Climate Change Reporting and Corporate Governance among Asian and African Energy Firms

Emmanuel Tetteh Asare¹, King Carl Tornam Duho*², and Edmund Narh Amegatcher¹, ²

¹Department of Accounting, University of Ghana, Accra, Ghana
²Green Economy and Environmental Intelligence Unit, Dataking Research Lab, Dataking Consulting, Accra, Ghana
Email: kctduho@gmail.com

Abstract. This paper examines the extent of climate change disclosure among energy firms operating in Africa and Asia, as well as the firm, country and global determinants of the disclosures. A quantitative approach was applied to evaluate an unbalanced panel data of 31 firms in 18 countries across Africa and Asia for 2015 to 2020. Data was collected from the GRI database and a composite index was constructed to measure the extent of climate change disclosure using “GRI 305: Emissions” indicators. The study used a regression model to find the nexus between climate change disclosure and its determinants. Comparatively, Asian energy firms disclose more than their African counterparts. The determinants of climate change disclosure are board size, board diversity, multinational status, profitability, cross-listing status, membership to the United Nations Global Compact and the Human Development Index of the countries within which firms operate. This study provides insights about the extent of GRI 305: Emissions usage by energy firms in Africa and Asia. It also adds to the limited knowledge on climate change disclosure in Africa and Asia. With the recent COP26 conference in mind, this study extends knowledge on how businesses are taking action in line with the Agenda 2030 (specifically Sustainable Development Goal 13), the Paris Agreement and the Sendai Framework for Disaster Risk Reduction.

Keywords: Climate change; Corporate governance; Global Reporting Initiative; Energy; United Nations Global Compact; COP26

1. Introduction
The United Nations Framework Convention on Climate Change (UNFCCC) defined climate change as “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods” [1]. There is evidence that the period spanning 2010 – 2019 was the warmest decade and 2019 was found to be the second warmest year in history since 1880 behind 2016 [2]. It is noted that the earth’s climate system is continuously warming at unprecedented temperature levels and this is mainly due to anthropogenic factors [3]. Emissions of greenhouse gases as a result of
human activities, in recent times, are the highest in history despite many climate change mitigation policies.

Amid global concerns about the devastating and irreversible impact of climate change, governments, corporate institutions, and all other stakeholders are required to take responsibility, show true commitment and integrate their efforts to fight climate change [4]. There are even greater institutional demands for a strong collaboration between government, businesses and civil societies. Businesses are also expected to act responsibly to reduce their greenhouse gas emissions by transitioning to carbon-efficient technologies and processes [5]. Research indicates that developing countries would be the most vulnerable to the adverse impacts of climate change if the global temperature exceeds 2°C [6]. These countries will experience heightened poverty levels, greater health risks, and other devastating natural disasters if the fight against climate change fails. Asia has some of the world’s leading carbon emitters namely China, India and Japan. Consequently, Africa is densely populated with developing countries with high poverty levels, yet does not have strong structures and systems to combat adverse social and environmental issues due to poor governance among others.

According to researchers, most countries in these continents with varying poverty levels will be very vulnerable to climate change and therefore cautions the need for urgent climate action [7]. The International Energy Agency (IEA) has reported that the energy sector is the largest emitter of greenhouse gas [8]. Some scholars have argued that strong institutional pressures can be a form of coercive and normative force that increases the likelihood of firms operating in environmentally sensitive industries to make more environmental social and governance (ESG) disclosures than their counterparts in less environmentally sensitive industries [9,10]. Due to the vulnerability of Africa and Asia to the adverse impacts of climate change and the increasing global pressure for urgent climate action, this study is set out to achieve the following under-listed objectives with a specific focus on the energy sector; 1) to investigate the extent of climate change disclosures made by African and Asian energy firms; 2) to examine the firm-level factors that drive climate change disclosures among energy firms in Africa and Asia, and 3) to examine the country-specific factors and global forces that drive climate change disclosures among energy firms in Africa and Asia.

This study is organized into five sections. Section 2 is a review of past literature on climate change disclosure followed by section 3 focussing on the data and methodology used to carry out the study. Section 4 and section 5 discusses the empirical results of this study and draws conclusion, implications and suggestions for future studies respectively.

2. Literature review
This section provides a review of the theory that underpins the study and the previous literature on the concept of climate change and the determinants.

2.1 Institutional theory
Institutional theory is one of the most used theories in Corporate Social and Environmental Reporting (CSER) studies aside from the stakeholder theory and the legitimacy theory [11–14]. As a social theory [15], some researchers posit that the institutional theory provides relevant insights to explain why firms react to external pressures such as social structures, expectations and social institutions [16]. The institutional theory also provides broader perspectives to complement the legitimacy theory and the stakeholder theory and therefore is sometimes mostly preferable in investigating sustainability issues of firms [17–19]. Proponents of the institutional theory argue that organizations operate within contexts that are made up of certain values, norms, beliefs and taken-for-granted assumptions [20–22]. The values, norms, beliefs and assumptions within a given context over time become social constructions stabilized as legitimate ways of doing things and set of actions required by social actors [23,24].
This study specifically focuses on the neo-institutional branch (also referred to as the new institutional theory) [23,25]. To ensure organizational survival, managers become isomorphic by conforming to the demands of their institutional environments. In this sense, firms that fail to recognize the needs of their context (both internal and external) are deemed outcasts and therefore fail to gain legitimacy in society. Isomorphism is defined as “a constraining process that forces one unit in a population to resemble other units that face the same set of environmental conditions” [25]. According to the researchers, the institutional theory explains why organizations become similar in characteristics and form over time. Three different isomorphic pressures are; coercive (laws, rules and regulations), normative (values, norms and best practices) and mimetic isomorphism (mimicking or imitating).

