**School of Accounting**

# Corporate Governance Determinants of Environmental and Climate Change Disclosures and Performance: An Australian Empirical Study

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## DECLARATION

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

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Signature:……

Date:…….....

## ABSTRACT

*Corporate boards are no longer faced with expectations that focus solely on profit maximisation, but to give proper regard to the impact of its operations on the environment. Former UN Secretary-General Kofi Annan urges businesses to focus on the long term integration of business goals with objectives which consider our 'natural capital account'. In his words, "businesses cannot prosper in societies that fail" (Watson 2016,20).*

*The importance of environmental governance is evident. This thesis examines if environmental governance measures (board independence, presence of an environmental/sustainability committee, engagement in environmental assurance and three aspects of board affiliations) are associated with environmental and climate change (ECC) disclosures and performance. This is done to ascertain if these measures are substantive or symbolic governance measures. This study is performed during a period when Australia observed significant changes in Climate Change policies and introduction of prescriptive authoritative requirements for firms to report ECC information in corporate reports (i.e. introduction and subsequent repeal of Carbon Pricing, ASIC's Regulatory Guidance 247, ASX Corporate Governance 3rd Edition Recommendation 7.4). Examination of the 'regulatory effects' due to policy and authoritative guidance on the said associations are also considered.*

*Univariate results show year on year increases in levels of ECC disclosures over the five year period. Statistically significant differences in ECC disclosure levels are observed for two years before and two years after regulatory change. The greatest difference is observed in the two years preceding regulation. Results from multivariate analyses report that the presence of an independent board, environmental committees and environmental assurance are significant determinants of the extent of ECC disclosures and both positive and negative ECC performance indicators. Board resource dependence capabilities from director affiliations show that boards with environmental affiliation are not associated with the extent of ECC disclosures, while those with social/humanitarian and community affiliation are. Furthermore, the negative association with ECC performance reported for environmentally affiliated directors suggests that their roles are not only symbolic but potentially legitimizing as they have greater incentive to suppress negative ECC performance outcomes of the firm. Social/humanitarian affiliated directors are associated with only positive ECC performance, indicative of advisory capabilities which emphasise philanthropy and positive environmental endeavors, consistent with maintaining a positive image of the firm. Only community affiliated boards report positive association with both positive and negative environmental performance indicators, which suggest that their far wider connection with potentially influential stakeholders act as substantive governance measures associated with improved environmental engagement and accountability.*

*The impact of policy and regulatory change affects the associations for environmental committee and boards with social/humanitarian affiliation. Environmental committees' role in relation to firm ECC disclosures become less important with more stringent reporting requirements, while its association with environmental activities which reflect positive ECC performance outcomes is exacerbated. Similarly, a statistically greater association with only positive ECC performance for boards with social/humanitarian affiliation is observed. This augments the view that their capabilities linked to firm reputation management are also exacerbated with heighten regulation as it is likely to lead to greater engagement in activities which project positive philanthropic initiatives. However, despite regulation, independent boards, environmental assurance and boards with community affiliated directors remain substantive governance measures and directors with environmental affiliation remain only symbolic measures of environmental governance.*

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## GLOSSARY OF KEY ABBREVIATIONS

| | |
|---|---|
| ASX | Australian Securities Exchange |
| ASIC | Australian Securities Investment Commission |
| CCRF | Climate Change Reporting Framework |
| CDSB | Climate Disclosure Standards Board |
| CDP | Carbon Disclosure Project |
| CER | Clean Energy Regulator |
| Ceres | Coalition for Environmentally Responsible Economies |
| CGPR | Corporate Governance Principles and Recommendations |
| COAG | Council of Australian governments |
| CEFL | Clean Energy Future Legislation Package |
| COP | Conference of Parties |
| CPM | Carbon Pricing Mechanism/Carbon Price |
| CSR | Corporate Social Responsibility |
| DJSI | Dow Jones Sustainability Index |
| ECC | Environmental and Climate Change |
| ESI | Environmentally Sensitive Industries |
| ETS | Emissions Trading Scheme |
| GHG | Greenhouse Gas |
| GRI | Global Reporting Initiative |
| IETA | International Emissions Trading Association |
| IIRC | International Integrated Reporting Council |
| IPCC | International Panel on Climate Change |
| ISO | International Organisation for Standardization |
| KP | Kyoto Protocol |
| NGER Act | National Greenhouse and Energy Reporting Act 2007 |
| NGRS | National Greenhouse Response Strategy |
| NPI | National Pollution Inventory |
| OECD | The Organisation for Economic Co-operation and Development |
| OFR | Operating and Financial Review |
| PRI | Principles for Responsible Investment |
| RET | Renewable Energy Target |
| SASB | Sustainability Accounting Standards Board |
| SEC | Securities Exchange Commission |
| UN Global Compact | United Nations Global Compact |
| UNEP | United Nations Environment Programme |
| UNFCC | United Nations Framework Convention on Climate Change |
| VCPOL | Vienna Convention for the Protection of the Ozone Layer |
| WBCSD | World Business Council for Sustainable Development |
| WBSCC | World Business Summit on Climate Change |
| WEFGHGR | World Economic Forum Global Greenhouse Gas Register |
| WRI | World Resources Institute |

