The environmental disclosures of the electricity generation industry: a global perspective

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Abstract
The electricity generation industry has been under close regulatory and public scrutiny for decades for the significant impacts its activities have on the environment. The industry is responsible for a large proportion of greenhouse gas (GHG) emissions, which has intensified public and regulatory scrutiny of late. Therefore, electricity generation firms face immense pressure to show environmental responsibility. Firms respond with environmental disclosures in their annual reports, in stand-alone-reports, and on websites. In this study, we use comprehensive disclosure indices to measure the quality (or comprehensiveness) of the CO_2 emissions related disclosure and the overall environmental disclosure of 205 electricity generation firms in 35 countries. We find that firms in countries with a high commitment towards the environment and a carbon emissions trading scheme (measures of social concern for environmental protection and emissions), are likely to disclose more comprehensive environmental information. In addition, we find that firm size, age of the assets, listing status, and media exposure influence disclosure. Environmental performance, measured by CO_2 emissions, is not significantly related to environmental disclosure among our sample firms. The theoretical implication of these findings is that social beliefs (that is different in different countries) prompt a legitimating disclosure response from firms that is not significantly affected by their performance against that social belief. Our results address one of the major social concerns of our time, i.e., GHG emissions and firm disclosure responses, and therefore the results will be of interest to regulators, managers, accountants, environmental groups, and researchers.

Keywords: Carbon dioxide emissions; content analysis; electricity generation firms; environmental reporting

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1. Introduction

Global warming and climate change have become important social issues of international concern. The number of signatories of the United Nations Framework Convention on Climate Change in 1992, the Kyoto Protocol in 1997, and the Copenhagen Accord in 2009, attests to commitments by leaders around the globe to address these issues. The Intergovernmental Panel on Climate Change (IPCC 2007) states that the main cause of climate change is the emission of greenhouse gases (GHG), including carbon dioxide (CO_2) emissions. In 2007, the electricity industry was responsible for 41% of energy-related CO_2 emissions (IEA 2009). The industry has for several decades been under public scrutiny for various major environmental problems, including acid rain from the emission of sulphur dioxide (SO_2) and nitrogen oxide (NO_X) (Freedman et al. 2004, Freedman and Stagliano 2008b). Due to this public scrutiny, the industry is one of the most highly regulated. Apart from direct regulation, indirect measures, such as emissions trading schemes and carbon taxes, incentivise firms in this industry to improve their environmental performance, invest in renewable energy sources, and to enhance their environmentally responsible image through environmental disclosure. Increased societal interest in the reduction of CO_2 emissions is likely to lead to disproportionate scrutiny of the electricity generation industry and firms in this industry is likely to respond to this scrutiny with disclosure of emissions and other environmental information.

The role of environmental disclosure is, on the one hand, to inform shareholders, regulators, and other stakeholders of the environmental impacts a firm's activities have and of any initiatives to mitigate the impacts (Gray et al. 1996, De Klerk and De Villiers 2012, De Klerk et al. 2015), and on the other hand, to create and maintain a socially responsible image (Dowling and Pfeffer 1975, Lindblom 1993, Glennie and Lodhia 2013). Perhaps because of this dual role, prior research on the association between corporate environmental performance and environmental reporting offers inconclusive findings. Some studies found that poor environmental performers disclose more environmental information (e.g., Cho and Patten 2007, Freedman and Jaggi 2004, 2005, Patten 2002), whereas other studies found that better performers disclosed more (see Al-Tuwaijri et al. 2004, Clarkson et al. 2008), and some found no significant association between the two constructs (e.g., Freedman and Jaggi 2010, Ingram and Frazier 1980, Wiseman 1982). Most of these studies examine annual report disclosures (or 10Ks), but a few lately examine website disclosures (Clarkson et al. 2008) and stand-alone reports (Dhaliwal et al. 2011). The majority of the studies focus on US firms and include several industries. A cross-country study can shed light on the influence of the social norms in different countries on the environmental performance-disclosure relationship, especially given the fact that there are

country differences in environmental disclosure regulation, reflecting different environmental norms. In addition, focusing on the electricity industry controls for differences in regulation and social pressures across industries (see Van der Laan Smith et al. 2005). Finally, the choice of annual report or website disclosures is not fully understood but there is evidence that these mediums are used for different purposes (De Villiers and Van Staden 2011a), therefore including both in the same study will potentially provide further clarification.

We examine the influence of environmental performance and country measures that reflect countries' environmental norms on the environmental disclosure of 205 electricity generation firms using data from 2007. This year is particularly suitable, because it predates both the global financial crisis (that created many confounding effects in firm financial measures), and the collapse of carbon prices (that eased the public and regulatory pressure on firms in this industry to immediately respond with better performance and enhanced disclosures). With the world economy now emerging from the global financial crisis, there is every expectation that carbon prices will increase and that the pressures that applied in 2007 will return. Therefore, there is much to learn from 2007 environmental performance and disclosure data. We construct two comprehensive environmental disclosure measures, one for *overall environmental disclosure* and one for *CO_2 emissions* (a subset of the overall disclosure measure). Furthermore, we use annual reports, stand-alone reports,[1] and website disclosures to construct our measures. Our disclosure measures capture the quality or comprehensiveness[2] of the CO_2 emissions disclosure (in which this industry is a major contributor) and the overall environmental disclosure (in light of the industry's various environmental impacts).

We find that firms domiciled in countries that show a high commitment towards the environment and firms in countries with a carbon emissions trading scheme, are likely to produce higher quality environmental information (for both overall environmental disclosure and CO_2 emissions disclosure). We do not find a significant association between environmental performance (measured by CO_2 emissions intensity and by CO_2 emissions levels), and environmental reporting. Furthermore, we find firm size, age of assets, listing status, and media exposure to be significantly related to both measures of environmental disclosure. We interpret these results in light of our legitimacy theory framework, which focuses attention on firms' attempts to manage their reputations and show compliance with social norms through disclosures to ensure continued access to resources. From this perspective, our results suggest that differing social norms in different countries explain

[1] Stand-alone reports for the purpose of this paper includes sustainability reports, environmental reports, and corporate social responsibility reports containing environmental information.
[2] Comprehensiveness captures the degree of detail with which an item is disclosed, rather than the number of items disclosed (Wallace and Naser 1995). This measure of quality has been used in many studies including Aerts et al. (2008), Coy and Dixon (2004), and Van Staden and Hooks (2007).

environmental disclosures better than actual environmental performance. Specifically, firms match their environmental disclosure to the level of public interest in the environment in their country. The theoretical implication is that social beliefs prompt a legitimating disclosure response from firms that is not significantly affected by their performance against that social belief. Firm-specific issues such as size, asset age, and media exposure are also important drivers of the decision to disclose. Environmental performance may be less important as a driver of environmental disclosure, because both good and bad environmental performers feel the need to provide information through disclosure, good performers to ensure they are not mistaken for bad performers, and bad performers to manage their reputations by 'putting a positive spin' on their environmental performance news.

Our study is timely, novel, interesting, and of practical value for several reasons. We examine an issue at the heart of possibly the biggest social concern of our age, namely GHG emissions, an issue that is drawing massive regulatory attention. As accountants, we do not fully understand the disclosure (or accounting) decisions of the managers of large emitters. This is an important issue, because corporate disclosures are often the only source of information that is readily available to investors, regulators, and the general public (Atkins et al. 2015, Stent and Dowler 2015). Therefore, our examination of the disclosures of the highest GHG emitting industry globally, addresses a central accounting issue within one of the major social issues (Lawrence et al. 2013, Massa et al. 2015). In terms of our contribution to the environmental performance versus environmental disclosure literature, where contradictory results have been reported, we are the first to examine the association between environmental performance and disclosure in a single industry across many countries. Furthermore, we adopt a more rigorous and comprehensive approach to the construction of our disclosure measures, by considering the type and comprehensiveness of environmental information provided, and also considering various disclosure media, i.e. annual reports, stand-alone reports, and websites. Finally, in terms of practical value, we provide descriptive information that will be of interest to regulators who are interested in environmental performance and environmental reporting within the electricity generation industry. This industry impacts significantly on global CO_2 emissions, therefore an improved understanding of causal relationships will assist regulatory decision-making.

The remainder of the paper is structured as follows: Section 2 consists of the background and literature review, section 3 focuses on the theoretical framework and hypotheses development, section 4 describes the sample selection and research methods, section 5 discusses the findings, and section 6 concludes the paper.

2. Background and literature review

We look at three aspects - the association between environmental performance and environmental reporting, the environmental performance-disclosure relationship in the electricity generation industry and the influence of country factors - in sections 2.1 to 2.3. We improve on prior literature in the following ways: an increased sample size; a focus on one industry where cause-effect relationships can be expected to be similar for all firms in the sample; including all the main corporate disclosure media, i.e. annual reports, stand-alone-reports and websites; using a more comprehensive disclosure index; including firms from many different countries; and using a comprehensive set of control measures. In this way we want to establish if country level factors rather than environmental performance (good or bad) could be the reason for disclosure of environmental information.

2.1 The association between environmental performance and environmental reporting

One of the earliest studies in this area, Ingram and Frazier (1980), used the Council on Economic Priorities (CEP) ratings as an environmental performance measure to examine 40 US firms and found that environmental disclosures and environmental performance were not significantly correlated. Subsequent studies, mostly using the CEP ratings, have either failed to document any significant association (see Fekrat et al. 1996, Wiseman 1982) or provided inconsistent findings (see Freedman and Wasley 1990, Hughes et al. 2001).

Patten (2002) attributed these inconsistent findings to small sample sizes, failure to control for other firm-specific factors, and the weaknesses inherent in the CEP ratings. Patten (2002) examined the annual reports of a larger sample of US firms by using toxic release intensity (total toxic releases divided by sales) as a proxy for environmental performance, while controlling for size and industry. He found a *negative* association between environmental performance and disclosure, suggesting that firms with poor environmental performance made more extensive environmental disclosure. This negative association is also consistent with more recent studies in the US (e.g., Cho and Patten 2007, Cho et al. 2010, De Villiers and Van Staden 2011a), and studies from Australia (e.g., Clarkson et al. 2011, Deegan and Rankin 1996), Canada (e.g., Bewley and Li 2000, Warsame et al. 2002), the UK (Brammer and Pavelin 2006), Malaysia (Jaffar et al. 2002), and China (He et al. 2013).

However, the debate in this area continues as contrary evidence is offered by Al-Tuwaijri et al. (2004), Clarkson et al. (2008), and Silvia-Gao (2012) who found a *positive* association between environmental performance and disclosure. Al-Tuwaijri et al. (2004) examined the annual reports (10Ks) of 198 US firms. They analysed four performance-related disclosure items, two of which are mandatory. By contrast, Clarkson et

al. (2008) focused on the website disclosure of 191 US firms and used a more comprehensive GRI-based disclosure checklist (i.e. 95 items), encompassing various aspects of environmental matters and find that good performers disclose more. Furthermore, they found that bad environmental performing firms reported more general information and unverifiable claims (i.e., soft disclosures). Silva-Gao (2012) examined the predisposition among 54 US electric utilities to disclose the amount of environmental capital expenditure (ECE) in the Form 10-Ks. She found that firms with better environmental performance (based on CO_2, CH_4, and N_2O emissions intensity) were more likely to report on ECE.

The majority of the studies in this area are country-specific and there appears to be a predominance of studies focusing on US firms. There have been few cross-country studies. Dragomir (2010) analysed the environmental disclosures of 60 European Union (EU) firms' stand-alone reports and found a negative association. Dragomir (2010) did not control for country of origin. Freedman and Jaggi (2005) analysed the disclosure of GHG emissions information by the 120 largest firms from Kyoto Protocol ratifying countries in various corporate reporting media and found greater disclosures among high emitting firms whose home countries had ratified the Kyoto Protocol. Finally, Freedman and Jaggi (2010) analysed the GHG related disclosures made by the 128 largest firms from the EU, Japan, and Canada in various reporting media and found environmental performance to be not significant.

In a multi-country study of firms in a single industry, if environmental performance is found not to be significantly related to disclosure, there could be two reasons. First, if that industry is regarded as among the largest contributors of environmental problems, and the legitimacy of the entire industry is challenged, then all firms in the industry, regardless of their environmental performance, are pressurised to show conformance to the social norms around environmental issues. Second, consistent with Freedman and Jaggi (2010) who found the influence of country of origin to be significant, but not environmental performance, country variations in social norms around the environment and the related pressure on firms could be more influential in determining the level of disclosures than the environmental performance of individual firms, i.e., electricity generation firms within a particular country may disclose relatively uniformly, irrespective of their environmental performance.

2.2 The environmental performance-disclosure relationship in the electricity generation industry

In addition to substantial air emissions, the electricity industry is also associated with radioactive waste from nuclear power generating facilities and the displacement of native flora and fauna from the construction of hydroelectric dams. The resultant public and regulatory scrutiny pressurise firms in this industry to assess their

environmental performance and manage public perceptions by way of environmental disclosures. A recent survey of senior executives from power and utility firms in countries across Europe, the Americas, Asia Pacific, Middle East and Africa, reported that 94% predict a complete transformation of, or important changes to, the industry's business model, 67% expect the dependence on oil and gas-rich countries to reduce, and 82% see opportunities in dispersed power generation (PwC 2013). The significant changes in public opinion and awareness around climate change appear to be driving regulatory reform (De Villiers and Van Staden 2011b, De Villiers and Van Staden 2012). The opinion that regulators are producing significant policy uncertainty, thereby undermining investment, is most strongly held in North America (67%), South America (67%), and Europe (50%) (PwC 2013).

Several studies deal with the electricity industry (Doppegieter and De Villiers 1996), but few examine the environmental performance-disclosure relationship. Freedman et al. (2004) and Freedman and Stagliano (2008b) assessed this association on firms affected by the 1990 Clean Air Act (CAA) and used SO_2 emissions as the environmental performance measure and SO_2 emissions disclosure as the dependent variable. Freedman et al. (2004) examined the annual reports and 10Ks of 38 firms during the first phase of the CAA. In an extended study, Freedman and Stagliano (2008b) examined the disclosure of 32 electric utilities in the second phase of the CAA and considered disclosures made in various corporate reporting media. Both studies found that high SO_2 emissions are associated with greater SO_2 related disclosures.