While coercive isomorphism mechanism focuses on statutes, rules and regulations backed by appropriate sanctions for non-compliance, normative isomorphism relates to values and norms as the driving force of organizations’ actions. The researcher argued that socially constructed expectations of what ought to be done are the driving forces for some organizational practices [24]. It is also posited that these societal expectations over time become an external force that pressures organizations to adopt certain practices to gain legitimacy in their institutional environment [26]. Professionalism is therefore argued as a source of normative isomorphic pressure. Thus, firms that fail to follow and adopt professional standards, policies and procedures that reflect normative expectations are deemed to be deviants and therefore do not get the social license to operate.

It is argued that uncertainty is a major force and motivation behind mimetic isomorphism [25]. The researchers opined that imitation is a cognitive pressure that causes similarities among firms. Thus, the mimetic mechanism involves organizations mimicking, imitating or copying the behaviour of successful counterparts in an industry or a given context either for competitive advantage or to reduce uncertainty. Imitation by organizations aims at gaining legitimacy of acceptable acts or conventions within an institutional context. The three different strands of institutional isomorphism provide evidence that firms are rewarded for responding to the needs of their external environment either through increased legitimacy or through increased survival capabilities [27].

A limitation of the institutional theory, however, is that it focuses more on macro-level institutional structures that influence organizational practices rather than on individual and internal organizational dynamics that play a role in the process of institutionalization [11]. It is therefore important that internal perspectives within an organization are taken into consideration when examining institutional perspectives [26–28]. This means that while exploring the external forces that drive organizations’ isomorphism, there is a need to take into consideration the influence of organizational and individual factors in the process of institutionalization. This study, therefore, does not only examine how country-level factors and global pressures, as external factors, influence the climate change disclosure of firms but also takes into account some organizational factors such as corporate governance that may influence the process of firms’ institutionalization. This supports the argument that “what goes on inside organizations is as important as what goes on outside organizations to the institutional process” [29]. Thus, the internal factors will provide insights into why organizations act differently even though institutional pressures from the external environment should force all organizations to converge or act the same way.

2.2 Nature and extent of climate change

Undoubtedly, the threats of climate change have become clearer in recent times than in any other decade. Heavy rainfalls, very hot temperatures accompanying wildfires and other related diseases as well as deadly natural disasters have been already experienced in many parts of the world. Yet, although countries across the globe are making strides to tackle climate change, the pace is unmatchable to the degree to which climate change is closer to destroying the earth. This has led to many calls for urgent
climate action to reduce the global temperature below 1.5°C by 2030 and to achieve a net-zero carbon economy by 2050.

There is no doubt that human activity comprising of both agricultural activities and industrial processes is the major cause of most of the observed greenhouse gas emissions in the atmosphere and therefore a conscious effort to change some of these human activities will be the only way to swiftly tackle climate change. It is argued that the adverse impact of climate change will be mostly felt by developing countries either through heightened poverty, increased famine due to poor agricultural yields and other related diseases emanating from high temperatures among others [6]. The severity of the adverse impact of climate change has resulted in clarion calls for urgent climate action. The role of businesses towards urgent climate action cannot be overemphasized.

There is a clear indication that eliminating climate change will require strong collaboration and commitment from businesses and governments. Actions taken by these stakeholders are also expected to be very swift in order the global target of zero carbon emissions by 2050. However, while such actions are mostly observed in many countries across Europe and America, in Africa and Asia little to no action to fight climate change has been observed in most countries. For instance, There is a researcher who accounts that regulatory frameworks to drive carbon pricing in Africa are lacking as South Africa is the only country with carbon tax implemented while Senegal and Cote d’Ivoire have theirs under consideration [30]. The researcher laments that “most climate change frameworks used by countries in Africa are executive instruments and only a few countries have laws”. It is indicated that the global energy sector, populated with both large multinationals and mid-size companies in oil and gas, coal, electricity and fossil fuel production and supply is a leading contributor to total global greenhouse gas emissions [8,31].

There is therefore the need for this industry to lead the fight against climate change through various industry practices and policies that will reduce carbon emissions. The extent of climate change disclosure in this industry helps to provide insight into the future of the global net-zero economy by 2050.

2.3 Climate change reporting in the accounting literature

In response to growing institutional pressures and clarion calls for urgent climate actions, several past studies have explored various aspects of climate change to provide empirical evidence and insights that can help policymakers to better understand the issue to formulate appropriate mitigation strategies.

The majority of these past empirical studies focused on the relationship between firm-specific attributes and climate change disclosures [32–34]. It is argued that corporate governance is one of the key determinants of climate change disclosure [35]. Corporate governance factors such as board gender diversity [36], board independence [33] and board size [37–39] have all been found to have a significant effect on climate change disclosure of firms. It is also indicated that women tend to care more about the quality of life than material success and therefore tend to help their firms to achieve greater environmental performance [40]. Another study also found a strong positive relationship between multiple female directors on corporate boards and higher quality greenhouse gas (GHG) emissions disclosures [41].

