution of renewable electricity to the company's EBITDA in the current reporting year and at a given point in the future) and other items considered by [33] and [68], namely comparative figure for energy consumed; policy/mission/vision, stakeholder engagement program, supporting organizations promoting climate change, and awards received. Overall, the disclosure index used for this research contains 25 items. Consistent with [66] and to avoid subjectivity inherent in content analysis method [68] the index adopted a dichotomous scoring system. The score for all items was summed up and converted into percentage. For the detailed list of items, refer to [57].

3.3.2. Institutional Governance Variables

Table 1 below summarises the measures for independent variables and control variables. The selection of control variables is based on [12].

Table 1: Measurement of Independent and Control Variables

Variables	Measures	References
EMS certification (*EMS*)	A vector of EMS category variables which includes n = 3 categories: firms having no EMS, having a non-certified EMS and having an EMS that is ISO 14001 certified	[12]
Environmental committee (*EVC*)	Dummy variable of environment committee which = 1 if the firm has a specific environment committee, 0 otherwise	
GRI guidelines (*GRI*)	Dummy variable of GRI which = 1 if the firm uses the GRI to guide sustainability reporting, 0 otherwise.	
CDP survey (*CDP*)	Dummy variable of CDP which = 1 if the firm voluntary participates in CDP survey, 0 otherwise.	
Corporate governance (*CG*)	Corporate governance score (*note: maximum possible score is 30*)	[69]
Legal system (*LEG*)	1= code law; 0= common law	[63]
Strength of law enforcement (*ENF*)	World Bank's "Rule of law" (*note: the world's average is 0.00*)	[64]
Environmental performance index (*EPI*)	Environmental Performance Index (*note: score range is 0-100*)	[65]
Firm size (*SIZE*)	Market capitalisation	[12]
Firm performance (*ROA*)	Return on assets	
Leverage (*LEV*)	Total debt divided by total assets	

It is noteworthy to highlight that the measure for *CDP* has been simplified into two categories, instead of three [as in 12] since the preliminary assessment on the sample revealed that the majority of responses were not publicly available.

3.4. Regression Model

The regression model of this study is as follows:

$$CAEMD = \beta_0 + \beta_1 EMS + \beta_2 EVC + \beta_3 GRI + \beta_4 CDP + \beta_5 CG + \beta_6 LEG + \beta_7 ENF + \beta_8 EPI + \beta_9 SIZE + \beta_{10} ROA + \beta_{11} LEV + \varepsilon$$

where,

The measures are discussed in Section 3.3. above; ε = error term.

4. Findings

This section presents the findings to answer the research objective i.e. to examine institutional governance factors influencing the extent of carbon emission disclosures among electricity companies in Asia.

4.1. Descriptive Statistics

Table 2: Descriptive Statistics

Panel A: Descriptive Statistics for Continuous Variables				
	Min	Max	Mean	Std. Dev.
CAEMD	0.00	19.00	3.61	4.24
CG	8.00	23.00	15.64	3.81
ENF	-0.46	1.74	0.23	0.74
EPI	36.33	63.36	49.00	11.35
SIZE	14.01	23.70	20.74	2.24
ROA	-11.31	19.42	2.45	4.44
LEV	0.49	19.74	4.02	2.90

Panel B: Distribution of Categorical Variables				
	1		0	
	N	%	*N*	%
EVC	39	52	36	48
GRI	15	20	60	80
CDP	32	43	43	57
LEG	33	44	42	56

	Certified EMS		Uncertified EMS		No EMS	
	N	%	*N*	%	*N*	%
EMS	31	41	16	21	28	37

Based on Table 2, the highest extent of carbon emission disclosures (*CAEMD*), using the disclosure index, was 19.00 (out of possible, 25.00, hence 76%). However, on average, there was a low level of carbon emission disclosures among the sample companies with a mean *CAEMD* of 3.61 (14%). In fact, despite operating in an industry with the largest contribution towards carbon emissions, there were companies that did not make any related disclosures at all.

Panel A of the same table depicts the statistics for continuous independent variables. *SIZE*, which is measured by market capitalisation, was transformed into natural logarithm to reduce the skewness of data. Overall, the sample consisted of companies with moderate level of effective corporate governance (mean *CG* = 15.64); operated in strong law enforcement environment (mean *ENF* = 0.23) but lower commitment towards the environment (mean *EPI* = 49.00); were profitable (mean *ROA* = 2.45) and having low level of leverage (mean *LEV* = 4.02).