Freedman and Jaggi (2004) examined the association between CO_2 emissions and the disclosure of CO_2 emissions in the annual reports and 10Ks of 66 US electric utilities. They found that only one-third of the firms made such disclosures and that higher CO_2 emitters disclosed more. However, they only analysed US firms, considered only annual reports, and used a limited disclosure index consisting of five disclosure items being present or not, i.e., a measure that does not consider comprehensiveness of disclosure. They also used 1998 data when societal expectations of corporate environmental responsibility and disclosure may well have been smaller. Finally, as mentioned earlier, Silvia-Gao (2012) also examined this association among electric utilities. However, the focus was on a single aspect of disclosure (i.e., the disclosure of environmental capital expenditure), and the sample used was small and restricted to the US environment.

2.3 The influence of country factors

Several studies consider the influence of country factors on social and environmental disclosure. These can be broadly grouped into studies examining general social and/or environmental reporting (e.g., Buhr and Freedman

2001, Fekrat et al. 1996, Ho and Taylor 2007, Holland and Foo 2003, Newson and Deegan 2002, Van der Laan Smith et al. 2005); the publication of assurance statements (e.g., Kolk and Perego 2010, Perego 2009, Simnett et al. 2009); and the disclosure of CO_2 or GHG emissions (e.g., Freedman and Jaggi 2005, 2010, Prado-Lorenzo et al. 2009). In this section, we only review studies which investigate the influence of specific country indicators on CSR disclosure.

Kolk and Perego (2010), Perego (2009), and Simnett et al. (2009) analysed the influence of country of origin on sustainability report assurance statements. Kolk and Perego (2010) and Simnett et al. (2009) found that firms from code law countries, due to their stakeholder orientation, are more likely to have an assurance statement. However, these studies did not find consistent results for the influence of the strength of law enforcement. Simnett et al. (2009) found more incidence of an assurance statement among firms in countries with a strong legal environment, but Kolk and Perego (2010) and Perego (2009) found the contrary. Simnett et al. (2009) also show a tendency among firms in code law countries to procure assurance services from the auditing profession, while Perego (2009) found the tendency is greater among firms in countries with weak law enforcement.

Freedman and Jaggi (2005, 2010) and Prado-Lorenzo et al. (2009) examined the level of GHG emissions disclosures. As described earlier, Freedman and Jaggi (2005) found the influence of a country's Kyoto Protocol ratification status to be significant, while Freedman and Jaggi (2010) observed more extensive disclosures among Canadian and Japanese firms than EU firms. Freedman and Jaggi (2005) also examined the influence of the legal system and the strength of law enforcement, but did not find any significant influence. The influence of the Kyoto Protocol ratification status of a country is also evidenced in Prado-Lorenzo et al. (2009) who examined the GHG disclosures of carbon intensive firms from the US, Australia, Canada, and the EU. Freedman and Jaggi (2005, 2010) considered various reporting media but Prado-Lorenzo et al. (2009) only used website disclosures.

Van der Laan Smith et al. (2005) is the only prior study of electricity generation firms that consider more than one country. They examined the extent and quality of corporate social disclosure in the annual reports of 32 Norwegian/Danish firms and 26 US firms for the years 1998 and 1999. Due to differences in corporate governance, ownership, and cultural systems, the Norwegian/Danish firms are described as stakeholder-oriented, and the US firms as shareholder-orientated. Overall, they found that Norwegian/Danish firms disclosed higher quantity and quality than US firms.

The studies of the influence of country factors on CSR disclosure therefore suggest that country level factors could be an important factor that influence firms in that country to disclose CSR information voluntarily. While previous studies in the area considered the influence of legitimating reasons and institutional reasons for disclosure, it is possible that country factors could be an even greater reason for disclosure of this information.

3. Theoretical framework and hypotheses development

The voluntary disclosure of environmental information is generally explained in the literature using the concept of organisational legitimacy as a theoretical basis, see for example, Aerts and Cormier (2009), Cho and Patten (2007), Clarkson et al. (2008), and Patten (2002)[3] Suchman (1995, p. 574) refers to legitimacy as 'a generalised perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions'. The need for legitimacy arises since organisations operate in a society via a 'social contract' (Shocker and Sethi 1973). Organisations are an integral part of a society, and their existence, continuity, and growth rely on continued societal support (Sethi 1975, Shocker and Sethi 1973). Society grants legal standing and offer support to organisations by supplying resources and labour (Mathews 1983), and in return, organisations are expected to pursue various socially desirable goals in a socially acceptable manner (Ashforth and Gibbs 1990, Shocker and Sethi 1973). Failure to fulfil these expectations, be it actual or perceived, may result in a threat to organisational legitimacy, widely described as a legitimacy gap (Dowling and Pfeffer 1975).

A legitimacy gap can arise as a result of changing organisational functioning, changing societal expectations, or a combination of both (Sethi 1979). Involvement in environmental disasters such as oil spills and nuclear disasters (e.g., Deegan et al. 2000, Patten 1992), being prosecuted for environmental offences (e.g., Deegan and Rankin 1996, Warsame et al. 2002), and showing poor environmental performance (e.g., De Villiers and Van Staden 2011a, Patten 2002) could lead to a legitimacy gap. Even without a change in organisational functioning, societal expectations could still change as a result of increased awareness of the impacts of corporate activities on the environment. Walden and Schwartz (1997) use the term 'public pressure' in referring to these societal expectations. According to them, public pressure can arise from the dissatisfaction by the

[3] There are a range of other theories that can be used to better understand environmental disclosures. These include voluntary disclosure theory (Clarkson et al. 2008), stakeholder theory (Roberts 1992), institutional theory (De Villiers et al. 2014), and normativity (Bebbington et al. 2012). These theories are often overlapping (Gray et al. 1996). In this paper, we use only legitimacy theory as this theory is widely used in the literature to explain corporate environmental disclosure decisions (see for example, Parker (2005), Cho and Patten (2007), Clarkson et al. (2008), Deegan and Rankin (1996), Patten (2002), Walden and Schwartz (1997), but acknowledge that other theories can also be used to develop hypotheses and to promote a better understanding of environmental disclosure decisions.

general public (or a group within the public), new or proposed political actions, and/or increased regulatory oversight. The implications of a legitimacy gap could be enormous, leading to potential product boycotts by customers, withdrawals of investments by shareholders and difficulties in securing loans from banks, while increased lobbying activities by the public which could lead to increased regulation, and difficulties in hiring qualified staff (Dowling and Pfeffer 1975, Lindblom 1993, Neu et al. 1998). For recent examples of the public opinion influencing firms, consider the experiences of BP after the 2010 Gulf of Mexico oil spill, and the reversal of public sentiment around nuclear power generation in Germany and Japan after the 2011 Japanese tsunami.

Legitimacy theory is widely used in explaining corporate environmental disclosure decisions (Parker 2005) and emphasise the link between public and political pressure and environmental disclosure (Cho and Patten 2007, Clarkson et al. 2008, Deegan and Rankin 1996, Patten 2002, Walden and Schwartz 1997). Firms participate in, and influence, the public political process through accounting disclosures (Patten 2002). These disclosures play a role in legitimating (or legitimising) firms. Firms use disclosures to highlight actions taken to bring its performance up to societal expectations, or to justify any shortfall. Firms do this to ensure continued access to resources.

A legitimating strategy can be substantive, symbolic, or a combination of both (Ashforth and Gibbs 1990, Richardson 1985). Substantive legitimation involves 'structural transformation … to conform to social values' (Richardson 1985, p. 145). There is a real change in an organisation's goals, structures, and processes (Ashforth and Gibbs 1990) and disclosures are used to inform stakeholders or the public[4] on the changes undertaken in the organisations (Lindblom 1993). By contrast, symbolic legitimation involves 'the symbolic transformation of the identity or meaning of acts to conform to social values' (Richardson 1985, p. 143). This includes using disclosure to change public perceptions or expectations of the organisation's performance and to deflect attention away from the issue (Lindblom 1993).

3.1 The influence of environmental performance on environmental reporting

Firms with poor environmental performance can be expected to come under greater public and regulatory scrutiny (Cho and Patten 2007, Patten 2002). As climate change has gained attention at the global level in recent years with CO_2 emissions being scientifically established as the main contributor to global warming (IPCC

[4] Lindblom (1993, p. 2) uses the term 'relevant public', whilst O'Donovan (2002, p. 345) refers to 'conferring public'. This reflects the reality of differing degree of power, legitimacy, and urgency attributed to each stakeholder group (see further Mitchell et al. 1997). In this study, the term 'public' means any stakeholder group with interests in environmental issues.

2007), we expect firms with high CO_2 emissions to face demands to demonstrate planned reductions. Legitimacy theory would suggest that greater public and regulatory scrutiny and demands, will be met by more disclosure. Legitimacy theory would further suggest that bad environmental performers will have a greater need to justify themselves through disclosure. Prior research provides evidence that poor environmental performers disclose more environmental information (e.g., Cho and Patten 2007, De Villiers and Van Staden 2011a, Deegan and Rankin 1996, Patten 2002). However, Clarkson et al. (2008) find that better environmental performers disclose more. Considering that these prior studies included observations from different industries, and that their relatively small sample sizes precluded them from fully controlling for industry, their findings could be driven by cross-industry differences. A study that considers a single industry will potentially improve our understanding of the influence of environmental performance on corporate legitimating strategies.

Firms following a 'substantive' legitimating strategy use disclosure to explain current actions and future plans (Freedman et al. 2004). Planned emission reductions usually imply substantial capital investment requiring the disclosure of estimated cash flows (Freedman and Jaggi 2004, Freedman et al. 2004). Therefore firms with high CO_2 emissions, following 'substantive' legitimating strategies, will disclose more specific information, such as current/future plans and cash flows.

Firms adopting a 'symbolic' legitimating strategy use disclosure to change public perceptions regarding emissions (Freedman and Stagliano 2008a), including implying that the problem is not severe and comparing performance with industry peers with worse environmental performance. 'Symbolic' legitimating strategies can also aim to deflect attention away from the emissions issue by emphasizing other positive social and/or environmental issues (see for example, Dowling and Pfeffer 1975, Sethi 1975), resulting in poor environmental performers disclosing higher levels of overall environmental information. Patten (2000) for example, found that firms impacted by the Superfund legislation significantly increased both Superfund related disclosures and general environmental disclosures, suggesting that the latter were used to offset any negative perceptions emanating from the Superfund information provided. This suggests that firms with high CO_2 emissions following a 'symbolic' legitimating strategy will disclose more general CO_2 and overall environmental information to change perceptions regarding their actual performance, and to emphasize other positive social and environmental aspects.

As mentioned before, the literature is inconclusive with regards to the relationship between environmental performance and disclosure. This could be the result of several factors, including methodological issues such as the disclosure media (e.g., annual reports and websites) considered when collecting data for the disclosure

measures used, as well as the fact that the firms in the samples considered in the prior research are probably not uniform in terms of the legitimizing strategies followed ('symbolic' or 'substantive'). According to legitimacy theory, there is a relationship between environmental performance and environmental disclosure, however the mixed findings in the prior literature leave us unable to hypothesise a direction. Therefore, we hypothesise that:

H1: There is a relationship between environmental performance and the quality of CO_2 emissions information and overall environmental information disclosed by firms.

3.2 The influence of country level factors on environmental reporting

As we discussed in section 2.3, the literature suggests that country level factors could influence environmental disclosures. From a legitimacy theory perspective, firms will use voluntary disclosure to seek to positively influence their image as good corporate citizens that comply with societal norms. These societal norms can differ from country to country, for example, some societies can be more committed to environmental protection and this commitment will be reflected in country level measures of environmental commitment. Therefore, firms in societies with a greater commitment to environmental norms will be more likely to feel the need to show their commitment to such values by disclosing more environmental information. We will now provide further (more detailed) arguments in support of this general legitimacy theory based argument.

Environmental disclosure has remained largely voluntary across the world while mandatory reporting, if any, usually pertains to 'a single issue with limited disclosure requirements' (UNEP et al. 2010, p. 18). Along with Walden and Schwartz (1997) we argue that the degree of 'public pressure' (for environmental responsibility) is higher in an environment where there is a likelihood of additional legislation and sanctions, including mandatory reporting laws. Indeed, the prior literature provide evidence that meeting legal requirements and the need to pre-empt additional regulations are among the most important reasons for environmental reporting (e.g., Solomon and Lewis 2002, Wilmshurst and Frost 2000).[5] The extent of regulatory enforcement has also been associated with a lower incidence of corporate environmental lawsuits (Kassinis and Vafeas 2002), firms voluntarily responding in accordance to an external carbon disclosure initiative (Reid and Toffel 2009), and firms' decision to have their sustainability reports assured by a third party organisation (Simnett et al. 2009).

[5] This is also in line with the political cost argument, which suggests that firms facing political costs (pressure) may undertake 'social responsibility campaigns in the media' in order to reduce the likelihood that they will be targeted by adverse political action (Watts and Zimmerman 1978, p. 115).

A country's commitment to an environmental charter/protocol entails a need for the development of the necessary infrastructure and effective environmental protection efforts. For example, commitment to the Kyoto Protocol requires signatories to meet specific reduction targets for GHG emissions (UNFCCC 2009a), while the signatories of the Millennium Development Goals are required to embrace eight goals, including one on environmental sustainability (UN 2011). Furthermore, countries will commit to these specific targets if the populace supports it. Also, signatory governments have to enact specific initiatives that impact on firms, especially on high polluting firms. Therefore, being a signatory country both reflect public opinion and further influence public opinion towards expecting more environmental commitment from firms. Firms in signatory countries therefore need to show their environmental commitment through increased environmental disclosure to ensure continued legitimacy and thus continued access to resources. Freedman and Jaggi (2005) provide evidence in support of this argument with their finding that firms from countries which ratified the Kyoto Protocol, make more extensive Protocol-related disclosures (see also Prado-Lorenzo et al. 2009).

A carbon emissions trading scheme (henceforth, ETS) is a system being established at the country (or regional) level with the aim of reducing emissions efficiently through a market mechanism. Participants in an ETS (mostly firms in carbon intensive industries) are given or have to purchase 'carbon' credits, allowing CO_2 emissions up to a set amount. The total number of carbon credits is capped and firms are allowed to trade in credits. Firms that fail to cover any shortfall in carbon credits typically face hefty fines (Bebbington and Larrinaga-González 2008). Through this market mechanism, firms can subsidise their emissions reduction programmes by selling their extra emissions credits.

The institution of an ETS typically requires the development of corporate accounting and technical expertise to manage and to report on CO_2 emissions (Kolk et al. 2008), resulting in more comprehensive disclosures. Additionally, an ETS typically cause investors, policy makers, and the general public to be more interested in corporate CO_2 emissions management, the cash flow consequences, the potential impacts the ETS has on the firms' long term viability (Bebbington and Larrinaga-González 2008), and the extent to which the ETS has shifted the firms' focus on managing other significant environmental impacts.