# CHAPTER ONE
# INTRODUCTION

## 1.1 Introduction

Australian environmental and climate change (ECC)[1] related policies have been weighted down by various approaches over the last three decades (Griffith, Haigh and Rassias, 2007; Warren, Christoff and Green, 2016; Sullivan, 2005; Pearse, 2016). For the first time, a legislative carbon price mechanism was introduced in Australia from 1 July 2012, where 'liable entities'[2] were to report and pay a price for their carbon emissions and ultimately transition to an emission trading scheme (ETS). The Carbon Pricing Mechanism (CPM) only had a two year operative life span before it was abolished with effect from 1 July 2014 (Department of Environment and Energy 2017). More recently, the current Coalition government abandons the Clean Energy Target (CET) approach which requires companies to obtain power sources from low emission technology, in favour of the National Energy Guarantee (NEG) Strategy which relies on a percentage of coal fired power sources. The NEG also calls on the eventual phase out subsidies for renewables (Yaxley and Sweeney, 2017).

Furthermore, during this time, greater authoritative measures have been introduced requiring corporate Australia to provide ECC disclosures. Up until recently, the only authoritative requirement for Australian firms to provide ECC disclosure in corporate reports is section 299(1)(f) of the Corporations Law. In 2013, coinciding with the first operative year of the CPM, the Australian Securities and Investment Commission (ASIC) issued Regulatory Guide 247 (RG247). RG247 raised considerable attention on directors to ensure that they provide disclosures relating to the implications of social and environmental risks on the entity (ASIC, 2013).

[1] In this thesis, reference to a firms' environmental and climate change (ECC) related impacts pertain to environmental impacts from greenhouse gas (GHG), energy, pollutants, waste, water and other substances of environmental significance and may contribute to shifts in atmospheric conditions in climate over many decades. (Oxford dictionary refers to 'environment' as the 'surroundings or conditions in which a person, animal or plant lives or operates', while 'climate change' makes reference to a 'change in global or regional climate patterns' ).

[2] 'liable entities' under the Clean Energy Act 2011 were legal persons who are liable under the CPM. As at time of writing, the LEPID (Liable Entities Public Information Database) contains lists for 2012-2013 and 2013-2014 LEPID, correct as at 30 June 2015 available on http://www.cleanenergyregulator.gov.au/Infohub/CPM/Liable-Entities-Public-Information-Database.

Additionally, Australian Securities Exchange (ASX)'s 3rd edition release of the Corporate Governance Principles and Recommendations (CGPR) also calls on listed firms to disclose material exposure to environmental risks effective from 1 July 2014 (ASX, 2016), during the decoupling effect of the CPM repeal.

For corporate Australia, Federal government initiatives on ECC policies have brought anything but certainty or predictability to businesses as it lacks "a coherent national approach" (Climate Council, 2017,1) and "suffers from a lack of direction, short-termism and a haphazard approach" (ACOLA[3], 2017) . For this reason, it is not surprising that Australia's system is characterised as one where corporate volunteerism prevails as firms tend to adopt their own stance toward managing their ECC agenda (Griffith Haigh and Rassias, 2007). In fact, businesses will themselves to undertake corporate action under a fragmented and weak policy regime (Jones and Levy 2007).