However, it is posited that companies must reach the critical mass of at least three women on their boards to attain greater influence on boards [42]. With regards to board independence, it is suggested that the presence of independent directors on corporate boards is more likely to influence board effectiveness and socially responsible behaviours that will safeguard the interests of shareholders and other stakeholders [43]. It is also argued that increasing the proportion of independent non-executive directors on boards positively influences the level of climate change disclosure of firms [44]. However, other researchers found no association between board independence and environmental disclosure
quality of firms [45]. In terms of board size, it posited that as smaller boards increases in number the board becomes less effective [46]. Conversely, it is argued that larger boards tend to have people with diverse educational backgrounds, professional experience and industry knowledge and therefore will be more likely to be effective than smaller boards [47].

Aside from these corporate governance factors, firm size and profitability are other firms attributes that have also been found to be determinants of climate change disclosure [9,34,48]. Empirical insights suggest that country factors and global factors are key forces that drive climate change disclosure among firms. It is also opined that corporate sustainability is dynamic and socially constructed [49]. The researchers argued that understanding different socio-political contexts are critical in understanding why firms in different institutional environments have varied sustainability activities and disclosures. In line with propositions of the institutional theory, researchers found that there are disparities in firms’ sustainability practices owing to the differing legal, normative and sociocultural systems that exist within the environment where a firm operates [49]. This study specifically examines what influence that country factors such as human development index (HDI) and gross domestic product growth rate (GDPG) have on firms’ climate change disclosure in line with the GRI framework.

Past studies have found that firms operating in countries that are signatories to international protocols or agreements tend to disclose more than their counterparts that are not [9,44]. Researchers found empirical evidence to suggest that multinational companies established in countries that are signatories to the Kyoto Protocol disclose less in countries that are not signatories to the protocol [44]. Others also found that being a signatory to the UNGC has effects on firms’ sustainability reporting on the environment and human rights [50]. This evidence suggests that the multinational status of firms and their membership to international protocols can be a major source of isomorphic pressure to drive socially responsible organizational practices.

Based on the extant literature reviewed above and the insights gained from the institutional theory, this study hypothesizes that;

**H1.** There is firm-level disparity on the extent of climate change disclosure among energy firms in Africa and Asia due to varying firm attributes

**H2.** There is country-level disparity on the extent of climate change disclosure among energy firms in Africa and Asia due to varying socioeconomic country factors.

**H3.** Membership to multi-stakeholder initiatives such as UNGC is a global force that increases the likelihood of high climate change disclosure among African and Asian energy firms.

### 3. Data and methodology

This section provides an extensive description of the data utilised to address the research objectives and the methodology used.

#### 3.1 Data

This study employs a quantitative approach to determine the extent of climate change disclosure in Africa and Asia and the firm-level, country-level and global determinants of climate change. The selected population comprises corporate reports of African and Asian energy firms available on the GRI database since its inception. A random or probability sampling technique is adopted to sample data that is representative of the entire population and therefore helps to make accurate statistical inferences. This sampled data consists of an unbalanced panel of 31 firms in oil and gas, electricity, and other forms of energy from 18 countries across Africa and Asia for the periods 2015 to 2020. The selected reports from the database cover non-GRI, GRI citing, GRI-G1, GRI-G2, GRI-G3, GRI-G3.1, GRI-G4 and GRI Standards. Concrete qualitative information, references and evidence relevant to the study are recorded, coded, evaluated and carefully analyzed to make statistical inferences and draw conclusions.
Table 1. Description of variables.

| Variables | Definitions |
|-----------|-------------|
| EN 15     | Direct GHG emissions, coded as 1 where a disclosure is made and 0 if otherwise |
| EN 16     | Energy indirect GHG emissions, coded as 1 where a disclosure is made and 0 if otherwise |
| EN 17     | Other indirect GHG emissions, coded as 1 where a disclosure is made and 0 if otherwise |
| EN 18     | GHG emissions intensity, coded as 1 where a disclosure is made and 0 if otherwise |
| EN 19     | Reduction of GHG emissions, coded as 1 where a disclosure is made and 0 if otherwise |
| EN 20     | Emissions of ozone-depleting substances, coded as 1 where a disclosure is made and 0 if otherwise |
| EN 21     | Nitrogen oxides (NOx), sulphur oxides (SOx) and other significant air emissions, coded as 1 where a disclosure is made and 0 where otherwise |
| CCDI      | Climate change disclosure index as represented by Eqn. 1 |
| SIZE      | Total assets, measured as the natural logarithm of total assets |
| BSIZE     | Board size of firms, measured as the natural logarithm of total board sizes of all firms sampled |
| BIND      | Board independence, measured as the percentage of independent directors on corporate boards |
| BGENDER   | Board gender, measured as the percentage of women directors on corporate boards |
| MNE       | Multinational status of firms, coded as 1 where a firm is a multinational and 0 if otherwise |
| ROA       | Return on assets, measured as the ratio of profit after tax to total assets |
| UNGC      | Membership to United Nations Global Compact coded as 1 where a firm is a signatory and 0 if otherwise |
| CL        | Membership to UN Global Compact, coded as 1 if a firm is a signatory and 0 if otherwise |
| ASIA      | Asia, coded as 1 where a firm is an Asian firm and 0 where a firm is an African firm |
| HDI       | Human development index measured based on the scores reported by UNDP |
| GDPG      | Gross domestic product growth rates |