Following from these arguments and the evidence in the literature, we hypothesise:

H2: There is a relationship between country level measures that reflect societal commitment to environmental protection and firms' environmental disclosures (of CO_2 emissions information and all environmental information).

4. Sample selection and research methods

4.1 Sample selection

We start with the 621 electricity firms in the Compustat Global and North America databases (henceforth, Compustat) for the 2007 year. We exclude the 101 firms that do not generate electricity due to the reduced environmental impact of these firms. Of the 520 remaining firms, only 331 firms have CO_2 emissions data in the Carbon Monitoring for Action (CARMA) database. At the commencement of the research, the most recent data provided in CARMA was for the 2007 year. Several of these firms did not have an English language corporate website and an annual report for the financial year 2007. The final sample comprises 205 firms from 35 countries. Table 1 summarises the selection process and presents the distribution of the sample by country.

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4.2 Content analysis

4.2.1 Reporting media used

We analyse the environmental disclosures and CO_2 disclosures in the annual report, stand-alone reports, and on the corporate website. We use the 2007 fiscal year as the year of analysis. For firms with a fiscal year ended 30 June or later, the 2007 annual reports were used as the document of analysis. Otherwise, the 2008 annual reports were examined. All annual reports were downloaded from either the firm websites or the Mergent Online database. Stand-alone reports were downloaded from the firm websites.

For website disclosures, we searched through the firm websites using the sitemap tool and/or homepage menus for sections on the 'environment', 'emissions', 'corporate social responsibility' and 'sustainability'. We considered all general environmental information and emissions information published during (or belonging to) the 2007 year available on the websites, except for mandatory reports and multimedia-based information, such as audios and videos. We also analysed the sections on 'firm profile' and 'corporate governance' as these sections are included in our indices and contain information on firm vision and mission, policies, organisational structure, generation fuel type, and awards. Following Patten and Crampton (2004), we limited the analysis to two levels from the homepage/sitemap, unless further links indicated the disclosure of environmental information beyond the second level. Also, consistent with Patten and Crampton (2004), links to external websites were excluded.

4.2.2 Data measurement and capture

We developed two disclosure indices, namely a disclosure index for the *overall environmental information* (which also includes emissions information) and another disclosure index for the *CO_2 emissions information*, based on the GRI's 'Sustainability Reporting Guidelines' (GRI 2006, 2009) and the Greenhouse Gas Protocol's 'A Corporate Accounting and Reporting Standard (Revised Edition)' (WBCSD/WRI 2004) (see the Appendix for details of the disclosure indices). These guidelines have been widely recognised as reporting frameworks on sustainability performance (KPMG 2008, WRI 2010). To improve the validity of the indices, we also referred to other existing disclosure indices (i.e., Aerts and Cormier 2009, Belal et al. 2010, Clarkson et al. 2008, Freedman and Jaggi 2004, 2005, 2010, Haque and Deegan 2010, Prado-Lorenzo et al. 2009, Van Staden and Hooks 2007) and well established checklist instruments on environmental information (i.e., Hackston and Milne 1996, Williams 1999, Williams and Ho 1999).

Based on these resources and the results of a pilot study,[6] we came up with 43 items for the overall environmental information disclosure index and 25 items for the CO_2 emissions disclosure index. Consistent with the disclosure categories used in GRI (2006, 2009), these items were further divided into six disclosure categories, namely strategy and analysis; organisational profile; report parameters; governance, commitment, and engagement; environmental (or CO_2 emissions) initiatives (categorised as 'discussion on management approach' in GRI 2006, 2009); and performance indicators.

Following the most recent literature in the area (see for example, Clarkson et al. 2008, Van Staden and Hooks 2007, Al-Tuwaijri et al. 2004) we scored the disclosure items using a scale as it enables a differentiation in the quality and comprehensiveness of the items being disclosed (Coy and Dixon 2004, Webb et al. 2008). Since it can be argued that some disclosure items have more information content than other items (Buzby 1974, Freedman et al. 2004, Freedman and Stagliano 2008b) and that applying a blanket score range to every item is less appropriate (Dragomir 2010, Clarkson et al. 2008, Van Staden and Hooks 2007), we used three different scales. The first scale (0-1) was used for all 'self-contained' items (see Buzby 1974). A score of one (1) was assigned for disclosure and zero (0) for non-disclosure. Items on vision and/or mission statement, awards received, and GRI content index fall under this category.

[6] We conducted a pilot study involving 20 firms (about 10% of the sample) which have been randomly selected from the sample. The pilot study represents a combination of electric utilities with a varying degree of reporting quality, ten of which produced a stand-alone report for the 2007 year, whilst the remaining ten did not. For each firm, we analysed the whole set of reports, namely the annual report, the stand-alone report (if any), and the website. The disclosure indices were applied to the reports and changes were made where appropriate to the indices. All these firms were included again in the final analysis.

Secondly, a scale of 0-3 was used for items that require a description of initiatives, processes, policies, and procedures. Buzby (1974) regards these items as a category of information which could be expressed in terms of sub-elements of information. The use of this scale also includes some performance indicators that are by large 'descriptive' (i.e., items on biodiversity and noise, visual, odour, and radiation) and 'non-recurring' in nature (i.e., items on spills and compliance, complaints, and sanctions). For example, the disclosure of spills requires the provision of information on the total number and volume of spills; location and material of the spills; and trend analysis (see GRI 2006, 2009). A score of three (3) was awarded if the disclosure meets all the criteria; a score of two (2) was awarded if the disclosure meets at least half of the criteria; a score of one (1) was awarded if the disclosure meets less than half of the criteria; and a score of zero (0) for non-disclosure.

The third category includes items which could be disclosed in varying degrees of specificity (Buzby 1974). A scale of 0-5 was used for most of the performance indicators. Adapting the scoring system used by Clarkson et al. (2008), a point was awarded for each of the following: (1) performance data for the current period is presented; (2) performance data is presented relative to the previous year's data; (3) performance data is presented relative to target; (4) performance data is presented at a disaggregate level; and (5) if the disclosure meets all the criteria; provides additional descriptive analysis, including reasons for over- or under- performance and sources of environmental impacts; or includes data on industry averages and/or competitors' performance.

We ignored any repetitive information except where the repeated disclosure contains extra information that enhances the overall quality (or score) of the disclosed item (see also Guthrie et al. 2006). In order to not penalise firms for not disclosing items that are not applicable to them, we follow Al-Tuwaijri et al. (2004) and base the final disclosure score only on the items that are applicable to the firm. For example, information on emissions trading would not be disclosed if a firm is not residing in a country with an ETS and/or in an Annex B country, i.e., countries with a quantified emissions reduction commitment under the Kyoto Protocol (see UNFCCC 2009a). To consider whether an item is not applicable to an organisation, there must be an indication (e.g., brief statement) of such in the reports (GRI 2006, 2009). Additionally, the whole report was read before it is scored (Cooke 1989) and if necessary, the preceding years' reports were also reviewed (Owusu-Ansah 1988). The disclosure scores are calculated as 'the ratio of the actual scores awarded to a firm to the scores which that firm is expected to earn' (Cooke 1989, p. 115), expressed as a percentage. Firms are therefore rated on the disclosures that are applicable to them, but since the firms in our sample are all electricity generators, most of the items in the indices were applicable to all the firms.

4.2.3 Reliability of the scores

Milne and Adler (1999) specifically examine the consistency of coders and find that even inexperienced coders display a remarkable consistency in coding, with experienced coders faring better. We use an experienced coder, one of the co-authors of this paper. In addition, one of the other co-authors performed an audit of the coding. All of the differences identified were, after discussion, resolved in favour of the original coder, confirming the Milne and Adler (1999) findings, and providing assurance of the reliability of our coding. In addition, following Krippendorf (2004), we perform a stability test. A sample of 20 reports was randomly selected and coded for the second time a few months after the first round. This second round of coding was found to be consistent with the first round.

4.3 Empirical model

This study employs the following multiple regression model:

$$DISCLOSURE = \beta_0 + \beta_1 EP + \beta_2 EPI + \beta_3 ETS + \beta_4 LEGAL + \beta_5 LAW + \beta_6 SIZE + \beta_7 ROA + \beta_8 LEV + \beta_9 TOBIN\ Q + \beta_{10} VOLAT + \beta_{11} NEW + \beta_{12} CAPIN + \beta_{13} MEDIA + \beta_{14} FOREIGN + \beta_{15} LISTING + \varepsilon$$

where

EP	Environmental performance
EPI	Countries' environmental performance index
ETS	Countries' carbon emissions trading scheme
LEGAL	Countries' legal system (code law = 1; common law = 0)
LAW	Countries' strength of law enforcement
SIZE	Firm size
ROA	Profitability
LEV	Leverage
TOBIN Q	Tobin's q
VOLAT	Stock price volatility
NEW	Asset newness
CAPIN	Capital intensity
MEDIA	Media coverage
FOREIGN	Foreign operations
LISTING	Listing status

All data is for the 2007 fiscal year, unless stated otherwise.

4.3.1 Dependent variables - Environmental reporting disclosure scores (ERDS)

There are two environmental disclosure measures, *CO_2_ALL* (for CO_2 emissions disclosures) and *ENV_ALL* (for overall environmental disclosures). These are determined by applying self-developed indices on the disclosures made in the annual report, the stand-alone report, and on the corporate website. Each disclosure measure is tested in separately in our statistical analyses.

4.3.2 Main independent variables of interest

Environmental performance (*EP*) We use two measures of environmental performance in our main analysis (Table 4), CO_2 emissions intensity (*CO_2 emissions **intensity***) and total CO_2 emissions (*CO_2 emissions **level***). The first measure is based on CO_2 emissions intensity (CARMA 2007). This is calculated as the pounds of CO_2 emitted per megawatt hour of electricity produced. The higher this value, the worse the corporate environmental performance is. To facilitate the interpretation of the results, we reverse the sign of this variable (in line with Clarkson et al. 2008). In other words the larger the value of this measure, the better the corporate environmental performance is.

As it is important for humans that total carbon emissions decrease, the extent of emissions is important, not necessarily how effective the firm is in reducing its emissions. We therefore use total CO_2 emissions as a second environmental performance measure in our main analysis. For this analysis we use the natural logarithm of CO_2 emissions. The sign of this variable is also reversed in the statistical analysis.

Country level measures of environmental commitment

We use two country level measures, both of which reflect the social norms around the environment and environmental protection in each country.

Countries' commitment towards the environment (*EPI*) This measure reflects the degree of 'public pressure' (for environmental responsibility). Such public pressure increases the need to meet legal requirements and the may increase the perceived need to disclose to pre-empt additional regulations. Furthermore, since the Kyoto Protocol only focuses on GHG emissions and has now been ratified by most countries (see UNFCCC 2009b), our country environmental commitment measure is based on the countries' commitment to environmental performance (see Emerson et al. 2010). To represent a country's commitment towards the environment, we use an environmental performance index (EPI) published by the Yale Center for Environmental Law & Policy, Yale University and the Center for International Earth Science Information Network, Columbia University. The index, inspired by the United Nation's Millennium Declaration and Millennium Development Goals, measures the effectiveness of national environmental protection efforts (Emerson et al. 2010). We refer to the 2010 edition as the data for the year 2007 are published therein (instead of the 2006 or 2008 edition which uses older data).[7] A higher score indicates a high commitment towards the environment.

[7] However, there is no data for Hong Kong and the Cayman Islands in any of the editions. Since Hong Kong is a special administrative region of China since 1997 (CIA 2011), we use EPI data of China for Hong Kong. Additionally, the Cayman Islands is an overseas territory of the UK (CIA 2011) and as such we use the EPI data of the UK for the Cayman Islands.

Countries' carbon emissions trading scheme (*ETS*)[8] The European Union emissions trading scheme (EU-ETS) is the most established ETS for carbon emissions and has been in operation since January 2005 (Kolk et al. 2008). In addition, there are other ETSs (at the regional level) operating during the study period, namely Australia's New South Wales Greenhouse Gas Abatement Scheme (Griffiths et al. 2007) and Canada's Alberta Climate Change and Emissions Management Act (Green and Zhou 2013). Thus, firms domiciled in countries (or regions) with an *ETS* are assigned an indicator variable of one (1) and firms domiciled in countries (or regions) without an *ETS* are assigned zero (0).

4.3.3 Control variables

We motivate our control variables from the extant literature. We obtain data from COMPUSTAT, unless stated otherwise. Following Simnett et al. (2009), we use two country level control variables.[9]

Countries' legal system (*LEGAL*) Following the prior literature, we assume that firms domiciled in code law countries are more stakeholder-orientated, while firms domiciled in common law countries are more shareholder-orientated, based on the argument that the legal system of a country impacts on its corporate governance structures which, in turn, define the firm-stakeholders relationships (i.e., Van der Laan Smith et al. 2005, Kolk and Perego 2010) and shape the business culture (Simnett et al. 2009). Firms domiciled in code law countries are assigned an indicator variable of one (1), while firms domiciled in common law countries are assigned zero (0). The country classification is based on La Porta et al. (1997) and Central Intelligence Agency (CIA 2011).

Countries' strength of law enforcement (*LAW*) It is expected that firms domiciled in countries with a strong law enforcement environment will be more likely to provide more comprehensive environmental information. Consistent with Simnett et al. (2009), we use the World Bank's rule of law as the proxy for a country's strength of law enforcement. The rule of law measures 'the extent to which agents have confidence in, and abide by, the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence' (Kaufmann et al. 2008, p. 7). A higher score indicates a strong law enforcement environment.

[8] The following countries/regions in our sample have an ETS at the time of our observations: Australia – New South Wales province, Canada – Alberta province, Czech Rep., Denmark, France, Germany, Greece, Italy, Portugal, Spain, and the UK.
[9] While we follow Simnett et al. (2009) and control for the influence of the legal system and the strength of law enforcement on voluntary disclosure decisions, these two measures do not directly relate to environmental issues. Therefore, we treat these as control variables.

Firm size (*SIZE*) Large firms have a greater societal impact (Hackston and Milne 1996). They are also more visible and stakeholders pressurise them more to show social responsibility (Aerts and Cormier 2009, Brammer and Pavelin 2006, Freedman and Jaggi 2005). We use the natural logarithm of total assets, measured at the end of the 2007 fiscal year for *SIZE*.