Panel B provides the distribution of categorical independent variables. The majority of the sample companies had an environmental committee (*EVC* = 52%) and certified EMS (*EMS* = 41%), did not follow GRI guidelines (*GRI* = 80%) and voluntarily participate in CDP (*CDP* = 57%), and domiciled in common law countries (*LEG* = 56%).

4.2. Regression Analyses

Prior to conducting regression analysis, correlation analysis was performed. Based on Kolmogorov Smirnov test to detect the normality of *CAEMD*, p-value < 0.05, hence Spearman's rho test was conducted as correlation analysis. The result of one-tailed Spearman's rho test, not tabulated here, indicated that there is no multicollinearity issue among the independent variables that might have effect on the explanatory power of the regression models. The highest correlation coefficient was between certified *EMS* and *EVC* (R=0.642). According to [70], a coefficient correlation of

greater than, or equal to, (≥) 0.80 indicates there is cause for concern. Additionally, none of the independent variables had a variance inflation factor (VIF) of ≥ 5.000 [see 71].

Tables 3 and 4 present the results for regression analysis. Table 3 only included the main variables in the model, while the model in Table 4 also considered control variables. For both tables, standardised coefficients are reported. * and ** represent significance levels at 5 percent and 1 percent, respectively. All tests are one-tailed except for the constant. The model which only includes the main variables (Table 3) is significant (*F*-stat= 7.824; *p*=0.000). The adjusted R^2 is 0.454 indicating that 45.4% of the variation in carbon emission disclosures of the sample companies can be explained by the variables specified in the model. For this model, *GRI*, *CG*, *ENF*, and *EPI* are statistically significant. Among these significant variables, except for *EPI*, the correlation coefficient of others are according to the predicted direction.

When all variables including the control variables were estimated into the model (Table 4), the model remained significant (F-stat= 7.779; p=0.000), and the adjusted R^2 increased to 0.524 hence improving the explanatory power of the model. Although the correlation coefficient for *CG* remains positive, it is no longer statistically significant. Besides *GRI*, *ENF*, and *EPI*, two of the control variables – *SIZE* and *LEV* – are statistically significant.

The findings from the regression analyses suggest that the most important institutional governance factors for carbon emission disclosures of the sample companies are compliance to GRI recommendations and a country's strength of law enforcement and commitment towards the environment. Consistent with the arguments of institutional governance theory, companies that used GRI as a guideline had a more extensive carbon emission disclosures than their counterparts. This is due to the detailed guidelines on the climate change related indicators and management approaches available in the guideline. Companies in stronger law enforcement environment tended to have greater carbon disclosures, a finding rendering support to the previous studies [see 16, 57]. In essence, countries that have greater government intervention particularly on regulations and enforcements may be forced to disclose more transparent information regarding the impact of their company's operation on the environment. Contrary to expectation, companies operating in countries where there is low commitment towards the environment provided greater carbon disclosure. Being surrounded in the environment where environmental issues received low priority, companies attempted to secure competitive advantage through environmental strategies. This enabled them to differentiate themselves from other competitors in order to attract foreign as much as local investors particularly from those who consider environmental agenda in their investment decisions.

Table 3: Regression Analysis (main variables)

	β	*t*	*p-value*
Constant	5.520	1.553	0.125
Uncertified EMS	-0.001	-0.06	0.995
Certified EMS	0.137	1.066	0.290
EVC	0.052	0.366	0.715
GRI	0.468	4.454	0.000**
CDP	0.103	1.039	0.303
CG	0.235	2.505	0.015*
LEG	0.145	1.508	0.136
ENF	0.364	3.173	0.002**
EPI	-0.421	-3.756	0.000**
SIZE	-	-	-
ROA	-	-	-
LEV	-	-	-
N		75	
Adjusted R^2		0.454	
Model *F* stat		7.824	0.000**

Table 4: Regression Analysis (all variables)

	β	*t*	*p-value*
Constant	-9.672	-1.459	0.150
Uncertified EMS	-0.051	-0.457	0.650
Certified EMS	0.161	1.332	0.188
EVC	-0.028	-0.205	0.839
GRI	0.410	4.116	0.000**
CDP	0.015	0.156	0.877
CG	0.148	1.584	0.118
LEG	0.045	0.465	0.643
ENF	0.411	3.698	0.000**
EPI	-0.403	-3.831	0.000**
SIZE	0.355	3.330	0.001**
ROA	-0.152	-1.383	0.172
LEV	-0.205	-2.018	0.048*
N		75	
Adjusted R^2		0.524	
Model *F* stat		7.779	0.000**

As expected, larger companies give greater impact to the environment and are more visible [66], hence forcing them to disclose more information than the smaller companies. The negative relationship between leverage and carbon emission disclosures is of suggestion that firms with higher debts are more likely to disclose less public information so as to lower the information risk [72]. Hence, the disclosures of carbon emissions information were more prevalent among companies which have greater reliance towards equity financing.