3.2 Extent of climate change disclosure

Using form-oriented content analysis, we examine sampled corporate reports (sustainability report, annual report and integrated reports) of energy firms in Africa and Asia from the GRI database to measure the extent of climate change disclosure among African and Asian energy firms by constructing a climate change disclosure index (CCDI) [12–14]. This composite index is specified as follows:

$$CCDI_{i,t} = \frac{\sum_{j=1}^{score_{j}}}{\text{Maxscore}}$$  

Eqn 1

CCDI represents Climate Change Disclosure Index, i represents individual energy firms, t represent year and j represents the individual item in the index. The maxscore represents the maximum score a firm can obtain for a year. The index for each firm, i, at the year, t, should be the ratio of the sum of the individual scores to the maximum score. This index is a ratio of the summation of individual scores to the maximum score a firm can obtain. The indicators of GRI 305: Emissions, as summarized in Table 1 for each corporate report are coded to calculate the climate change index. This means that the disclosure of an indicator in a corporate report is coded as “1” and non-disclosure coded as “0”. The climate change composite index (CCDI) developed for all the indicators measures the overall climate change disclosure.

3.3 Linear regression model

Eqn 2 depicts the linear regression model used for this study. The regression analysis provides an understanding of the nexus between the dependent variable (climate change disclosure) and independent
variables by regressing the climate change disclosure index (CCDI) on the individual variables used in this study. The independent variables comprise firm-level, country-level and global-level variables as summarized in Table 1. The linear regression model is mathematically depicted as follows.

\[
\text{CCDI}_{it} = \alpha_{it} + \sum_{j=1}^{m} \beta_{Firm} + \sum_{k=1}^{n} \beta_{Country} + \sum_{l=1}^{p} \beta_{Global} + \epsilon_{it}
\]

Eqn 2

We used the panel corrected standard error (PCSE) regression. Also, Firm represents the firm-specific variables, Country represents country-specific factors and Global represent the global factor. CCDI represents the climate change disclosure index, Firm represents firm-level determinants of climate change disclosures, Country represents country-level determinants and Global represents international or global determinants of climate change disclosures. In addition, \( \alpha \) represents the constant terms, \( \beta \) represents the regression coefficients and \( \epsilon \) represents the error term. Since data is panel data, \( i \) and \( t \) represent the differences in firms and years respectively.

4. Result and discussion

This section provides the results and the discussions for the study. The regression results are discussed in line with the extant literature and theory.

4.1 Descriptive statistics

Table 2 shows the descriptive statistics of the dependent and independent variables used in this study. The results indicate that on average, the overall level of climate change disclosure among African and Asian energy firms in line with GRI 305: Emissions is about 62.5 percent. Individually, an average of about 88.7 percent, 78.7 percent and 38.0 percent corporate reports disclosure on direct GHG emissions (EN 15), energy indirect GHG emissions (EN 16) and other indirect GHG emissions (EN 17) respectively. Additionally, about 60.0 percent, 64.7 percent, 30.7 percent and 76.7 percent of corporate reports make disclosures on GHG emissions intensity (EN 18), reduction of GHG emissions (EN 19), emission of ozone-depleting substances (EN 20) and Nitrogen oxide, Sulphur oxide and other significant air emissions (EN 21) respectively.

| Variable | Obs | Mean | Std.Dev. | Min | Max |
|----------|-----|------|----------|-----|-----|
| CCDI     | 150 | 0.625| 0.298    | 0.00| 1.00|
| EN 15    | 150 | 0.887| 0.318    | 0.00| 1.00|
| EN 16    | 150 | 0.787| 0.411    | 0.00| 1.00|
| EN 17    | 150 | 0.380| 0.487    | 0.00| 1.00|
| EN 18    | 150 | 0.600| 0.492    | 0.00| 1.00|
| EN 19    | 150 | 0.647| 0.480    | 0.00| 1.00|
| EN 20    | 150 | 0.307| 0.463    | 0.00| 1.00|
| EN 21    | 150 | 0.767| 0.424    | 0.00| 1.00|

Source: Computations in STATA14

The result provides evidence that climate change reporting is gradually growing among firms in Africa and Asia although reporting by African firms remains relatively low. Firms are using their corporate disclosures as a response mechanism to institutional pressures as argued by some researchers [51] and are therefore reporting more on sustainability issues that have gained much attention from shareholders and other stakeholders. The result also confirms the argument of prior studies that posit that firms operating in highly environmentally sensitive industries disclose more sustainability information [9,48]. From the descriptive statistics, corporate disclosure on other indirect GHG emissions and emission of
ozone-depleting substances (EN 20) remains low while that of direct GHG is the highest among all the indicators.