## 1.2 Motivation for Research

Given the precarious climate policy developments in Australia over the past three decades, coupled with more recent legislative measures[4] in Australia requiring corporate Australia to disclose environmental and climate information, the importance of examining voluntary measures adopted by corporate Australia today could not be more, timely. Recent trends also show that voluntary corporate initiatives through their alliances with organisations which commit to collective action on climate change (e.g. World Business Council for Sustainable Development, Ceres, Climate Group), engagement with rating indicators which score firms as best or poor social and environmental performers (e.g. Dow Jones Sustainability Index (DJSI) and voluntary participation in international carbon trading schemes (e.g. European ETS, Chicago Climate Exchange) have all fast become standard corporate protocols. These have also led to a greater importance for accurate GHG measurements through the adoption of voluntary reporting frameworks, which have

[3] ACOLA is an independent not for profit that supports evidence based interdisciplinary research. It is a combination of four learned academies : Australian Academy of Science, Academy of Social Sciences in Australia, Australian Academy of the Humanities and Australian Academy of Technological Sciences and Engineering (ACOLA, 2017).

[4] Details pertaining to policy and regulatory developments since its early beginnings are presented in section 2.2 and section 2.3 in the following Chapter.

eventually even become mandatory ones in some jurisdictions[5] internationally (KPMG 2017; Kauffmann, Tebar Less and Teichmann, 2012). Australian corporate leaders also proclaim the importance of the environmental and climate change (ECC) agenda with respect to their overall corporate objective: "Responding to climate change is a priority Board governance and strategic issue for our Company" (BHP 2015, 2016). In essence, voluntary disclosure and governance measures adopted by corporations appear to reflect their view of the importance of the ECC agenda and their beliefs on scholarly finds which suggest that corporate disclosure of ECC related performance results, plans and initiatives are used by key stakeholder groups and investors to assess corporate performance and risks (Griffin, Lont and Sun, 2012; IGCC, 2016). For this reason, it is important to address if voluntary disclosure measures and firm governance mechanisms employed today, are positive steps toward greater environmental accountability or are merely symbolic measures.

Existing trends indicate that more boards are designing board committees or creating specific executive positions which focus on environmental concerns of organisations (Peters and Romi, 2014; Liao, Luo and Tang, 2011). Firms are also increasingly engaging in environmental assurance over reported information (Perego and Kolk, 2012). According to a survey, among global 250 firms, 67 per cent of firms that issue corporate sustainability reports in 2016 engage in third party assurance, a twofold increase from only 30 per cent in 2005 (KPMG 2017, 26). Additionally, as independent non-executive directors are to represent the best interest of security holders and their presence are recommended by regulatory authorities (ASX CGC 2014,14), their role in relation to the firms' environmental agenda should be better understood, particularly given recent carbon policy and ECC disclosure initiatives. Today, firms are also expected to engage in social and community concerns, to benefit their 'triple bottom line' (TBL) or meet the 3Ps (people, planet and profits) model as good corporate citizens (Elkington, 1997; Bachoo,Tan and Wilson, 2013). Firms are increasingly involved in these initiatives and their involvement is expected to affect board characteristics. Therefore, from a resource dependence view in corporate governance (Hillman and Dalziel, 2003), directors with social, community

[5] For example, the EU Non-Financial Reporting Directive (eg. Finland, Ireland, Greece, Czech Republic) will name companies publically if they fail to report on their social, environmental and board diversity policies, Canada, Japan, EU, Australia, Israel, UK, EU observed mandatory requirements to report ECC information (Kauffmann, Tebar Less and Teichmann 2012, Figure 2).

and environmental affiliations could affect firms' environmental engagement. There appears to be little evidence of this being examined in literature. For these reasons, this study seeks to address the association between board independence, presence of environmental/CSR committees, environmental assurance and directors' social, environmental and community affiliations with environmental and climate change (ECC) disclosures and performance.

Additionally, as research generally tend to support pro-regulatory measures in favour of existing corporate voluntarism with respect to disclosure accountability (Ribeiro, Carmo and de Carvalho, 2013; Clarkson, Overell and Chapple, 2011; Frost, 2007), there is a lack of studies which examine if corporate volunteerism is affected by policy or regulatory changes. In this study, the researcher examines if the associations between governance mechanisms and ECC disclosures and performance are exacerbated, inhibited or remain the same during these tumultuous periods.