Financial performance and position (*ROA*, *LEV*, *TOBIN Q*, and ***VOLAT*)** Aerts and Cormier (2009) suggest that profitability is a determinant for environmental news exposure. Profitable firms are more likely to voluntarily disclose environmental information to manage their image as environmentally responsive (Cormier et al. 2005) and to minimise environmental news exposure. For this study, profitability is measured by return on assets (*ROA*) and calculated as the ratio of net income before extraordinary items at the end of 2007 to total assets at the end of 2006 (see Clarkson et al. 2008, De Villiers and Van Staden 2011a).

Since environmental issues can affect the financial stability of an organisation, Roberts (1992) asserts that highly leveraged firms will face greater expectations from creditors to observe their social responsibility activities. Therefore, they would be expected to provide more extensive disclosure. *LEV*, our measure of leverage, is calculated as total debt at the end of 2007 divided by total assets at the same date.

Tobin's Q (*TOBIN* Q) could represent the level of intangible assets in a firm. The higher the composition of intangible assets in relation to physical assets, the less polluting the firm is (Al-Tuwaijri et al. 2004, Clarkson et al. 2008, De Villiers and Van Staden 2011a). This implies that firms with a lower Tobin's Q (i.e., those having a bigger impact on the environment) would be disclosing more environmental information than firms with a higher Tobin's Q (see Clarkson et al. 2008, De Villiers and Van Staden 2011a). *TOBIN Q* is measured as the market value of the shares at the end of 2007 plus the value of preference shares, long term debt and current liabilities, divided by total assets at the end of 2007.

We also assess the financial position of a firm based on its stock price volatility (*VOLAT*). Erratic stock price movements could indicate financial instability and engaging in environmental irresponsible behaviour would further add to the riskiness as an investment. In this sense, there would be a greater pressure for the 'volatile' firms to demonstrate environmental responsibility. *VOLAT* is measured as the standard deviation of market adjusted monthly stock returns during 2007.

Age of the assets (*NEW* and *CAPIN*) It is argued that newer assets are cleaner (Clarkson et al. 2008, Cormier and Magnan 2004, Cormier et al. 2005, De Villiers and Van Staden 2011a) and therefore have less impact on the environment. Consistent with Cormier and Magnan (2004) and Cormier et al. (2005), we expect firms with older assets to provide more extensive environmental information than their counterparts. The age of the firms'

assets is measured by the asset newness (*NEW*) (the ratio of net property, plant, and equipment to gross property, plant, and equipment at the end of 2007) and capital intensity (*CAPIN*) (the ratio of capital spending to total sales at the end of 2007), see Clarkson et al. 2008.

Media coverage (*MEDIA*) According to Brown and Deegan (1998), the media can be used to shape, and in turn represent, the community's concerns on organisational performance. They find that higher levels of media attention regarding firm environmental performance is associated with higher levels of environmental disclosure (see Aerts and Cormier 2009, Cormier and Magnan 2004, Deegan et al. 2002). For this study, *MEDIA* is based on the number of environmental news articles about the firm as available in the Factiva database. We only count environmental news available in the press during 2007.

Foreign operations (*FOREIGN*) Multinational firms operate in various countries and are subjected to international scrutiny (Branco and Rodrigues 2008, Newson and Deegan 2002). Therefore, they need to consider any national differences and abide by the rules and regulations of the countries in which they operate (Branco and Rodrigues 2008, Haniffa and Cooke 2005, Newson and Deegan 2002). The extent of multinational operations (*FOREIGN*) is based on the ratio of sales outside the home country to total sales (see Branco and Rodrigues 2008, Meek et al. 1995). We refer to the segmental reporting section in the respective firms' annual reports to determine foreign sales.

Listing status (*LISTING*) The pressure for corporate responsibility is greater for firms listed on stock exchanges, and more so for firms with international listings. This not only exposes them to greater environmental news (Aerts and Cormier 2009), but they also face additional pressures from capital markets for the disclosure of information (Cormier and Magnan 2004, Hackston and Milne 1996, Haniffa and Cooke 2005, Meek et al. 1995). For this study, an indicator variable of one (1) is assigned if a firm is listed in the US, in the UK, or on a stock exchange outside of its home country, and zero (0) otherwise. Listing in the US and the UK is also given a higher value, due to perceived stricter disclosure requirements under these two listings (see Aerts and Cormier 2009, Hackston and Milne 1996).

5. Findings and analysis

5.1 Quality of the environmental reporting

Panel A of Table 2 presents the distribution of the environmental reporting quality scores. All but two firms (18 firms) disclosed some form of environmental information (CO_2 emissions information) in their corporate reports. The highest score achieved by the sample firms for *CO_2_ALL* is 83.12 percent and 78.81 percent for

ENV_ALL. However, the average scores for *CO_2_ALL* and *ENV_ALL* are 25.73 percent and 27.11 percent, respectively. It means that the firms met about one-fourth of the criteria determined by the disclosure indices. Although not tabulated here, such low scores reflect a lack of performance-specific data. This overemphasis on general-type information can be construed as having a legitimating motive (Aerts and Cormier 2009, Clarkson et al. 2008, Deegan and Rankin 1996, Gray et al. 1996, Hackston and Milne 1996).

5.2 Descriptive statistics

Panel B of Table 2 depicts the descriptive statistics for the continuous independent variables and Panel C of the same table provides the distribution of the categorical variables. On average, the CO_2 emissions intensity (*EP*) of the sample firms is 1107 (rounded up). If the CARMA classification is being used, the sample comprises firms which emitted a moderate amount of CO_2 emissions. The average total assets (*SIZE*) of the sample firms is US$17.352 billion. The sample is made up of low profit (*ROA* = 0.038), moderately leveraged (*LEV* = 0.335) and locally based (*FOREIGN* = 0.108) firms. Furthermore, on average, there are 45 environmental news articles on the sample firms during the year.

The table also indicates that most of the firms' headquarters are located in an environment of strong law enforcement (*LAW* = 1.094) and a high environmental commitment (*EPI* = 64.746). The world's average for *LAW* is 0.00 (see Kaufmann et al. 2008) while the average for *EPI* is 58.37 (see Emerson et al. 2010). A small proportion of the sample firms are domiciled in code law countries (*LEGAL* = 30.7 percent) and in countries with an ETS (*ETS* = 19.0 percent).

>>INSERT TABLE 2 HERE<<

5.3 Correlation statistics

Table 3 provides the results of the correlation statistics with Pearson above the diagonal and Spearman's rho below. There is no apparent significant association between *EP* and both the disclosure measures (i.e. *CO_2_ALL* and *ENV_ALL*). By contrast, all the country variables (i.e. *LEGAL*, *LAW*, *EPI*, and *ETS*) are positively related to the disclosures. However, the correlations between *ENV_ALL* and *LAW* (in both Pearson and Spearman correlation analyses) and *ETS* (in the Spearman correlation analysis) are not statistically significant. The table also reveals that both the disclosure measures are highly correlated with each other (Pearson: $R = 0.924$, $p = 0.000$; Spearman's rho: $R = 0.901$, $p = 0.000$), suggesting that firms with high quality of CO_2 emission

disclosures also disclose high quality overall environmental information (i.e., they are being consistent in their reporting practices).

There appears to be no multicollinearity issues among the independent variables. According to Field (2009), a coefficient correlation of ≥ 0.80 indicates there is cause for concern. Based on the table below, the highest coefficient is 0.724 ($p = 0.000$) which is between *SIZE* and *MEDIA*. Additionally, we control for multicollinearity in the regression analysis by dropping any variables with a variance inflation factor (VIF) of $\geq$ 5.000 (see De Vaus 2002), which is well below the recommended maximum value of 10 (Field 2009).

>>INSERT TABLE 3 HERE<<

5.4 Regression analysis

Table 4 presents the results of the linear regression (OLS). We report each variable's unstandardised coefficients and *p*-values (one-tailed) and each model's adjusted R^2 and *F* statistic.

>>INSERT TABLE 4 HERE<<

We use emissions intensity and the level of emissions as measures of environmental performance and CO_2 disclosures and all environmental disclosures as dependent variables. Across all four regressions, environmental performance (EP) is not significantly related to environmental disclosures. Therefore, we reject hypothesis 1. Both *EPI* and *ETS* are positive and significant across all four models, providing evidence in support of hypothesis 2. Furthermore, of the control variables *SIZE*, *NEW*, and *MEDIA* are significant for both models while *LISTING* is also significant for the *ENV_ALL* model. The adjusted R^2 for both models are high (55.3 percent for the *ENV_ALL* model and 61.1 percent for the *CO_2_ALL* model) and both models are significant.[10] The results using the absolute CO_2 emissions level are consistent with the results using the CO_2 emissions intensity, therefore we continue with CO_2 emissions intensity only in our further analyses and discussion.

We refer to two arguments developed in section 2.1 in order to explain the fact that *EP* is not significantly related to disclosure. First, our study focuses on a single industry which is regarded as among the largest contributors of environmental problems. It is the legitimacy of the industry as a whole that has been increasingly

[10] As a sensitivity test, we re-estimate the regressions after excluding all firms from countries with three and fewer firms in our sample (we thus exclude 32 firms from 20 countries and estimate the regression with 173 firms from 15 countries). The results remain qualitatively similar, i.e., EP is not significantly related to disclosure while EPI and ETS is.

scrutinised and challenged, instead of the environmental performance of the individual firms in the industry. As a result, all firms, regardless of their environmental performance, are pressurised to show conformance to the social norms around environmental issues. Second, country variations in social norms around the environment and the related pressure on firms are more influential in determining the level of disclosures. This is consistent with Freedman and Jaggi (2010) who found the influence of country of origin to be significant, but not environmental performance.

EPI and *ETS* relate specifically to environmental matters, thus these measures are indicative of societal norms around environmental responsibility. *EPI* indicates the effectiveness of national environmental protection efforts based on certain measurable environmental outcomes including the level of emissions, deforestation, and other pollutants (Emerson et al. 2010). In this kind of environment, firms are more likely to feel the pressure to demonstrate their environmental performance and initiatives with increased environmental reporting. Furthermore, an ETS scheme can require costly investment in new technology and affect public awareness, norms, and expectations.

The findings for *SIZE*, *NEW*, *MEDIA*, and *LISTING* are consistent with the prior literature. Due to their scale, large firms are more visible, perceived to be more polluting, and thus are more likely to be expected to engage in environmental reporting (Hackston and Milne 1996). Additionally, older technology is usually associated with inefficiency and being less environmental friendly (Clarkson et al. 2008, De Villiers and Van Staden 2011a). Therefore, firms with a high proportion of old assets are perceived to be contributing to more pollution, escalating the need for reporting on the environment. Consistent with Aerts and Cormier (2009) and Deegan et al. (2002), we find that firm exposure to media scrutiny is an important driver for the quality of environmental reporting. The media has long been recognised as having the power to mobilise public opinion and expectations on certain issues, and reporting on the environment (and CO_2) would be an effective mechanism to respond to these expectations. Being listed in the US and UK entails greater reporting requirements (Aerts and Cormier 2009), including those related to environmental issues. Also, firms listed outside their home country have additional stakeholders to consider and this intensifies the pressure to be environmentally responsible and to make environmental disclosures (Hackston and Milne 1996).

5.5 *Additional analyses*

5.5.1 Including additional emissions in the performance measure

Using CO_2 emissions intensity (or CO_2 emissions level) could be argued to be a simple measure for the multidimensional construct of environmental performance (see Ilinitch et al. 1998).[11] However, as elaborated before, we use CO_2 emissions intensity due to data accessibility. Also, for firms in this industry, CO_2 emissions represents an aspect which has been under close regulatory and public scrutiny in recent years since they contribute significantly to the global CO_2 emissions build up. Another measure that could be a valid proxy for environmental performance and is available in the public domain is the percentage of electricity generated by fossil fuels. Generation by fossil fuels (i.e., coal, oil, and gas) certainly give more significant impacts than any other types of generation. These include direct impacts such as the various types of emissions (for example, CO_2, SO_2, NO_x, and mercury), significant water consumption for cooling, water contamination by coal ash and heated water, as well as other impacts associated with the upstream activities such as coal mining and oil drilling. We do not include this variable in the main analysis as this variable is highly correlated with CO_2 emissions intensity (Pearson's R = -0.836; p = 0.000, two-tailed). The data for this is available from the CARMA database and based on the information reported by firms in their corporate reports (annual reports, stand-alone reports, or websites).

The findings (untabulated) are consistent with the main findings (i.e., EP is not significant while *EPI* and *ETS* is positive and significant).

5.5.2 Separate analysis for US and non-US firms

We estimate separate regressions for the US and non-US firms as the US firms constitute a significant part of the sample (i.e. 38 percent), and show the results in Table 5. Although not tabulated here, the mean *CO_2_ALL* for the US sample is 27.54, and for the non-US sample is 24.61. The mean *ENV_ALL* for the US sample is 28.98, and for the non-US sample is 25.97, i.e., the US firms provided higher quality environmental information. We drop the country variables in the US model, because only one country's data is included. In addition, we drop three firms from the model as they have a Cook's distance value > 1.0.[12]

For US firms, we find the association between *EP* and environmental disclosure to be positive and significant (*CO2_ALL*: $p < 0.05$, one-tailed; *ENV_ALL*: $p < 0.10$, one-tailed). The positive coefficient implies

[11] For a more comprehensive discussion of the issues involved, please consult the special issue on "Indicators and indices in sustainability" published in Volume 5, Issue 3 of Sustainability Accounting, Management and Policy Journal.
[12] According to Field (2009), Cook's distance > 1.0 indicates that there are certain cases that exert undue influence over the parameters of the models (i.e. significant outliers).

that better environmentally performing firms provided more comprehensive environmental disclosures. The finding is contradictory to the finding of Freedman and Jaggi (2004) who found a negative association. Differences in the research design (e.g., sample, time period, and number of independent variables) could have caused the inconsistent finding. However, the finding provides support for the studies by Al-Tuwaijri et al. (2004), Clarkson et al. (2008), and Silva-Gao (2012) and the argument that firms would proactively disclose environmental information in order to legitimise their operations (see also Van Staden and Hooks 2007). In this sample, the significant control variables for both disclosure measures are *SIZE*, *VOLAT*, *NEW*, *MEDIA*, and *LISTING*.

EP is not significant in the non-US sample. *EPI* and *ETS* are both significant in the *CO_2_ALL* model, but only *EPI* in the *ENV_ALL* model. The control variables, *SIZE*, *NEW* and *LISTING* are significant. The results for *NEW* and *MEDIA* suggest that the influence of these variables on *ENV_ALL* in the main analysis is driven by the US firms in the sample.