### Table 3. Descriptive statistics of explanatory variables.

| Variable | Obs | Mean   | Std.Dev. | Min    | Max   |
|----------|-----|--------|----------|--------|-------|
| BSIZE    | 150 | 2.340  | 0.298    | 1.609  | 2.773 |
| BIND     | 150 | 0.387  | 0.168    | 0.000  | 0.818 |
| BGENDER  | 150 | 0.085  | 0.092    | 0.000  | 0.364 |
| SIZE     | 149 | 23.014 | 4.360    | 8.812  | 35.954|
| MNE      | 150 | 0.293  | 0.457    | 0.000  | 1.000 |
| ROA      | 150 | 0.035  | 0.114    | -0.389 | 1.000 |
| UNGC     | 150 | 0.507  | 0.502    | 0.000  | 1.000 |
| CL       | 150 | 0.140  | 0.348    | 0.000  | 1.000 |
| ASIA     | 150 | 0.873  | 0.334    | 0.000  | 1.000 |
| HDI      | 149 | 0.786  | 0.102    | 0.531  | 0.949 |
| GDPG     | 149 | 3.625  | 3.347    | -8.862 | 26.681|

Source: Computations in STATA14

4.2 Descriptive statistics on explanatory variables
The results show that on average about 87.3 percent of the total number of energy firms sampled are domiciled in Asia.

### Table 4. Pairwise correlations of explanatory variables.

| Variables | VIF | (1)       | (2)       | (3)       | (4)       | (5)       |
|-----------|-----|-----------|-----------|-----------|-----------|-----------|
| (1) BSIZE | 1.85| 1.000     |           |           |           |           |
| (2) BIND  | 1.41|-0.149*    | 1.000     |           |           |           |
| (3) BGENDER | 1.55| 0.105     | 0.246***  | 1.000     |           |           |
| (4) SIZE  | 1.68| 0.503***  | 0.246***  | 0.125     | 1.000     |           |
| (5) MNE   | 1.46|-0.059     | -0.117    | -0.333*** | -0.084    | 1.000     |
| (6) ROA   | 1.21| 0.053     | -0.121    | -0.030    | 0.076     | 0.021     |
| (7) UNGC  | 1.13| 0.194**   | -0.030    | 0.031     | 0.012     | -0.096    |
| (8) CL    | 1.44| 0.245***  | -0.023    | -0.048    | -0.064    | 0.331***  |
| (9) ASIA  | 1.43| 0.000     | -0.066    | -0.451*** | 0.053     | 0.069     |
| (10) HDI  | 1.47| 0.051     | 0.154*    | -0.057    | 0.1 76**  | 0.202**   |
| (11) GDPG | 1.19|-0.006     | -0.020    | -0.106    | -0.043    | 0.005     |

Source: Computations in STATA14
The level of reporting by African firms following GRI standards is very low. The explanatory variables for this study comprise firm-level indicators, country factors as well as global factors. In terms of gender diversity, the result indicates that on average, women occupy about 8.5 percent of the overall board size with a maximum number of four (4) women and a minimum of zero female directors. Women’s representation on corporate boards in Africa and Asia continues to remain relatively low and therefore must be given a critical look. Energy firms sampled for this study make average profitability of 3.5 percent as measured by return on assets. On average, about 29.3 percent of the firms sampled for this study are multinationals. Furthermore, about 50.7 percent of the firms sampled are members of the UNGC with about 14.0 percent cross-listed on different stock exchanges either in or outside the country of establishment. In terms of country-level factors, the average HDI is about 78.6 percent while that of GDP growth rate is about 3.625. Table 3 is the descriptive statistic on explanatory variables.

4.3 Correlation analysis and multi-collinearity

Table 4 shows the results of the pairwise correlation test of explanatory variables and variance inflation factor (VIF). To prevent wrong inferences and errors arising from the inclusion of wrong variables and the exclusion of relevant variables, this study tests for multi-collinearity using correlation test and the VIF. The correlation test shows the associations between variables. VIF, on the other hand, measures the extent to which the variance of coefficients is inflated by multi-collinearity. Testing for multi-collinearity helps to identify independent variables that are highly associated with each other and thus likely to distort the analysis. The result shows moderate correlations between all the explanatory variables. Although the correlation between firm size and board size is high, this correlation is not very strong. As a rule of thumb, when the VIF is greater than 10, there is high collinearity [52]. From the above results, none of the variables has a VIF greater than 10 therefore there is no high collinearity.

4.4 Determinants of climate change disclosure

The regression analysis are presented in Table 5 showing that the model is appropriate as evident by the Chi squared ($\chi^2$).

Overall, the regression result shows that energy sector firms in Asia disclose more about climate change than their counterparts in Africa. Asia as a continent has some of the world’s fastest-growing economies and heavily industrialized countries with massive greenhouse gas emissions. China, India and Japan are among the world’s top five highest carbon emitters by country with China’s carbon emissions alone exceeding all of developing country’s carbon emissions combined. Due to this, global pressure serving as a coercive and normative force on Asian countries to reduce their greenhouse emissions is stronger than that of Africa.

The determinants of climate change disclosure among African and Asian energy firms in line with GRI 305: Emissions, as indicated by the regression results, are board size, gender diversity, firm size, multinational status, firm profitability, membership to UNGC, cross-listing status and human development index of the country within which a firm operates. In line with earlier empirical findings [32,36,45,53,54], this study found that firm attributes such as an increase in board size and the number of women directors on a firm’s board significantly increase climate change disclosures.