## 1.3 Objectives and aims

The broad objective of this study is to examine environmental and climate change (ECC) disclosures of top ASX listed firms over a five year period and if specific governance measures are associated with the extent of ECC disclosures and ECC performance.

Specifically the aims are firstly, to report on ECC disclosure trends of ASX firms' corporate annual reports and sustainability reports during significant policy and regulatory changes. This is done to report on disclosure patterns overtime. Across sector examination also provides evidence overtime of the extent of standardisation of disclosure practices in relation to an index[6] built on the requirements of an international framework, the Climate Change Reporting Framework (CCRF). Secondly, this study examines if three common and prominent environmental governance mechanisms adopted by firms today (board independence, environmental committee and environmental assurance) and board resource dependence capabilities

[6] This study uses CCRF requirements to build the ECC disclosure index (ECC Index). ECC index applied in this study is adapted from eight out of twelve requirements set out in the latest CCRF June 2015 release and is comprised of 59 items grouped into five disclosure categories which measure the quantitative, qualitative, scope and methodology, assurance and disclosure presentation. Further details are presented in Chapter 4

relating to director affiliations in three areas (environmental, social/humanitarian and community affiliations[7]) are associated with *ECC disclosures*. Thirdly, the association between these governance variables and firm *ECC performance* indicative of positive or negative environmental performance is also examined. These tests address if specified governance measures are in fact substantive measures or mere symbolic gestures in relation the corporations' environmental disclosure initiatives and performance. Fourthly, this study adds a further dimension and understanding to the examined associations by integrating the effect of authoritative and policy changes ('regulatory effect') observed during the research period on examined relations. This is done to observe if regulatory effects exacerbate or otherwise inhibit the said associations. This is rarely considered in many prior studies, where the regulatory context is inferred based on study period and not explicitly tested (Liao, Luo and Tang 2015; Choi, Lee, Psaros 2013).

## 1.4 Contribution of research

This research is significant for several key reasons. Firstly, this longitudinal study provides evidence of the implications on corporate ECC disclosures as a result of recent changes in Climate Change policy and prescriptive changes in requirements for firms to report ECC information in corporate reports in Australia. Secondly, it is also the first quantitative study which measures the extent of corporate ECC disclosure against requirements outlined in the Climate Change Reporting Framework (CCRF). As far as the researcher is aware, there has only been one other Australian study that has previously applied the requirements of draft CCRF (Cotter, Najah and Wang 2011). Cotter, Najah and Wang (2011)'s case study involved examination of only one Australian listed company and is benchmarked against an evaluation tool derived from the first Climate Disclosure Standards Board (CDSB)'s draft reporting framework issued in May 2009. The existing CCRF is the only framework today which was designed to incorporate requirements and provisions found in financial standards (e.g. IASB), international legislation (e.g. UK Companies Act 2006), regulatory sources on specific environmental elements (e.g. UK Department of Environment, Food and Rural Affairs, Australian Water

[7] Board affiliation definitions can be found in Appendix A.

Accounting Standards) and voluntary reporting regimes (e.g. GRI, IIRC, ISO, OECD) and applies characteristics and principles of comparability and decision usefulness, similar to that applied in preparing financial information (CDSB 2015). Therefore, this study is the first to provide preliminary evidence on the extent of standardization of current ECC disclosure practices of top ASX listed firms against an international reporting framework, which purports to incorporate requirements of other prominent standards. In so doing, this study will examine if there are distinct disclosure trends or uniformity of disclosures across disclosing firms or respective industries over a five year research period. Thirdly, examination of the association between director affiliations and ECC disclosures and performance in this manner is the first in Australian social and environmental (SED) literature. The examination of board affiliation segregated into three distinct categorisation is also the most comprehensively done when compared to other international studies (De Villiers and van Staden, 2011; Mallin, Michelon and Raggi, 2013; Rodrigue, Magnan and Cho, 2013).

## 1.5 Limitations and assumptions

The researcher acknowledges that this study should be considered in light of certain limitations and assumptions. There is inevitably some level of judgement being applied due to subjectivity in the construction of the ECC disclosure and performance indexes. However, consistent application of criteria and stated assumptions were performed. These are further detailed in Chapter 4. Although the results of this study may be generalisable, but it should be carefully considered in light of the institutional settings which firms may operate in. These results would be particularly relevant only if they operate in similar settings as the Australian context. Indicators of ECC performance is also subject to that which is disclosed in corporate reports and may not be truly indicative of firm's environmental engagement or performance.