>>INSERT TABLE 5 HERE<<

5.5.3 Analysis by individual country variables

A criticism of the extant cross country literature on social and environmental reporting is the limited number of country variables included in the research model. One possible reason for this limitation could be the high correlation among the country variables. In this section, we examine the influence of the individual country variables on *CO_2_ALL* and *ENV_ALL*. Each model includes *EP*, all the control variables, and one of the country variables at a time. We examine the main country variables included in our study (, *EPI* and *ETS*) and the country level control variables *(LEGAL and LAW)* as well as other country variables that could be relevant in understanding the variations in environmental disclosure. These other variables are the World Bank indices of government effectiveness, regulatory quality, and voice and accountability (Kaufmann et al. 2008), the AccountAbility's competitive responsibility index (MacGillivray et al. 2007), Hofstede's culture dimensions (Hofstede 2011), the press freedom index (Reporters Without Borders 2007), the ratification of the Kyoto Protocol (by the effective date, i.e. 16 February 2005) (UNFCCC 2009b), being domiciled in countries governed by the European Union Emissions Trading Scheme (EC 2011), and the level of economic development (i.e. developed vs. less developed) (The World Bank 2011). All periodic data are for year 2007, or the closest date available.

We find that all the country variables examined are capable of explaining, at least one of, the disclosure quality measures, except for *LEGAL* and the Kyoto Protocol ratification status. The following variables are positive and significant (one-tailed) for both disclosure measures: *EPI* (*CO_2_ALL*: $p = 0.000$; *ENV_ALL*: $p = 0.001$), *ETS* (*CO_2_ALL*: $p =$ *ENV_ALL*: 0.000; $p = 0.005$); the competitive responsibility index (*CO_2_ALL*: $p = 0.001$; *ENV_ALL*: $p = 0.099$), culture dimensions of individualism (*CO_2_ALL*: $p = 0.003$; *ENV_ALL*: $p = 0.096$) and power distance (*CO_2_ALL*: $p = 0.000$; *ENV_ALL*: $p = 0.015$), being domiciled in countries governed by the European Union Emissions Trading Scheme (*CO_2_ALL*: $p = 0.000$; *ENV_ALL*: $p = 0.020$), the voice and accountability index (*CO_2_ALL*: $p = 0.000$; *ENV_ALL*: $p = 0.001$), and the press freedom index (*CO_2_ALL*: $p = 0.000$; *ENV_ALL*: $p = 0.001$). Furthermore, LAW ($p = 0.008$), the culture dimension of masculinity ($p = 0.011$), the indices of government effectiveness ($p = 0.052$) and regulatory quality ($p = 0.003$), and the level of economic development ($p = 0.001$) only influenced *CO_2_ALL*, while the culture dimension of uncertainty avoidance only influenced *ENV_ALL* ($p = 0.005$).

5.5.4 Analysis by alternative disclosure measures (soft, hard, and assurance)

Clarkson et al. (2008) divided disclosures into 'soft' and 'hard'. 'Soft' disclosure represents information that 'are difficult to verify' (p. 305) and 'can also easily be imitated by firms with no real commitment to protecting the environment' (p. 313). By contrast, 'hard' disclosures are objective measures of environmental performance and credible information that 'cannot be easily mimicked by poor environmental performers' (p. 309). Examples of hard disclosures are specific environmental performance indicators about actual emissions and conservation efforts. Examples of soft disclosures are general disclosures related to the existence of an environmental policy and statements that management is committed to protecting the environment. Clarkson et al. (2008) argued and found that firms with worse environmental performance disclosed more extensive 'soft' disclosures than their counterparts. However, Clarkson et al. (2011) found contrary evidence.

Based on the definition, we first classified our disclosure items into soft and hard and then re-calculated the scores for each firm. Our scores are in absolute numbers (instead of ratios) and they are labelled *CO_2_SOFT*, *CO_2_HARD*, *ENV_SOFT*, and *ENV_HARD*. The results are shown in Table 6. Overall, the adjusted R^2 is higher for 'soft' disclosures (Panel A) (*CO_2_SOFT* = 0.627; *ENV_SOFT* = 0.572) compared to ‘hard’ disclosures (Panel B). *EP* is not significant. For country variables, *EPI* and *ETS* remain as the important variables explaining the variation in both *HARD* and *SOFT* disclosures.

>>INSERT TABLE 6 HERE<<

According to Simnett et al. (2009), the provision of an assurance statement enhances the credibility of the disclosed information. Of the 205 firms, 26 firms (12.7 percent) provided an assurance statement. We estimate a logistic regression in which the dependent variable takes the value of 1 where the report is assured, otherwise 0. The results (untabulated) reveal that *ETS*, *SIZE* and *TOBIN Q* are positive and significant. This shows that firms domiciled in the countries with an ETS, larger firms, and firms with higher intangible assets (hence, less polluting) have a greater proclivity to have their environmental information assured by a third party.

5.5.5 Analysis by disclosure media

We repeat the analysis by distinguishing the disclosure scores by reporting medium. This involves six regression models: CO_2 emissions information in each reporting medium (*CO_2_AR*, *CO_2_SAR*, and *CO_2_WS*) and overall environmental information in each reporting medium (*ENV_AR*, *ENV_SAR*, and *ENV_WS*). The results are reported in Table 7. The important results that are similar to our main findings are that Environmental performance (*EP*) is not significant, that *EPI* and *ETS* is positive and significant in most of the regressions, and that *SIZE* is positive and significant across all reporting media and disclosure types. However, in Panel D, *ETS* is counter intuitively negative and significant. This result implies that firms in non-ETS countries are more likely to disclose environmental information in their annual report. By examining the descriptive data, we were able to determine that firms in non-ETS countries are less likely to publish separate environmental reports. Therefore, these firms provide more of their disclosures in their annual reports, even though they disclose less in all media combined.

>>INSERT TABLE 7 HERE<<

6. Discussion and Conclusion

This study examines the quality and the determinants of the environmental disclosures of 205 electricity generation firms internationally during 2007. This is an important issue, because electricity generation firms are responsible for 41% of energy-related CO_2 emissions (IEA 2009), a major source of global warming and climate change (IPCC 2007). Our disclosure measures are CO_2 emissions and overall environmental disclosures in annual reports, stand-alone reports, and on websites. On average, the firms in our sample only disclose one-fourth of the criteria included in our disclosure index, which is based on best practice guidelines. Specifically, there is a lack of disclosures of performance indicators, an issue that may interest regulators. Mandatory reporting should be feasible due to the regulated nature of this industry.

We assess the influence of environmental performance and societal norms around environmental protection as reflected by country level measures on environmental disclosure. Contrary to our legitimacy theory derived prediction, we find that environmental performance, measured by CO_2 emissions intensity, does not influence the level of overall disclosure. We ascribe this finding to analysing one specific industry, the electricity generation industry, which has major environmental impacts as seen by its contribution towards the increase in the global CO_2 emissions concentration. The pressure to demonstrate environmental responsibility is relatively uniform across the firms in the industry, therefore the social norms around the environment and thus the degree of public pressure in the firm's country is of higher importance in explaining disclosure differences (see Freedman and Jaggi 2010). An interesting finding, that could be explored further in future research, is that US firms with lower emissions were likely to disclose more regarding their emissions than firms with higher emissions. Therefore, among firms in a specific country, where there are no country-level control variables, we find a positive and significant relationship between environmental performance and environmental disclosure. This finding contrasts with much of the prior literature, except Clarkson et al. (2008) and Al-Tuwaijri et al. (2004).

We find that countries' environmental norms, as reflected by a country's commitment towards the environment and the presence of a carbon emissions trading scheme (measures of social concern for environmental protection and emissions) provide significant explanatory value regarding the environmental disclosure practices of electricity generation firms. Specifically, firms in countries with a greater commitment to the environment are likely to disclose more environmental and emissions information. The theoretical implication of these findings is that social beliefs and norms prompt a legitimating disclosure response from firms that is not significantly affected by their performance against that social belief (i.e., in this case that the environment is important and emissions are bad).

Our results are consistent with prior studies in finding that firm size, age of assets, media exposure, and listing status are important variables in explaining the variation in the quality of CO_2 emissions disclosure and overall environmental information.

As with all research, our findings should be interpreted with caution. First, we use 'comprehensiveness' as the proxy for quality of reporting. While it is valid, there are many other quality attributes that could represent quality including adequacy, informativeness, timeliness, understandability, readability, reliability, relevance, and comparability. However, we used the best practice in content analysis currently in use, and in addition, we rely on Hooks and Van Staden (2011) who find that various methods of content analysis yield highly correlated

results. Second, there was a time lag between the period of interest and our web content analysis, implying that web content could have changed before our analysis. However, we used the Internet Archive: Wayback Machine tool to help us trace firm websites back to the 2007 financial year end date (or at the closest date available) for verification purposes, and found no evidence of significant changes. Third, our measure for environmental performance (i.e. CO_2 emissions intensity) is relatively limited and it does not capture the overall environmental performance of firms. However, we use the best available data. Furthermore, CO_2 emissions are currently important from a social and political point of view due to the fact that it is associated with climate change and the fact that many governments around the world have committed themselves to lower national greenhouse gas emissions. Therefore CO_2 emissions might well be highly correlated with public pressure on firms that could drive disclosure decisions. We have supplemented the main result by using the absolute level of CO_2 emissions and the percentage of electricity generated by fossil fuels and there were no noteworthy change in the results. In addition, some countries are under-represented due to data availability, nevertheless our study's sample size is bigger and our country representation is better than most prior studies in this area. We also acknowledge that country-level institutions may not cause corporate environmental disclosures, but we believe that these measures reflect social norms. Finally, the fact that our data relate to 2007, the start of the global financial crisis, could be an important consideration in any interpretation of the results.

References

Aerts, W. and Cormier, D., 2009. Media legitimacy and corporate environmental communication. Accounting, Organizations and Society, 34 (1), 1-27.

Aerts, W., Cormier, D. and Magnan, M., 2008. Corporate environmental disclosure, financial markets and the media: an international perspective. Ecological Economics, 64 (3), 643-659.

Al-Tuwaijri, S.A., Christensen, T.E. and Hughes, K.E., 2004. The relations among environmental disclosure, environmental performance, and economic performance: a simultaneous equation approach. Accounting, Organizations and Society, 29 (5), 447-471.

Ashforth, B.E. and Gibbs, B.W., 1990. The double-edge of organizational legitimation. Organization Science, 1 (2), 177-194.

Atkins, J.F., Solomon, A., Norton, S. and Joseph, N.L., 2015. The emergence of integrated private reporting. Meditari Accountancy Research, 23 (1), 28-61.

Bebbington, J. and Larrinaga-González, C., 2008. Carbon trading: accounting and reporting issues. European Accounting Review, 17 (4), 697-717.

Bebbington, J., Kirk, E.A. and Larrinaga, C. 2012. The production of normativity: A comparison of reporting regimes in Spain and the UK. Accounting, Organizations and Society, 37 (2), 78-94.

Belal, A.R., Kabir, M.R., Cooper, S., Dey, P., Ahmed Khan, N., Rahman, T. and Ali, M., 2010. Corporate environmental and climate change disclosures: empirical evidence from Bangladesh. Research in Accounting in Emerging Economies, 10, 145-167.

Bewley, K. and Li, Y., 2000. Disclosure of environmental information by Canadian manufacturing companies: a voluntary disclosure perspective. Advances in Environmental Accounting and Management, 1 (1), 201-226.

Brammer, S. and Pavelin, S., 2006. Voluntary environmental disclosures by large UK companies. Journal of Business Finance & Accounting, 33 (7&8), 1168-1188.

Branco, M.C. and Rodrigues, L.L., 2008. Factors influencing social responsibility disclosure by Portuguese companies. Journal of Business Ethics, 83 (4), 685-701.

Brown, N. and Deegan, C., 1998. The public disclosure of environmental performance information - a dual test of media agency setting theory and legitimacy theory. Accounting and Business Research, 29 (1), 21-41.

Buhr, N. and Freedman, M., 2001. Culture, institutional factors and differences in environmental disclosure between Canada and the United States. Critical Perspectives on Accounting, 12 (3), 293-322.

Buzby, SL., 1974. Selected items of information and their disclosure in annual reports. The Accounting Review, 49 (3), 423-435.

CARMA, 2007. Power Companies. Available from: http://carma.org/company [Accessed 31 August 2009].

Cho, C.H. and Patten, D.M., 2007. The role of environmental disclosures as tools of legitimacy: a research note. Accounting, Organizations and Society, 32 (7), 630-647.

Cho, C.H., Roberts, R.W. and Patten, D.M., 2010. The language of US corporate environmental disclosure. Accounting, Organizations and Society, 35 (4), 431-443.

CIA. 2011. The World Factbook. Available from: https://www.cia.gov/library/publications/the-world-factbook/index.html [Accessed 18 October 2011].

Clarkson, P.M., Li, Y., Richardson, G.D. and Vasvari, F.P., 2008. Revisiting the relation between environmental performance and environmental disclosure: an empirical analysis. Accounting, Organizations and Society, 33 (4), 303-327.

Clarkson, P.M., Overell, M.B. and Chapple, L., 2011. Environmental reporting and its relation to corporate environmental performance. Abacus, 47 (1), 27-60.

Cooke, T.E., 1989. Disclosure in the corporate annual reports of Swedish companies. Accounting and Business Research, 19 (74): 113-124.

Cormier, D. and Magnan, M., 2004. The impact of the web on information and communication modes: the case of corporate environmental disclosure. International Journal of Technology Management, 27 (4), 393-416.

Cormier, D., Magnan, M. and Van Velthoven, B., 2005. Environmental disclosure quality in large German companies: economic incentives, public pressures or institutional conditions? European Accounting Review, 14 (1), 3-39.

Coy, D. and Dixon, K., 2004. The public accountability index: crafting a parametric disclosure index for annual reports. The British Accounting Review, 36 (1), 79-106.

De Klerk, M. and De Villiers, C., 2012. The Value Relevance of Corporate Responsibility Reporting by South African Companies. Meditari Accountancy Research, 20 (1), 21-38.

De Klerk, M., De Villiers, C. and Van Staden, C.J., 2015. The value relevance of Corporate Social Responsibility disclosure in the UK. Pacific Accounting Review, 27 (2), 208-228.

De Vaus, D., 2002. Analyzing Social Science Data - 50 Key Problems in Data Analysis. London: SAGE Publications Ltd.