However, the influence of board independence on climate change disclosure was not statistically significant. Besides, the result reveals a curvilinear relationship between firm size and climate change disclosure implying that disclosures are high when firms are in their early years of operations in a particular context but their level of disclosure falls as they grow and expand their scale in the long run. It is argued that in the short run, media attention and some societal pressures serve as coercive forces that drive firms to disclose more to gain legitimacy [55]. The results of this study affirm and add knowledge to the findings of earlier studies [55]. Rather than increasing their environmental and social
performance as they become large, firms begin to engage in some irresponsible business practices and disclose false information as they grow larger over the long run. This may result from excessive power and influence through governments’ reliance on firms as well as other contacts with social actors and political officials. The use of power and undue influence by large firms as a mechanism to gain political and social favours over competitors is a major socio-political problem in Africa and Asia.

Table 5. Regression results on determinants of climate change disclosures.

| Variables | VIF | (1) CCDI | (2) CCDI | (3) CCDI |
|-----------|-----|----------|----------|----------|
| BSIZE     | 1.85| 0.231*** | 0.296*** | 0.344*** |
| BIND      | 1.41| -0.237   | -0.037   | 0.075    |
| BGENDER   | 1.55| 0.989*** | 1.198*** | 0.999*** |
| SIZE      | 1.68| -0.011*  | 0.093*** | 0.002*** |
| SIZE x SIZE |     |          |          |          |
| MNE       | 1.46| -0.097*  | -0.092*  |          |
| ROA       | 1.21| 0.495*   | 0.584**  |          |
| UNGC      | 1.13| 0.064*   | 0.079**  |          |
| CL        | 1.44| -0.104*  | -0.163***|          |
| Asia      | 1.43| 0.299*** | 0.331*** |          |
| HDI       | 1.47| -0.670***| -0.977***|          |
| GDPG      | 1.19| 0.008    | 0.005    |          |
| _cons     |     | 0.093    | 0.324    | -0.775** |

| Obs.  | 150 | 148 | 148 |
|-------|-----|-----|-----|
| R-squared | 0.167 | 0.424 | 0.504 |
| Firms | 31  | 31  | 31  |
| Countries | 18  | 18  | 18  |
| Wald Chi-squared | 25.42*** | 160.59*** | 210.55*** |

Note: Standard errors are in parenthesis *** p<0.01, ** p<0.05, * p<0.1

Source: Computations in STATA14

It is found that a positive and significant relationship exists between firms’ profitability and membership to UNGC, and the level of climate change disclosures. Membership to UNGC is a source of normative isomorphism that drives a higher level of disclosures [50]. Conversely, a negative and significant relationship was found for multinational status, cross-listing status and human development index. Besides, the study found no significant effect of GDP growth rate on climate change disclosure.
5. Conclusion
This study was set out to investigate the extent of climate change disclosures among African and Asian energy firms. It was found that the level of climate change disclosure is relatively high at about 62.5 percent. Asian energy firms make higher disclosures than African firms. Board size, gender diversity, firm size, firm profitability and membership to UNGC were found to have a positive and significant relationship with climate change disclosure among African and Asian energy firms. A negative and significant relationship was however found between climate change disclosure and multinational status of firms, firm cross-listing status and the HDI of a country with which firms operate.

The study failed to find any significant relationship between board independence and GDP growth of a country on climate change disclosure. Through this study, various stakeholders including shareholders in the energy industry including corporate managers, institutional investors, policymakers, market regulators, governments, international organizations and society are provided with general insights about the extent of climate change disclosure among African and Asian energy firms and the firm-level, industry-level and global determinants of these disclosures, therefore, adding to the limited existing knowledge on climate change disclosure in Africa and Asia on a cross-country basis.

5.1 Contributions/ implications
This research adds to the limited existing knowledge on climate change disclosure in Africa and Asia. It also extends knowledge on how businesses are taking action in line with the Agenda 2030 (specifically Sustainable Development Goal 13), the Paris Agreement and the Sendai Framework for Disaster Risk Reduction. Despite many challenges facing Africa as a continent, this research provides comprehensive insights that indicate that clear roadmaps that will set out what governments of African countries and businesses in the continent are expected to do to reduce their carbon emissions must be established and implemented since Africa continues to lag in the fight against climate change. G7 countries that have also made commitments to provide funds to support poor countries in the fights against climate change must also do well to fulfil those commitments to remove any impediment that will slow down climate action in developing countries.

Findings from this study showed that as multinationals grow larger and larger they begin to wield more power and influence over the government due to the dependence of the government on them for certain provisions. This finding is true and clear in most African countries. There is therefore the tendency that while most developing countries are going to be dependent on developed countries for finance, technology and other resources to fight climate change, such undue influences and demands by developed countries and multinationals may erupt and this will slow down the fight against climate change. Political leaders in poor countries must therefore limit their contacts and overdependence on multinationals to prevent such possible undue influences. International regulatory bodies must also set clear guidelines to ensure that while developing countries depend on developed countries for finance to support climate action such provision does not lead to any undue influence that may cause irresponsible demands from developed countries and multinationals operating in such countries.