## 1.6 Overview of Thesis

This thesis proceeds as follows. In Chapter 2, literature is reviewed to uncover the background and developments of Australia's ECC policies, regulatory guidance

measures concerning firm ECC disclosures and voluntary ECC reporting regimes. It also discusses the importance of examining governance in the ECC disclosure-performance context and presents findings from literature on studies examining governance and ECC disclosures and ECC performance. Chapter 3 presents the theoretical framework and hypotheses for this study. Chapter 4 details sample selection, variable definitions and research methodologies used in this study. Chapters 5 and 6 presents results of Univariate and Multivariate statistical tests performed. Chapter 7 discusses sensitivity tests performed and results obtained. Finally, Chapter 8 concludes on overall results, presents limitations, implications and contribution of this study.

# CHAPTER TWO
# LITERATURE REVIEW

## 2.1 Introduction

This Chapter begins with section 2.2, which discusses the background and developments of Australia's environmental and climate change (ECC) policy initiatives from its early beginnings. This is followed by literature on legislative and recent authoritative guidance measures requiring ECC disclosures in corporate reports of Australian firms. In Section 2.3, three voluntary disclosure regimes, Carbon Disclosure Project (CDP), Global Reporting Initiative (GRI) and CCRF (Climate Change Reporting Framework) are discussed to inform about their aims, scope, recent developments and their impact on corporate ECC disclosure practices today. Section 2.4 provides a brief survey of prior literature examining motivations of firms to provide ECC disclosure and discusses the importance of governance determinants in this context. Section 2.5 and section 2.6 presents chronologically both international and Australian studies which examine the relation between governance and ECC disclosure and ECC performance respectively. Finally, section 2.7 concludes this Chapter.

## 2.2 Environmental and climate change policy initiatives in Australia

### *2.2.1 Australian ECC policy initiatives and politics on climate change*

Initial attempts in the 1980s by Malcolm Fraser's government, proposed the principles of the World Conservation Strategy (WCS)[8] in Australia, which then led to a National Conservation Strategy for Australia (NCSA) in June 1983. The objectives of NCSA did not come to fruition until 1988 when the National Strategy for Ecologically Sustainable Development (ESD) was established. The ESD established a greater role for federal government in environmental policies, which at that time belonged primarily to States and Territories. This was aimed at integrating economic and environmental policy goals in policies (Emmery, 1994). Subsequently, following the 1988 Toronto Conference on Climate Change, Labor government led by Bob Hawke adopted an interim emissions planning target[9] in 1990. The emergence of 'climate change' as a policy in Australia then took centre stage. At this time, States already had their own emission reduction approaches and this led to incongruent State and Federal approaches. For example, the Victorian State government initiated the Greenhouse Strategy (GS) which pushed for greater fuel substitution towards gas and renewable energy technologies, whilst the federal government under the ESD was guided by interim emission targets and relied on market approaches where polluters paid (Willis 1992).

Paul Keating, who succeeded Bob Hawke as Prime Minister in December 1991 then led the Federal government to adopt more neoliberal policies which promote market competition (Warren, Christoff and Green, 2016). Australia's ratification of the United Nations Framework on Climate Change (UNFCC) on 4 June 1992 following UN's Rio Summit then led to the nation's policy response to address the purposes of the UNFCC through the National Greenhouse Response Strategy (NGRS)[10]. The

[8] World Conservation Strategy (WCS) was a global framework for practical guidance on conservation efforts prepared by Conservation of Nature and Natural Resources (IUCN), United Nations Environment Programme (UNEP) and Wold Wildlife Fund (WWF) (Emmery, 1994).

[9] An interim emissions target was a national reduction of greenhouse gas (GHG) by 20% below 1998 levels by 2005. (Warren, Christoff and Green, 2016).

[10] The NGRS included The Greenhouse Challenge program (GC), which was a voluntary measure initiated by Keating's government which relied on organisations' initiative to achieve maximum GHG abatement as was practicable. GC was officially endorsed by the Council of Australian governments (COAG), a peak intergovernmental forum established in May 1992 (Griffith, Haigh and Rassias, 2007).