De Villiers, C., Low, M. and Samkin, G., 2014. The institutionalisation of mining company sustainability disclosures. Journal of Cleaner Production, 84, 51-58.

De Villiers, C. and Van Staden, C.J., 2011a. Where firms choose to disclose voluntary environmental information. Journal of Accounting and Public Policy, 30 (6), 504-525.
De Villiers, C. and Van Staden, C.J., 2011b. Shareholder Requirements for Compulsory Environmental Information in Annual Reports and on Websites. Australian Accounting Review, 21 (4), 317-326.
De Villiers, C. and Van Staden, C.J., 2012. New Zealand shareholder attitudes towards corporate environmental disclosure. Pacific Accounting Review, 24 (2), 186-210.
Deegan, C. and Rankin, M., 1996. Do Australian companies report environmental news objectively? an analysis of environmental disclosures by firms prosecuted successfully by the Environmental Protection Authority. Accounting, Auditing & Accountability Journal, 9 (2), 50-67.
Deegan, C., Rankin, M. and Tobin, J., 2002. An examination of the corporate social and environmental disclosures of BHP from 1983-1997: a test of legitimacy theory. Accounting, Auditing & Accountability Journal, 15 (3), 312-343.
Deegan, C., Rankin, M. and Voght, P., 2000. Firms' disclosure reactions to major social incidents: Australian evidence. Accounting Forum, 24 (1), 101-130.
Dhaliwal, D.S., Li, O.Z., Tsang, A. and Yang, Y.G. , 2011. Voluntary nonfinancial disclosure and the cost of equity capital: the initiation of corporate social responsibility reporting. The Accounting Review, 86 (1), 59-100.
Doppegieter, J.J. and De Villiers, C.J., 1996. Environmental Reporting Practices in the South African Energy Sector. Management Dynamics, 5 (1), 15-42.
Dowling, J. and Pfeffer, J., 1975. Organizational legitimacy: social values and organizational behavior. The Pacific Sociological Review ,18 (1), 122-136.
Dragomir, V. D., 2010. Environmentally sensitive disclosures and financial performance in a European setting. Journal of Accounting and Organizational Change, 6 (3), 359-388.
EC, 2011. National allocation plans: First phase (2005-2007). Brussels, Belgium: European Commission. Available from: http://ec.europa.eu/clima/policies/ets/allocation/2005/documentation_en.htm [Accessed 11 December 2011].
Emerson, J., Esty, D.C., Levy, M.A., Kim, C.H., Mara, V., de Sherbinin, A. and Srebotnjak, T., 2010. 2010 Environmental Performance Index. New Haven: Yale Center for Environmental Law and Policy.
Fekrat, M.A., Inclan, C. and Petroni, D., 1996. Corporate environmental disclosures: competitive disclosure hypothesis using 1991 annual report data. The International Journal of Accounting, 31 (2), 175-195.
Field, A., 2009. Discovering Statistics Using SPSS (and Sex and Drugs and Rock 'n' Roll). 3rd ed. London: SAGE Publications.
Freedman, M. and Jaggi, B., 2004. Carbon dioxide emissions and disclosures by electric utilities. Advances in Public Interest Accounting, 10 (1), 105-129.
Freedman, M. and Jaggi, B., 2005. Global warming, commitment to the Kyoto Protocol, and accounting disclosures by the largest global public firms from polluting industries. The International Journal of Accounting, 40 (3), 215-232.
Freedman, M. and Jaggi, B., 2010. Global warming and corporate disclosures: a comparative analysis of companies from the European Union, Japan and Canada. Advances in Environmental Accounting and Management, 4, 129-160.
Freedman, M., Jaggi, B. and Stagliano, A.J., 2004. Pollution disclosures by electric utilities: an evaluation at the start of the first phase of 1990 Clean Air Act. Advances in Environmental Accounting and Management, 2, 59-100.
Freedman, M. and Stagliano, A. J., 2008a. Accounting disclosures of toxic release inventory for 2002. Accounting and the Public Interest, 8 (1), 21-38.
Freedman, M. and Stagliano, A. J., 2008b. Environmental disclosures: electric utilities and Phase 2 of the Clean Air Act. Critical Perspectives on Accounting, 19 (4), 466-486.
Freedman, M. and Wasley, C.,1990. The association between environmental performance and environmental disclosure in annual reports and 10Ks. Advances in Public Interest Accounting, 3 (2), 183-193.
Glennie, M. and Lodhia, S. 2013. The influence of internal organisational factors on corporate-community partnership agendas: An Australian case study. Meditari Accountancy Research, 21 (1), 52-67.
Gray, R., Owen, D. and Adams, C., 1996. Accounting & Accountability - Changes and Challenges in Corporate Social and Environmental Reporting. Hertfordshire: Prentice Hall Europe.
Green, W. and Zhou, S., 2013. An international examination of assurance practices on carbon emissions disclosures. Australian Accounting Review, 23 (1), 54-66.
GRI, 2006. Sustainability Reporting Guidelines. Amsterdam: Global Reporting Initiative.
GRI, 2009. Sustainability Reporting Guidelines & Electric Utility Sector Supplements. Amsterdam: Global Reporting Initiative.
Griffiths, A., Haigh, N. and Rassias, J., 2007. A framework for understanding institutional governance systems and climate change: the case of Australia. European Management Journal, 25 (6), 415-427.

Guthrie, J, Petty, R. and Ricceri, F., 2006. The voluntary reporting of intellectual capital - comparing evidence from Hong Kong and Australia. Journal of Intellectual Capital, 7 (2), 1469-1930.
Hackston, D. and Milne, M.J., 1996. Some determinants of social and environmental disclosures in New Zealand companies. Accounting, Auditing & Accountability Journal, 9 (1), 77-108.
Haniffa, R.M. and Cooke, T.E., 2005. The impact of culture and governance on corporate social reporting. Journal of Accounting and Public Policy, 24 (5), 391-430.
Haque, S., and Deegan, C., 2010. Corporate climate change-related governance practices and related disclosures: evidence from Australia. Australian Accounting Review, 20 (4), 317-333.
He, Y., Tang, Q. and Wang, K., 2013. Carbon disclosure, carbon performance, and cost of capital. China Journal of Accounting Studies, 1 (3-4), 190-220.
Ho, L.J. and Taylor, M.E., 2007. An empirical analysis of triple bottom-line reporting and its determinants: evidence from the United States and Japan. Journal of International Financial Management and Accounting, 18 (2), 123-150.
Hofstede, G., 2011. Geert Hosftede™ cultural dimensions. Helsinki, Finland: Itim International. Available from: http://www.geert-hofstede.com/ [Accessed 1 September 2011].
Holland, L. and Foo, Y.B., 2003. Differences in environmental reporting practices in the UK and the US: the legal and regulatory context. The British Accounting Review, 35 (1), 1-18.
Hooks, J. and Van Staden, C.J., 2011. Evaluating environmental disclosures: the relationship between quality and extent measures. British Accounting Review, 43 (93), 200-213.
Hughes, S.B., Anderson, A. and Golden, S., 2001. Corporate environmental disclosures: are they useful in determining environmental performance? Journal of Accounting and Public Policy, 20 (3), 217-240.
IEA, 2009. CO_2 Emissions from Fuel Combustion - Highlights (2009 Edition). Paris: International Energy Agency.
Ilinitch, A.Y., Soderstrom, N.S. and Thomas, T.E., 1998. Measuring corporate environmental performance. Journal of Accounting and Public Policy, 17 (4), 383-408.
Ingram, R.W. and Frazier, K.B., 1980. Environmental performance and corporate disclosure. Journal of Accounting Research, 18 (2), 614-622.
IPCC, 2007. Climate Change 2007: Synthesis Report. Valencia: Intergovernmental Panel on Climate Change.
Jaffar, R., Mohd. Iskandar, T. and Muhamad, J., 2002. An investigation of environmental disclosures: Evidence from selected industries in Malaysia. International Journal of Business and Society, 3 (2), 55-68.
Kassinis, G. and Vafeas, N., 2002. Corporate boards and outside stakeholders as determinants of environmental litigation. Strategic Management Journal, 23 (5), 399-415.
Kaufmann, D., Kraay, A. and Mastruzzi, M., 2008. Governance matters VII: aggregate and individual governance indicators 1996-2007. Available from: http://ssrn.com/abstract=1148386 [Accessed 14 December 2009].
Kolk, A., Levy, D. and Pinkse, J., 2008. Corporate responses in an emerging climate regime: the institutionalization and commensuration of carbon disclosure. European Accounting Review 17, (4), 719-745.
Kolk, A. and Perego, P., 2010. Determinants of the adoption of sustainability assurance statements: an international investigation. Business Strategy and the Environment, 19 (3), 182-198.
KPMG, 2008. KPMG International Survey of Corporate Responsibility Reporting 2008. Amsterdam: KPMG International.
Krippendorf, K., 2004. Content Analysis - An Introduction to Its Methodology. 2nd ed. California: Sage Publications Inc.
La Porta, R., Lopez-de-Silanes, F., Schleifer, A. and Vishny, R.W., 1997. Legal determinants of external finance. The Journal of Finance, 52 (3), 1131-1150.
Lawrence, S.R., Botes, V., Collins, E. and Roper, J., 2013. Does accounting construct the identity of firms as purely self-interested or as socially responsible? Meditari Accountancy Research, 21 (2), 144-160.
Lindblom, C.K., 1993. The implications of organizational legitimacy for corporate social performance and disclosure. Paper presented at 1993 Critical Perspectives on Accounting Conference, April 15-17, New York.
MacGillivray, A., Begley, P. and Zadek, S., 2007. The state of responsible competitiveness 2007 (eds). London: AccountAbility.
Massa, L., Farneti, F. and Scappini, B., 2015. Developing a sustainability report in a small to medium enterprise: process and consequences. Meditari Accountancy Research, 23 (1), 62-91.
Mathews, M.R., 1983. Socially responsible accounting. London: Chapman & Hall.
Meek, G.K., Roberts, C. B. and Gray, S.T., 1995. Factors influencing voluntary annual report disclosures by U.S., U.K. and Continental European Multinational Corporations. Journal of International Business Studies, 26 (3), 555-572.

Milne, M.J. and Adler, R.W.,1999. Exploring the reliability of social and environmental disclosures content analysis. Accounting, Auditing & Accountability Journal, 12 (2), 237-256.
Mitchell, R.K., Agle, B.R. and Wood, D.J., 1997. Toward a theory of stakeholder identification and salience: defining the principle of who and what really counts. The Academy of Management Review, 22 (4), 853-886.
Neu, D., Warsame, H. and Pedwell, K.,1998. Managing public impressions: environmental disclosures in annual reports. Accounting, Organizations and Society, 23 (3), 265-282.
Newson, M. and Deegan, C., 2002. Global expectations and their association with corporate social disclosure practices in Australia, Singapore and South Korea. The International Journal of Accounting, 37 (2), 183-213.
O'Donovan, G., 2002. Environmental disclosures in the annual report - extending the applicability and predictive power of legitimacy theory. Accounting, Auditing & Accountability Journal, 15 (3), 344-371.
Owusu-Ansah, S., 1988. The impact of corporate attributes on the extent of mandatory disclosure and reporting by listed companies in Zimbabwe. The International Journal of Accounting, 33 (5), 605-631.
Parker, L.D., 2005. Social and environmental accountability research - a view from the commentary box. Accounting, Auditing & Accountability Journal, 18 (6), 842-860.
Patten, D.M., 1992. Intra-industry environmental disclosure in response to the Alaskan oil spill: a note on legitimacy theory. Accounting, Organizations and Society, 17 (5), 471-475.
Patten, D.M., 2000. Changing Superfund disclosure and its relation to the provision of other environmental information. Advances in Environmental Accounting and Management, 1, 101-121.
Patten, D.M., 2002. The relation between environmental performance and environmental disclosure: a research note. Accounting, Organizations and Society, 27 (8), 763-773.
Patten, D.M., and Crampton, W., 2004. Legitimacy and the internet: an examination of corporate web page environmental disclosures. Advances in Environmental Accounting and Management, 2, 31-57.
Perego, P., 2009. Causes and consequences of choosing different assurance providers: an international study of sustainability reporting. International Journal of Management, 26 (3), 412-425.
Prado-Lorenzo, J., Rodríguez-Dominguez, L., Gallego-Álvarez, I. and Gárcia-Sánchez, I., 2009. Factors influencing the disclosure of greenhouse gas emissions in companies world-wide. Management Decision, 47 (7), 1133-1157.
PwC, 2013. 13th PwC Annual Global Power & Utilities Survey: Energy transformation, The impact on the power sector business model. PriceWaterhouseCoopers. Report available at: http://www.pwc.com/gx/en/utilities/global-power-and-utilities-survey/assets/pwc-global-survey-new.pdf Accessed on 31 October 2014.
Reid, E.M. and Toffel, M.W., 2009. Responding to public and private politics: corporate disclosure of climate change strategies. Strategic Management Journal, 30 (11), 1157-1178.
Reporters Without Borders. 2007. Press freedom index 2007. Available from: http://en.rsf.org/press-freedom-index-2007,34.html [Accessed 1 September 2011].
Richardson, A.T., 1985. Symbolic and substantive legitimation in professional practice. Canadian Journal of Sociology, 10 (2), 139-152.
Roberts, R.W., 1992. Determinants of corporate social responsibility disclosure: an application of stakeholder theory. Accounting, Organizations and Society, 17 (6), 595-612.
Sethi, S.P., 1975. Dimensions of corporate social performance: an analytical framework. California Management Review, 17 (3), 58-64.
Sethi, S.P., 1979. A conceptual framework for environmental analysis of social issues and evaluations of business response patterns. Academy of Management Journal, 4 (1), 63-74.
Shocker, A.D. and Sethi, S.P., 1973. An approach to incorporating societal preferences in developing corporate action strategies. California Management Review, 15 (4), 97-105.
Silva-Gao, L., 2012. The disclosure of environmental capital expenditures: evidence from the electric utility sector in the USA. Corporate Social Responsibility and Environmental Management, 19 (4), 240-252.
Simnett, R., Vanstraelen, A. and Chua, W.F., 2009. Assurance on sustainability reports: an international comparison. The Accounting Review, 84 (3), 937-967.
Solomon, A. and Lewis, L., 2002. Incentives and disincentives for corporate environmental disclosure. Business Strategy and the Environment, 11 (3), 154-169.
Stent, W. and Dowler, T., 2015. Early assessments of the gap between integrated reporting and current corporate reporting. Meditari Accountancy Research, 23 (1), 92-117.
Suchman, M.C., 1995. Managing legitimacy: strategic and institutional approach. The Academy of Management Review, 20 (3), 571-610.
The World Bank, 2011. Indicators. Available from: http://data.worldbank.org/indicator [Accessed 1 September 2011].