High emitting companies in the energy sectors of African and Asian countries like China, India, Japan, South Africa, Egypt, Algeria and Nigeria must be swift in transitioning from the use of high carbon-emitting industrial technologies and processes to zero-emitting ones. Finally, urgent climate action will require strong collaboration between governments and businesses and a conscious effort to do the right things to reduce greenhouse gas emissions and concentration in the atmosphere.

5.2 Recommendations and suggestions for future research
By responding to clarion calls for more cross-country studies on climate change involving firms of different sizes and other attributes, this study fills the existing gaps in the literature by providing evidence about cross-country variations in climate change disclosures. In terms of policy, it is recommended that governments in African and Asian countries must strengthen their domestic
regulations and formulate stringent policies to ensure that multinationals who operate in their country do not act irresponsibly. Political leaders and other state actors must also reduce reliance and contacts with the large organizations since this weakens the government’s control on those firms and leads to irresponsible business practices by very large firms in the long run. Various civil society organizations in Africa and Asia must also lead climate change campaigns as a coercive force that will put firms and governments on their toes to implement climate actions.

This study calls for future studies to explore how individual human factors of corporate directors and other governance actors influence climate change disclosures both in the energy sector and in other high carbon-emitting industries, using different approaches. For instance, using a qualitative approach such as interviews, future studies can explore how group-think and CEO or Chairman dominance affect firms’ climate change disclosure and environmental performance. Future studies can also explore climate change disclosure of firms in other industries either on a cross-country or intra-country basis.

Acknowledgements
This project is part of technical research supported by the Dataking Research Lab of Dataking Consulting, in Accra, Ghana (https://datakingconsulting.com/). An earlier version also benefitted from feedback from participants at the 2nd Birmingham Business School Responsible Business Academic Symposium. We are also grateful for useful feedback from the participants of the 1st ASEAN International Conference on Energy and Environment. We appreciate Portia Dunyo, Rhoda Ladjer Akuaku and Bless Akotey for proofreading the manuscript.

References
[1] United Nations (UN). UNFCC Article 1. United Nations Framework Convention on Climate Change 1992.

[2] Stocker TF. Close Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change 2013.

[3] WMO. The State of the Global Climate 2020. World Meteorological Organization (WMO) 2021.

[4] Duho KCT. Global Response to Climate Change by the Accounting Profession: Insights for Ghana. Modern Ghana 2020.

[5] Duho KCT, Bonou SCC. Climate Finance and Carbon Pricing in the Context of Africa’s Continental Free Trade Area. Accra: Dataking Consulting; 2021.

[6] Pachauri RK, Allen MR, Barros VR, Broome J, Cramer W, Christ R, et al. Climate change 2014: synthesis report. Contribution of Working Groups I, II and III to the fifth assessment report of the Intergovernmental Panel on Climate Change. IPCC; 2014.

[7] das Gupta M. Population, poverty, and climate change. The World Bank Research Observer 2014;29:83–108.

[8] IEA. Bet Zero by 2050. International Energy Agency 2021.

[9] Freedman M, Jaggi B. Global warming, commitment to the Kyoto protocol, and accounting disclosures by the largest global public firms from polluting industries. The International Journal of Accounting 2005;40:215–32.
[10] Amran A, Periasamy V, Zulkafli AH. Determinants of climate change disclosure by developed and emerging countries in Asia Pacific. Sustainable Development 2014;22:188–204.

[11] Mahmood Z, Ahmad Z. Quest for alternative sociological perspectives on corporate social and environmental reporting. Journal of Accounting and Finance in Emerging Economies 2015;1:135–53.

[12] Duho KCT, Agyenim-Boateng C, Asare ET, Onumah JM. Convergence and determinants of anti-corruption disclosure among extractive firms in Africa. Journal of Financial Crime 2020.

[13] Asare ET, Duho KCT, Agyenim-Boateng C, Onumah JM, Simpson SNY. Anti-corruption disclosure as a necessary evil: impact on profitability and stability of extractive firms in Africa. Journal of Financial Crime 2021;28:531–47.

[14] Duho KCT. Examining Anti-Corruption Disclosures, Profitability and Financial Stability Among Extractive Firms in Africa. MPhil Thesis, University of Ghana 2020. https://doi.org/10.2139/ssrn.3896916.

[15] Deegan C. EBOOK: Financial Accounting Theory: European Edition. McGraw Hill; 2011.

[16] Powell WW, DiMaggio PJ. The new institutionalism in organizational analysis. University of Chicago Press; 2012.

[17] Deegan C. Organizational legitimacy as a motive for sustainability reporting. Sustainability accounting and accountability, Routledge; 2010, p. 146–68.

[18] Ball A, Craig R. Using neo-institutionalism to advance social and environmental accounting. Critical Perspectives on Accounting 2010;21:283–93.

[19] Higgins C, Larrinaga C. Sustainability reporting: Insights from institutional theory. Sustainability accounting and accountability, Routledge; 2014, p. 291–303.

[20] Barley SR, Tolbert PS. Institutionalization and structuration: Studying the links between action and institution. Organization Studies 1997;18:93–117.

[21] Oliver C. Strategic responses to institutional processes. Academy of Management Review 1991;16:145–79.

[22] Carpenter VL, Feroz EH. Institutional theory and accounting rule choice: an analysis of four US state governments’ decisions to adopt generally accepted accounting principles. Accounting, Organizations and Society 2001;26:565–96.