NGRS was an integrated framework approach between industry and government at all levels (commonwealth, state and local) and hinged heavily on voluntary participation by corporations to assist Australia to meet its commitments. The National Greenhouse Gas Inventory (NGGI) was then established to facilitate Australia's international emissions reporting obligations under the UNFCC (Griffith, Haigh and Rassias, 2007). The NGGI today tracks Australia's emission performance and reports emission estimates based on the Kyoto Protocol system.

On the global front, following the first Conference of Parties (COP) in Berlin, in 1995, negotiations and submissions culminated in the adoption of the Kyoto Protocol in 1997 at the third COP in Kyoto Japan. The purposes of the Kyoto Protocol was to contain greenhouse gases (GHG) through approaches which reflect 'common but differentiated responsibilities' which effectively places wealthier industrialised countries with a heavier burden to commit to limiting GHG emissions. Australia was given a more generous concession due to its reliance on fossil fuels (UNFCC, 2016). Amidst these developments globally, John Howard's Coalition government which came to office from March 1996, emphasised Australia's 'carboniferous competitive advantage' (Warren, Christoff and Green, 2016, 5) and debated on the short term economic impacts of GHG mitigation and emphasised voluntary over mandated action. The Howard government initiated programs which minimise emissions through co-operative agreements, to engage the industry's support for climate change activities on the principle of voluntary actions which do not impose unnecessary costs on Australian industries, also famously known as its 'no regrets' strategy [11] (Sullivan, 2005). However, similar to Keating, Howard's policies were criticised as being weak climate policy commitments which failed to produce significant reforms for Australia (Pearce, 2016; Warren, Christoff and Green, 2016). To this end, although Australia signed the Kyoto Protocol on 24 April 1998, Howard's Coalition government did not ratify the Kyoto Protocol (Parliament of Australia, 2017a). This also saw the beginning of climate action groups such as Greenpeace mobilising movements aimed at translating the science of climate change into political objectives, as activists felt that they were not having rational debates on climate

[11] The basis of 'no regrets' principle initially applied to Australia's policy on emissions abatement globally, where Australia would not commit to abatement actions if there are no comparable action by other nations. This principle was extended to domestic abatement programs which implied progress on abatement initiatives were not meant to impact profitability or affect corporate competitiveness (Senate Report, 2000).

policies with the Howard government (Pearse, 2016). Howard government's policy stance subsequently shifted in consideration for a national emissions trading (ETS) scheme. This was mooted by initiatives like the Business Leaders Roundtable (BLR), where business leaders called for a national ETS as there was concern that delayed response by Australia would costs businesses (Griffth, Haigh and Rassias, 2007). This period also saw other initiatives, like the implementation of the National Pollution Inventory (NPI), which today requires Australian companies to measure and report on 93 toxic substances (NPI, 2007).

By 2007, both sides of politics promised to introduce a national emission trading scheme if elected. Australia's climate policy intensified as both sides of politics advocated different approaches. On 29 September 2007, Howard's government established the National Greenhouse and Energy Reporting Act 2007 (NGER) as a precursor to the planned introduction of an emission trading scheme in 2011 (Rankin, Windsor and Wahyuni, 2011). The NGER Scheme operates under the NGER Act and is a single national framework to report company information about GHG, energy production and consumption. The NGER Scheme also tracks Australia's progress against international emissions reduction commitments (Clean Energy Regulator, 2016).

The incoming Kevin Rudd Labor government then took office on 3 December 2007 and ratified the Kyoto Protocol on 12 December 2007, two years after the Kyoto Protocol entered into force on 16 February 2005 (Parliament of Australia 2017a). The Carbon Pollution Reduction Scheme (CPRS)[12], a national emissions trading scheme, then took centre stage following the Garnaut Climate Change review in 2008 (National Archives of Australia, 2017a). The CPRS Bill 2009 was introduced to Parliament in May 2009 (Betz and Owen, 2010). The CPRS was scheduled to commence on 1 July 2011 to cover 70 per cent of Australia's GHG. However, as the CPRS would impose higher costs on companies most affected, such as the mining and energy industries. The CPRS underwent amendments to appease these groups

[12] CPRS permits were to be acquired at a fixed price (at$10/tonne) in the first year (2011-2012), fully tradeable from 2012-2013 and thereafter permits were bankable (i.e. transferable for future use without restrictions). Free permits were to be given to coal-fired electricity companies, coal mining and emissions intensive trade exposed industries (EITE). These were to be given based on historic electricity output and ratio of emission intensity to average emission intensity. (Betz 2010, 4968)