UN, 2011. Millennium Development Goals. Available from: http://www.un.org/millenniumgoals/environ.shtml [Accessed 20 October 2011].
UNEP, GRI, KPMG, and USB, 2010. Carrots and Sticks - Promoting Transparency and Sustainability - An Update on Trends in Voluntary and Mandatory Approaches to Sustainability Reporting. Amsterdam: United Nations Environment Programme, The Global Reporting Initiative, KPMG, and University of Stellenbosch Business School.
UNFCCC, 2009a. Kyoto Protocol. Available from: http://unfccc.int/kyoto_protocol/items/2830.php [Accessed 1 December 2009].
UNFCCC, 2009b. Kyoto Protocol status of ratification. Available from: http://unfccc.int/files/kyoto_protocol/status_of_ratification/application/pdf/kp_ratification_20091203.pdf [Accessed 15 November 2009].
Van der Laan Smith, J., Adhikari, A. and Tondkar, R.H., 2005. Exploring differences in social disclosures internationally: a stakeholder perspective. Journal of Accounting and Public Policy, 24 (2), 123-151.
Van Staden, C.J. and Hooks, J., 2007. A comprehensive comparison of corporate environmental reporting and responsiveness. The British Accounting Review, 39 (3), 197-210.
Walden, W.D. and Schwartz, B.N., 1997. Environmental disclosures and public policy pressure. Journal of Accounting and Public Policy, 16 (2), 125-154.
Wallace, R.S.O. and Naser, K., 1995. Firm-specific determinants of the comprehensiveness of mandatory disclosure. Journal of Accounting and Public Policy, 14 (4), 311-368.
Warsame, H., Neu, D. and Simmons, V., 2002. Responding to "discrediting" events: annual report disclosure responses to environmental fines. Accounting and the Public Interest, 2 (1), 22-40.
Watts, R.L., and Zimmerman, J.L., 1978. Towards a positive theory of the determination of accounting standards. The Accounting Review, 53 (1), 112-134.
WBCSD/WRI, 2004. The Greenhouse Gas Protocol - A Corporate Accounting and Reporting Standard (Revised Edition). Washington: World Business Council for Sustainable Development and World Resource Institute.
Webb, K.A., Cahan, S.F. and Sun, J., 2008. The effect of globalization and legal environment on voluntary disclosure. The International Journal of Accounting, 43 (3), 219-245.
Williams, S.M., 1999. Voluntary environmental and social accounting disclosure practices in the Asia-Pacific region: an international empirical test of political economy theory. The International Journal of Accounting, 34 (2), 209-238.
Williams, S.M. and Ho, W.P.S., 1999. Corporate social disclosures by listed companies on their web sites: an international comparison. The International Journal of Accounting, 34 (3), 389-419.
Wilmshurst, T.D. and Frost, G.R., 2000. Corporate environmental reporting: a test of legitimacy theory. Accounting, Auditing & Accountability Journal, 13 (1), 10-26.
Wiseman, J., 1982. An evaluation of environmental disclosures made in corporate annual reports. Accounting, Organizations and Society, 7 (1), 53-63.
WRI, 2010. GHG Protocol Initiative. Available from: http://www.wri.org/project/ghg-protocol [Accessed 18 October 2010].

Appendix – Disclosure Indices

Overall environmental disclosure index (*ENV*)

No	Disclosure categories and items	Map to GRI	Scores
1	***Strategy and Analysis***		
1.1	CEO/chairman statement	1.1-1.2;DMA	0-3
1.2	Vision/mission statement	4.8	0-1
			4
2	***Organisational Profile***		
2.1	Installed capacity by primary energy source	EU1	0-3
2.2	Risk & regulations	1.1-1.2;DMA;EN28	0-3
2.3	Awards received	2.10	0-1
			7
3	***Report Parameters***		
3.1	Report profile	3.1-3.4	0-3
3.2	Report process	3.5, 3.9	0-3
3.3	Methodology	3.6-3.11;EN7,16,20,24,29;EU4	0-3
3.4	GRI content index/a specific section	3.12	0-1
3.5	External assurance	3.13	0-3
			13
4	***Governance, Commitments, and Engagement***		
4.1	Organisation: structure & appointment	1.2;4.1;4.7;DMA	0-3
4.2	Organisation: duties & compensation	1.2;4.5;4.9-4.10	0-3
4.3	Internally developed policy	4.8;DMA	0-3
4.4	Commitment to external initiatives	4.11-4.13	0-3
4.5	Stakeholder engagement activities	4.4;4.12;4.14-4.17	0-3
			15
5	***Environmental Initiatives***		
5.1	Initiatives on materials & wastes	EN22,24,26,29;DMA	0-3
5.2	Initiatives on GHG emissions	EU5;EN6-7,18,26,29;DMA	0-3
5.3	Initiatives on water, discharges, & spills	EN23,26,29;DMA	0-3
5.4	Initiatives on biodiversity	EN13-14;EU13;DMA	0-3
5.5	Initiatives on other emissions	EN26,29;DMA	0-3
5.6	Initiatives on other environmental impacts	EN26,29;DMA	0-3
5.7	Training & awareness	DMA	0-3
5.8	Management system/audit	EN13;DMA	0-3
5.9	Accounting system	not available	0-3
5.10	Other contributions/involvements	not available	0-3
			30
6	***Performance Indicators***		
6.1	Materials performance indicators		
	6.1.1 Materials use	EN1,26	0-5
	6.1.2 Recycled materials	EN2	0-5
6.2	Energy performance indicators		
	6.2.1 Direct energy consumption	EU2;EN3,29	0-5
	6.2.2 Indirect energy consumption	EN4,29	0-5
	6.2.3 Energy saving	EN5-7	0-5
6.3	Water performance indicators		
	6.3.1 Total water withdrawal	EN8-9	0-5
	6.3.2 Water recycling	EN10	0-5
6.4	Biodiversity	EU4;EN11-12,15,23,25	0-3
6.5	Emissions, effluents, & waste		

No	Disclosure categories and items	Map to GRI	Scores
	6.5.1 Direct & indirect GHG emissions	EN16,29	0-5
	6.5.2 Other indirect GHG emissions	EN17,29	0-5
	6.5.3 Emissions of NO_x, SO_2, & others	EN19-20,29	0-5
	6.5.4 Water discharges	EN21, 25-26, 29	0-5
	6.5.5 Wastes	EN22,24,29	0-5
	6.5.6 Spills	EN23	0-3
6.6	Noise, visual, odour, & radiation	EN29	0-3
6.7	Compliance, complaints, & sanctions	EN28	0-3
6.8	Expenditures & investments	EN30	0-5
6.9	Dollar savings/monetary benefits	1.2, DMA	0-5
			82
		Total disclosure (TD)	**151**

CO_2 emissions disclosure index (CO_2)

No	Disclosure categories and items	Map to GRI	Scores
1	***Strategy and Analysis***		
1.1	CEO/chairman statement	1.1-1.2;DMA	0-3
1.2	Vision/mission statement	4.8	0-1
			4
2	***Organisational Profile***		
2.1	Risks & regulations	1.1-1.2;DMA;EN28	0-3
2.2	Awards received	2.10	0-1
			4
3	***Report Parameters***		
3.1	Report profile	3.1-3.4	0-3
3.2	Report process	3.5;3.9	0-3
3.3	Methodology	3.6-3.11;EN7,16,29	0-3
3.4	GRI content index/a specific section	3.12	0-1
3.5	External assurance	3.13	0-3
			13
4	***Governance, Commitments, and Engagement***		
4.1	Organisation	1.2;4.1;4.5;4.7;4.9-4.10;DMA	0-3
4.2	Internally developed policy	4.8;DMA	0-3
4.3	Commitment to external initiatives	4.11-4.13	0-3
4.4	Stakeholders engagement activities	4.4;4.12;4.14-4.17	0-3
			12
5	***CO_2 Emissions Initiatives***		
5.1	Initiatives to reduce emissions		
	5.1.1 Renewable and non-emitting energy	EN6,18;DMA	0-3
	5.1.2 Energy efficiency	EN6-7,18,29;DMA	0-3
	5.1.3 Carbon capture & sequestration	EN18;DMA	0-3
	5.1.4 Emissions trading	EU5;EN30;DMA	0-3
5.2	Training & awareness	1.2;DMA	0-3
5.3	Management & accounting systems	DMA	0-3
5.4	Other contributions/involvements	not available	0-3
			21
6	***Performance Indicators***		
6.1	Direct & indirect emissions	EN16,29	0-5
6.2	Other relevant indirect emissions	EN17,29	0-5
6.3	Compliance, complaints, & sanctions	EN28	0-3
6.4	Expenditures & investments	EN30	0-5
6.5	Dollar savings/monetary benefits	1.2, DMA	0-5
			23
		Total disclosure (TD)	**77**

Table 1. Sample selection criteria and country composition

Panel A: Sample selection criteria

Criteria	*N*
Electricity firms on Compustat	621
Excluding:	
No electricity generation business	101
No data in CARMA	189
No corporate website (in English)	80
No annual report (in English)	46
Final sample	205

Panel B: Country composition

No	Country	*N*	%	No	Country	*N*	%
1	USA	78	38.0	19	Thailand	3	1.5
2	Canada	14	6.8	20	The Philippines	3	1.5
3	Japan	11	5.4	21	Greece	2	1.0
4	UK	11	5.4	22	Singapore	2	1.0
5	Russia	9	4.4	23	Cayman Islands	1	0.5
6	India	7	3.4	24	Colombia	1	0.5
7	Brazil	6	2.9	25	Czech Republic	1	0.5
8	Hong Kong	6	2.9	26	Denmark	1	0.5
9	Pakistan	6	2.9	27	Kenya	1	0.5
10	Italy	5	2.4	28	Korea	1	0.5
11	Australia	4	2.0	29	Norway	1	0.5
12	China	4	2.0	30	Oman	1	0.5
13	France	4	2.0	31	Portugal	1	0.5
14	Germany	4	2.0	32	Qatar	1	0.5
15	Malaysia	4	2.0	33	Saudi Arabia	1	0.5
16	Chile	3	1.5	34	Switzerland	1	0.5
17	New Zealand	3	1.5	35	Turkey	1	0.5
18	Spain	3	1.5				
					Total	205	100.0

Table 2. Descriptive statistics

Panel A: Distribution of disclosure scores

	CO_2_ALL		*ENV_ALL*	
Score range	*N*	%	*N*	%
91-100	0	0.00	0	0.00
81-90	1	0.49	0	0.00
71-80	4	1.95	2	0.98
61-70	8	3.90	5	2.44
51-60	26	12.68	28	13.66
41-50	12	5.85	14	6.83
31-40	16	7.80	24	11.71
21-30	35	17.07	47	22.93
11-20	46	22.44	46	22.44
1-10	39	19.02	37	18.05
0	18	8.78	2	0.98
	205	100.0	205	100.00
Minimum		0.00		0.00
Maximum		83.12		78.81
Mean		25.73		27.11

Panel B: Descriptive statistics for continuous independent and control variables

Variable	Mean	Median	Q1	Q3	Std dev
EP - EI	1106.785	1097.550	335.470	1813.905	777.078
EP - EL	21142428.700	4301155.000	116365.000	25200000.000	38755222.660
LAW	1.094	1.590	0.590	1.590	0.892
EPI	64.746	63.500	63.500	69.850	7.714
SIZE	17531.780	5592.434	1476.562	20311.180	33371.665
ROA	0.038	0.036	0.018	0.055	0.078
LEV	0.335	0.341	0.231	0.435	0.159
TOBIN Q	1.233	1.082	0.924	1.408	0.517
VOLAT	0.371	0.274	0.208	0.350	0.564
NEW	0.670	0.657	0.586	0.777	0.156
CAPIN	0.922	0.166	0.096	0.260	6.590
MEDIA	44.560	8.000	1.000	39.500	96.602
FOREIGN	0.108	0.000	0.000	0.014	0.247

Panel C: Distribution of categorical independent and control variables

	1		0	
Variable	*N*	%	*N*	%
LEGAL	63	30.7	142	69.3
ETS	39	19.0	166	81.0
LISTING	100	48.8	105	51.2

This table presents descriptive statistics for the disclosure scores and the independent and control variables used in the statistical analysis. Statistics are presented for the full sample of 205 firms. *CO_2_ALL* is the CO_2 emissions disclosure. *ENV_ALL* is the overall environmental disclosure. *EP – EI* is environmental performance measured as CO_2 emissions intensity, while *EP – EL* is environmental performance measured as CO_2 emissions levels. *LAW* is the countries' rule of law index. *EPI* is the countries' environmental performance index. *SIZE* is firm size. *ROA* is profitability. *LEV* is leverage. *TOBIN Q* is Tobin's q. *VOLAT* is stock price volatility. *NEW* is asset newness. *CAPIN* is capital intensity. *MEDIA* is media coverage. *FOREIGN* is foreign operations. *LEGAL* is countries' legal system. *ETS* is countries' carbon emissions trading scheme. *LISTING* is listing status.