[23] Meyer JW, Rowan B. Institutionalized organizations: Formal structure as myth and ceremony. American Journal of Sociology 1977;83:340–63.

[24] Wr S. Institutions and organizations: Ideas and interests. Thousand Oak, CA 2008.

[25] DiMaggio PJ, Powell WW. The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. American Sociological Review 1983:147–60.

[26] Greenwood R, Meyer RE. Influencing ideas: A celebration of DiMaggio and Powell (1983). Journal of Management Inquiry 2008;17:258–64.
[27] Scott WR. The adolescence of institutional theory. Administrative Science Quarterly 1987:493–511.

[28] Thornton PH, Ocasio W, Lounsbury M. The institutional logics perspective: A new approach to culture, structure, and process. Oxford University Press on Demand; 2012.

[29] Bebbington J, Higgins C, Frame B. Initiating sustainable development reporting: evidence from New Zealand. Accounting, Auditing & Accountability Journal 2009;22:588–625.

[30] Duho KCT. Current State of Africa’s Experience of Carbon Pricing and Recommendations for the Future. The World Financial Review, July/August Edition 2021:12–4.

[31] Duho KCT. The impact of China’s financing for coal on climate change and agriculture in Africa. China Africa Project 2021.

[32] Liao L, Luo L, Tang Q. Gender diversity, board independence, environmental committee and greenhouse gas disclosure. The British Accounting Review 2015;47:409–24.

[33] Prado-Lorenzo J, Rodríguez-Domínguez L, Gallego-Álvarez I, García-Sánchez I. Factors influencing the disclosure of greenhouse gas emissions in companies world-wide. Management Decision 2009;47:1133–57.

[34] Ahmad Z, Hassan S, Mohammad J. Determinants of Environmental Reporting in Malaysia. International Journal of Business Studies 2003;11:69–90.

[35] Kolk A, Perego P. Determinants of the adoption of sustainability assurance statements: An international investigation. Business Strategy and the Environment 2010;19:182–98.

[36] Charumathi B, Rahman H. Do women on boards influence climate change disclosures to CDP?—evidence from large Indian companies. Australasian Accounting, Business and Finance Journal 2019;13:5–31.

[37] Gibson K, O’Donovan G. Corporate governance and environmental reporting: an Australian study. Corporate Governance: An International Review 2007;15:944–56.

[38] Cong Y, Freedman M. Corporate governance and environmental performance and disclosures. Advances in Accounting 2011;27:223–32.

[39] Lagasio V, Cucari N. Corporate governance and environmental social governance disclosure: A meta-analytical review. Corporate Social Responsibility and Environmental Management 2019;26:701–11.

[40] Hofstede G, Hofstede GJ, Minkov M. Cultures and organizations: software of the mind: intercultural cooperation and its importance for survival. McGraw-Hill; 2010.

[41] Hollindale J, Kent P, Routledge J, Chapple L. Women on boards and greenhouse gas emission disclosures. Accounting & Finance 2019;59:277–308.

[42] Ahmed A, Monem RM, Delaney D, Ng C. Gender diversity in corporate boards and continuous disclosure: Evidence from Australia. Journal of Contemporary Accounting & Economics 2017;13:89–107.

[43] Webb E. An examination of socially responsible firms’ board structure. Journal of Management and Governance 2004;8:255–77.
[44] Amran A, Haniffa R. Evidence in development of sustainability reporting: a case of a developing country. Business Strategy and the Environment 2011;20:141–56.

[45] Baalouch F, Ayadi SD, Hussainey K. A study of the determinants of environmental disclosure quality: evidence from French listed companies. Journal of Management and Governance 2019;23:939–71.

[46] Jensen MC. The modern industrial revolution, exit, and the failure of internal control systems. The Journal of Finance 1993;48:831–80.

[47] Hasnah H. Corporate governance failure: How would effective internal and external monitoring mechanisms help 2009.

[48] Alsaeed K. The association between firm-specific characteristics and disclosure: The case of Saudi Arabia. Managerial Auditing Journal 2006;21:476–96.

[49] Tran M, Beddewela E. Does context matter for sustainability disclosure? Institutional factors in Southeast Asia. Business Ethics: A European Review 2020;29:282–302.

[50] Chen S, Bouvain P. Is corporate responsibility converging? A comparison of corporate responsibility reporting in the USA, UK, Australia, and Germany. Journal of Business Ethics 2009;87:299–317.

[51] Deegan C. The legitimising effect of social and environmental disclosures—a theoretical foundation. Accounting, Auditing & Accountability Journal 2002;15:282–311.

[52] Wooldridge JM. Introductory econometrics: A modern approach. Cengage learning; 2015.

[53] Al-Shaer H, Zaman M. Board gender diversity and sustainability reporting quality. Journal of Contemporary Accounting & Economics 2016;12:210–22.

[54] Ben-Amar W, Chang M, McIlkenny P. Board gender diversity and corporate response to sustainability initiatives: Evidence from the carbon disclosure project. Journal of Business Ethics 2017;142:369–83.

[55] Watts RL, Zimmerman JL. Positive accounting theory. New Jersey: Prentice-Hall Inc; 1986.