Other internal governance factors including environmental management system (*EMS*, both certified and uncertified), the existence of environmental committee (*EVC*), and voluntary participation in CDP (C*DP*) are not significant factors. A closer investigation on this issue revealed that all these factors are positively associated with *GRI* (the use of GRI as reporting guideline) which is the only internal governance factor found to be significant. The regression analysis in Table 4 also suggests that good corporate governance (*CG*) did not lead to better carbon disclosures. This could be due to the fact that electricity industry is highly regulated and hence companies need to have good governance which made them less distinct from each other.

In summary, based on the results above, H3 and H7 are supported, with H8 is partially supported since the relationship is not according to the predicted direction. Other hypotheses are not supported.

5. Conclusions and Implications

This research examines the carbon disclosure by 75 electricity generation companies in Asia using institutional governance perspective as the basis. More extensive carbon emission disclosures were found among companies using GRI as the reporting guideline; operating in strong law enforcement setting and countries with low commitment towards the environment; that are larger in size; and had low level of leverage.

It is noteworthy to reiterate the main contributions of this research. Firstly, in terms of contributions to the literature, this research has investigated an issue of high interest to many, namely carbon emissions and the reporting thereof by companies operating in one of the most polluting industries (i.e. electricity industry). While most of the previous studies were country specific, this research has conducted an international comparison focusing on Asian countries in which about 40 percent of global GHG emissions are derived from. It content analysed a comprehensive set of documents including both annual reports and stand-alone sustainability reports, and analysed the reporting practices on the basis of arguments put forward by institutional governance theory. As a result, it overcame the overreliance of prior literature on annual report disclosures and legitimacy theory as the underlying arguments.

The disclosure of carbon emissions in the corporate report is still voluntary, however, as the environmental issues have become increasingly crucial, that actions need to be taken to overcome them. The efforts need to be taken not only within the society but also at the corporate level as it is important for the companies to demonstrate the awareness on environmental issues in particular those related to climate change and global warming. Therefore,

from the practical viewpoint, this research is able to create awareness among companies on the importance of managing their CO_2 emissions for environmental reasons through disclosures in media accessible by the public including annual reports. As a result, stakeholders will have information necessary for them to make investment and other decisions [73]. In a similar vein, companies could gain competitive advantage through reducing the costs and improved operational efficiencies. The abovementioned benefits are expected to bring about positive corporate reputation which in turn translate into better firm performance in the future.

The research findings hinted at the low extent of carbon emission disclosures among the electricity companies in Asia. Considering that the industry contributed significantly to global CO_2 emissions, such a finding provides some implications for the policy formulation. First, there is a need for regulators to consider mandatory reporting of emissions by these companies. There is a possibility that they are already required to provide the information to the regulators, however, this needs to be extended to the public at large since environmental issue is a public issue (not merely the issue of regulators). Second, requirement for mandatory disclosure of information shall be accompanied by detailed guidelines or standards as to how to report on carbon emissions information for consistency and comparability reasons. This is where the disclosure index developed in this study could be of useful. Third, to be effective, a certain mechanism shall be in place to penalise companies that have failed to provide sufficient information as required. The role of each country's bourse or stock exchange on this matter is paramount important.

The findings have to be interpreted with caution. Firstly, this research only examined one year data, hence it only provides a snapshot of carbon emission disclosures. Examining disclosures on a longitudinal basis will provide insights into the trend in disclosure. Secondly, the regression analysis shows an adjusted R^2 of 52.4% indicating that 37.6% of the variations in disclosure remained unexplained. Governance attributes that can be considered for future research include board size, board independence, board diversity, and ownership structure [19],[27],[28],[29],[55]. Furthermore, [6] considered various country variables including the national culture, competitive responsibility index, voice and accountability index, press freedom index, government effectiveness index, regulatory quality index, and level of economic development. These indices need to be considered to enhance the robustness of the findings.

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