Table 3. Correlation statistics

	CO_2_ALL	*ENV_ALL*	*EP - EI*	*EP - EL*	*EPI*	*ETS*	*LEGAL*	*LAW*	*SIZE*
CO_2_ALL	-	0.924***	0.009	-0.207***	0.356***	0.277***	0.197***	0.229***	0.695***
ENV_ALL	0.901***	-	-0.015	-0.202***	0.280***	0.151**	0.256***	0.093	0.710***
EP - EI	-0.017	-0.077	-	0.372***	0.303***	0.166**	0.233***	-0.039	-0.137**
EP - EL	-0.361***	-0.437***	0.646***	-	0.224***	0.110*	-0.057	0.071	-0.408***
EPI	0.288***	0.119**	0.304***	0.211***	-	0.467***	0.303***	0.463***	0.154**
ETS	0.194***	0.055	0.167***	0.167***	0.541***	-	0.243***	0.170**	0.019
LEGAL	0.148**	0.203***	0.238***	0.040	0.193***	0.243***	-	-0.434***	0.267***
LAW	0.162**	-0.011	0.008	0.108	0.528***	0.208***	-0.482***	-	0.099
SIZE	0.717***	0.741***	-0.105	-0.580***	0.095	0.026	0.234***	-0.053	-
ROA	0.143**	0.179***	-0.136**	-0.098	-0.137**	0.003	0.026	-0.133**	0.044
LEV	0.019	-0.025	-0.056	-0.159**	0.060	-0.161**	-0.064	0.013	0.147**
TOBIN Q	-0.151**	-0.150**	0.009	0.049	-0.085	0.121**	0.111*	-0.110*	-0.246***
VOLAT	-0.130**	-0.112*	-0.089	0.099*	-0.233***	-0.105*	-0.265***	0.020	-0.148**
NEW	-0.340***	-0.380***	0.170***	0.293***	-0.004	0.132**	-0.295***	0.208***	-0.373***
CAPIN	-0.053	-0.051	-0.043	-0.100*	-0.090	0.028	-0.033	0.018	0.022
MEDIA	0.626***	0.574***	-0.108*	-0.454***	0.112*	0.045	-0.136**	-0.191***	0.724***
FOREIGN	0.142**	0.022	0.075	0.038	0.358***	0.407***	-0.037	0.311***	0.096
LISTING	0.323***	0.326***	-0.199***	-0.217***	0.027	0.024	-0.206***	0.198***	0.307***

Table 3. Correlation statistics (Continued)

	ROA	*LEV*	*TOBIN Q*	*VOLAT*	*NEW*	*CAPIN*	*MEDIA*	*FOREIGN*	*LISTING*
CO_2_ALL	0.128**	0.003	-0.155**	-0.079	-0.352***	-0.073	0.543***	0.047	0.298***
ENV_ALL	0.154**	-0.007	-0.110	-0.112	-0.377***	-0.130	0.441***	-0.064	0.296***
EP - EI	-0.041	-0.056	-0.008	-0.024	0.171***	0.154**	0.029	0.125**	-0.193***
EP- EL	-0.035	-0.189***	-0.062	0.037	0.087	0.056	-0.304***	0.106	-0.177***
EPI	-0.052	-0.068	-0.153**	-0.040	-0.105	0.100	0.141**	0.307***	0.095
ETS	-0.020	-0.180***	0.081	0.030	0.142**	0.016	0.141**	0.436***	0.024
LEGAL	0.102	-0.055	0.162**	-0.099	-0.312***	-0.054	-0.003	0.042	-0.206***
LAW	-0.113	0.141**	-0.233***	0.049	0.056	0.091	0.196***	0.228***	0.279***
SIZE	0.162**	0.155**	-0.228***	-0.193***	-0.450***	-0.237***	0.489***	-0.095	0.284***
ROA	-	0.023	0.239***	-0.132**	-0.146**	-0.044	0.004	-0.093	-0.084
LEV	-0.194***	-	-0.157**	-0.152**	-0.085	-0.217***	-0.043	-0.010	-0.069
TOBIN Q	0.424***	-0.102*	-	0.085	0.180***	0.071	-0.125**	0.086	-0.181***
VOLAT	0.040	-0.065	0.030	-	0.163**	0.034	-0.010	0.061	0.105
NEW	-0.133**	-0.028	0.154**	0.307***	-	0.214***	-0.139**	0.190***	0.011
CAPIN	-0.160**	-0.015	0.071	0.226***	0.198***	-	-0.050	-0.017	-0.042
MEDIA	-0.014	0.114*	-0.190***	0.060	-0.103*	0.122**	-	0.098	0.275***
FOREIGN	-0.022	0.046	0.114*	0.062	0.123**	-0.007	0.171***	-	0.044
LISTING	0.017	-0.036	-0.233***	0.241***	-0.023	0.087	0.471***	0.108*	-

This table presents the correlation statistics for all the variables with Pearson's *r* above the diagonal and Spearman's rho below the diagonal. Statistics are presented for the full sample of 205 firms. *CO_2_ALL* is the CO_2 emissions disclosure. *ENV_ALL* is the overall environmental disclosure. *EP – EI* is environmental performance measured as CO_2 emissions intensity, while *EP – EL* is environmental performance measured as CO_2 emissions levels (for both measures the value of *EP* is reversed such that higher *EP* denotes lower emissions, i.e. better environmental performance). *EPI* is the countries' environmental performance index. *ETS* is countries' carbon emissions trading scheme. *LEGAL* is countries' legal system. *LAW* is the countries' rule of law index. *SIZE* is firm size. *ROA* is profitability. *LEV* is leverage. *TOBIN Q* is Tobin's q. *VOLAT* is stock price volatility. *NEW* is asset newness. *CAPIN* is capital intensity. *MEDIA* is media coverage. *FOREIGN* is foreign operations. *LISTING* is listing status. *, ** and *** represent significance levels (one-tailed) at the 10, 5, and 1 percent levels respectively.

Table 4. Results of the OLS regression

	CO_2 emissions ***intensity***		*CO_2 emissions* ***intensity***		*CO_2 emissions* ***level***		*CO_2 emissions* ***level***	
	Panel A: CO2_ALL		**Panel B**: ENV_ALL		**Panel C**: *CO_2_ALL*		**Panel D**: *ENV_ALL*	
	β	*p*-value	*β*	*p*-value	*β*	*p*-value	*β*	*p*-value
Constant	-40.377	0.009***	-42.558	0.004***	-46.892	0.002***	-47.767	0.001***
Variables of interest:								
H1: *EP*	0.001	0.144	0.001	0.164	-0.097	0.326	-0.178	0.192
H2: *EPI* (+)	0.396	0.020**	0.447	0.008***	0.457	0.007***	0.495	0.003***
H2: *ETS* (+)	11.014	0.000***	4.512	0.053*	10.748	0.000***	4.257	0.064*
Control variables:								
LEGAL (+)	-3.861	0.121	-2.352	0.228	-3.012	0.184	-1.068	0.372
LAW (+)	-0.053	0.488	-1.897	0.120	-0.074	0.483	-1.764	0.139
SIZE (+)	5.780	0.000***	5.703	0.000***	5.571	0.000***	5.357	0.000***
ROA (+)	11.511	0.177	8.371	0.240	11.979	0.170	10.523	0.190
LEV (+)	-1.049	0.434	-4.417	0.231	-1.183	0.426	-5.103	0.198
TOBIN Q (-)	1.473	0.242	2.966	0.070	1.478	0.230	2.323	0.111
VOLAT (+)	1.342	0.220	0.343	0.418	1.281	0.231	0.266	0.437
NEW (-)	-19.602	0.004***	-13.284	0.029**	-17.367	0.008***	-10.429	0.065
CAPIN (-)	0.196	0.094	0.018	0.451	0.213	0.077	0.039	0.391
MEDIA (+)	0.042	0.000***	0.018	0.050**	0.044	0.000***	0.020	0.030**
FOREIGN (+)	-3.165	0.228	-6.558	0.053	-3.184	0.227	-6.435	0.057
LISTING (+)	3.169	0.064	4.525	0.012**	2.681	0.097	3.982	0.022**
N	205		205		205		205	
Model *F* stat	22.351	0.000***	17.792	0.000***	22.233	0.000***	17.735	0.000***
Adj. R^2	0.611		0.553		0.610		0.552	

The expected signs are presented in parentheses. *CO_2_ALL* is the CO_2 emissions disclosure. *ENV_ALL* is the overall environmental disclosure. *EP* is environmental performance, being CO_2 emissions intensity in Panel A and B and CO_2 emissions level in Panel C and D (for both measures the value of *EP* is reversed such that higher *EP* denotes lower emissions, i.e. better environmental performance). *EPI* is the countries' environmental performance index. *ETS* is coded 1 for countries with an ETS scheme, otherwise 0. *LEGAL* signifies countries' legal system, where code law = 1, common law = 0. *LAW* is the countries' rule of law index. *SIZE* is firm size. *ROA* is profitability. *LEV* is leverage. *TOBIN Q* is Tobin's q. *VOLAT* is stock price volatility. *NEW* is asset newness. *CAPIN* is capital intensity. *MEDIA* is media coverage. *FOREIGN* is foreign operations. *LISTING* is listing status. *, ** and *** represent significance levels at the 10, 5, and 1 percent levels respectively, all one-tailed, except for the constant.

Table 5. Results of the OLS regression - *US* vs. *non-US* firms

	Panel A: *US*				**Panel B**: *Non-US*			
	CO_2_ALL		*ENV_ALL*		*CO_2_ALL*		*ENV_ALL*	
	β	*p*-value	*β*	*p*-value	*β*	*p*-value	*β*	*p*-value
Constant	-16.681	0.354	-18.233	0.232	-49.915	0.009***	-49.695	0.009***
Variables of interest:								
H1: *EP*	0.003	0.045**	0.002	0.077	0.000	0.422	0.001	0.323
H2: *EPI* (+)	-	-	-	-	0.445	0.023**	0.463	0.019**
H2: *ETS* (+)	-	-	-	-	10.043	0.004***	3.242	0.191
Control variables:								
LEGAL (+)	-	-	-	-	-5.666	0.077	-4.044	0.153
LAW (+)	-	-	-	-	0.328	0.436	-1.447	0.238
SIZE (+)	6.118	0.000***	6.012	0.000***	6.325	0.000***	6.241	0.000***
ROA (+)	212.814	0.017**	120.473	0.075	15.795	0.159	13.527	0.195
LEV (+)	-7.276	0.287	-1.359	0.451	3.210	0.343	-2.816	0.361
TOBIN Q (-)	0.059	0.497	-1.207	0.415	0.858	0.375	3.324	0.109
VOLAT (+)	37.463	0.025**	33.319	0.020**	-1.324	0.382	-3.616	0.206
NEW (-)	-45.646	0.007***	-33.268	0.016**	-15.521	0.046**	-9.414	0.151
CAPIN (-)	-6.357	0.281	-1.158	0.450	0.181	0.146	0.011	0.475
MEDIA (+)	0.050	0.000***	0.023	0.023**	0.029	0.054	0.007	0.352
FOREIGN (+)	4.910	0.338	-10.653	0.143	-4.128	0.222	-6.442	0.115
LISTING (+)	6.865	0.024**	6.019	0.020**	4.655	0.080	6.810	0.020**
N	75		75		127		127	
Model *F* stat	12.126	0.000***	9.770	0.000***	14.350	0.000***	10.722	0.000***
Adj. R^2	0.623		0.566		0.614		0.536	

Three firms are dropped from the US sample because of a Cook's distance value > 1.0. The expected signs for the variables are presented in parentheses. *EP* is environmental performance, being CO_2 emissions intensity, the value of *EP* is reversed, thus higher *EP* represents lower emissions, i.e. better environmental performance. Unstandardised coefficients are reported. All variables are defined in Table 4. ** and *** represent significance levels at 5 and 1 percent levels respectively, all one-tailed, except for the constant.

Table 6. Results of the OLS regression – *soft vs hard disclosures*

	Panel A: *Soft*				**Panel B**: *Hard*			
	CO_2_SOFT		*ENV_SOFT*		*CO_2_HARD*		*ENV_HARD*	
	β	*p*-value	*β*	*p*-value	*β*	*p*-value	*β*	*p*-value
Constant	-15.729	0.009***	-20.735	0.003***	-15.827	0.015**	-43.096	0.008***
Variables of interest:								
H1: *EP*	0.000	0.263	0.000	0.406	0.001	0.092	0.002	0.132
H2: *EPI* (+)	0.180	0.009***	0.278	0.001***	0.131	0.054	0.405	0.023**
H2: *ETS* (+)	3.952	0.001***	0.799	0.274	4.486	0.000***	5.832	0.030**
Control variables	included		included		included		included	
N	205		205		205		205	
Model *F* stat	23865	0.000***	19.148	0.000***	16.749	0.000***	15.317	0.000***
Adj. R^2	0.627		0.572		0.537		0.513	

The expected signs for the variables are presented in parentheses. *EP* is environmental performance, being CO_2 emissions intensity, the value of *EP* is reversed, thus higher *EP* represents lower emissions, i.e. better environmental performance. Unstandardised coefficients are reported. *SOFT* disclosures are unverifiable claims and general disclosures, whereas *HARD* disclosures are verifiable and specific. All other variables are defined in Table 4. ** and *** represent significance levels at 5 percent and 1 percent levels respectively, all one-tailed, except for the constant.

Table 7. Results of the OLS regression (by reporting medium)

	Panel A: *CO_2_AR*		**Panel B**: *CO_2_SAR*		**Panel C**: *CO_2_WS*		**Panel D**: *ENV_AR*		**Panel E**: *ENV_SAR*		**Panel F**: *ENV_WS*	
	β	*p*-value	*β*	*p*-value	*β*	*p*-value	*β*	*p*-value	*β*	*p*-value	*β*	*p*-value
Constant	-25.425	0.006***	-10.784	0.287	-19.398	0.043**	-28.206	0.001***	-12.484	0.262	-23.002	0.006***
Variables of interest:												
H1: *EP*	0.001	0.174	0.002	0.090	0.000	0.412	0.001	0.140	0.003	0.069	0.000	0.279
H2: *EPI* (+)	0.321	0.006***	0.036	0.440	0.202	0.076	0.396	0.001***	0.079	0.374	0.221	0.025**
H2: *ETS* (+)	4.207	0.015**	15.317	0.000***	7.298	0.001***	-3.632	0.018**	14.742	0.000***	4.367	0.006***
Control variables	included		included		included		included		included		included	
N	204		205		205		205		205		205	
Model *F* stat	16.430	0.000***	10.463	0.000***	16.043	0.000***	12.738	0.000***	8.673	0.000***	12.395	0.000***
Adj. R^2	0.533		0.410		0.525		0.463		0.361		0.456	

One firm is dropped from the *CO_2_AR* sample (Panel A) for a Cook's distance value > 1.0. The expected signs for the variables are presented in parentheses. *EP* is environmental performance, being CO_2 emissions intensity, the value of *EP* is reversed, thus higher *EP* represents lower emissions, i.e. better environmental performance. Unstandardised coefficients are reported. *CO_2_AR* is the disclosure scores for the CO_2 emissions information reported in the annual report. *CO_2_SAR* is the disclosure scores for the CO_2 emissions information reported in the stand-alone report. *CO_2_WS* is the disclosure scores for the CO_2 emissions information reported on the website. *ENV_AR* is the disclosure scores for the overall environmental information reported in the annual report. *ENV_SAR* is the disclosure scores for the overall environmental information reported in the stand-alone report. *ENV_WS* is the disclosure scores for the overall environmental information reported on the website. All other variables are defined in Table 4. **, and *** represent significance levels at the 5 percent and 1 percent levels respectively. All tests are one-tailed, except for constant.