(Rankin, Windsor and Wahyuni, 2011). In turn, CPRS was not supported by conservation groups and the Federal Greens party who saw that too many concessions were given to companies. Then, CPRS Bill 2009(No.2) followed by CPRS Bill 2010 ultimately failed to pass Parliament (Parliament of Australia, 2017b). The CPRS's momentum was also affected, following the outcome of the UNFCC negotiations in Copenhagen in December 2009 which failed to establish a legally binding agreement internationally (Warren, Christoff and Green, 2016). From interviews conducted with members of climate action groups, active mobilisation by activists shifted after Copenhagen. The "weight of inaction in Federal politics and internationally took its toll on the movement" (Pearse, 2016, 1089). Although Rudd's term in office was dominated by climate change, the effects of the global financial crisis (GFC) also impacted progress on their climate priorities. The CPRS being twice defeated could trigger but did not result in a double dissolution election (National Archives of Australia, 2017a).

Julia Gillard, who replaced Kevin Rudd on 24 June 2010, introduced the new Clean Energy Future Legislation package (CEFL) in November 2011 (National Archives of Australia, 2017b). The package constitutes 18 Bills (Grantham Institute 2015, 2). The legislative measures include the enactment of the Clean Energy Act 2011 which established the carbon pricing mechanism (CPM)[13] ("carbon tax"). The CPM required NGER liable entities to report and pay a price on carbon emissions from 1 July 2012. Other complementary initiatives to develop clean energy technologies set up during Gillard's term of government include the establishment of the Clean Energy Finance Corporation (CEFC), an independent entity with grants of $10 billion to develop and commercialise clean energy technologies and the Australian Renewable Energy Agency (ARENA) to administer research and development programs. In 2012, plans to link the Australian ETS to the EU ETS were in the pipeline. It involved a transitional phase starting from 1 July 2015 and to subsequently commence full linking from 2018 (Grantham Institute, 2015).

[13] The Carbon Pricing Mechanism (CPM) operated in two stages, a fixed price stage (1 July 2012 to 30 June 2015) and a flexible price stage (from 1 July 2015), where Australia's price of carbon was intended to be linked to the European (EU) Emissions Trading Scheme (ETS). Prior to the September 2013 Elections, the Federal government announced a proposed early transition to an Emission Trading Scheme (ETS) from 1 July 2014. However, the newly elected Liberal-Coalition government which came into office from September 2013, put forward carbon tax repeal bills in Parliament and promised the abolishment of the carbon price from 1 July 2014 (Department of Environment, 2014).

However, with the change in government in 2013, Bills to implement the link failed to materialise.

The outcome of the federal elections on 7 December 2013 paved the way for Tony Abbott's Coalition government to deliver on their election promise to abolish the carbon tax. Although activists support the carbon tax but their campaigns failed to deliver changes in public opinions (Pearse 2016, Figure1). The Clean Energy Legislation (Carbon Tax Repeal) Bill 2014 passed the House of Representatives and Senate on 17 July 2014, abolishing the price on carbon with effect from 1 July 2014 (Department of Environment and Energy, 2017c). Abott's Coalition government repealed the carbon tax but maintained that Australia's commitment under the Kyoto Protocol remain unchanged. Australia's target commitment for this period is to limit emission to 5 per cent below 2000 levels by 2020. To achieve this, the Coalition introduced their Direct Action Plan (DAP), which includes initiatives to boost renewable energy, support emerging technologies through the Renewable Energy Target (RET)[14] and an Emissions Reduction fund (ERF)[15] of $2.55 billion to incentivise businesses and community to invest in new technologies to improve energy efficiency or reduce carbon emissions (Miller, 2014).

The present Coalition government led by Malcolm Turnbull, who was sworn in as Prime Minister on 15 September 2015, ratified the Paris Agreement at the Paris COP on 12 December 2015 and Doha Agreement to the Kyoto Protocol. Australia

[14] RET in its present form is a result of changes overtime to the federal legislation enacted in 2000. The Renewable Energy (Electricity) Act 2000 (Cth) (RE Act) initially provided that by 2010 an additional 2 per cent of Australia's electricity generation must be from renewable sources (or a targeted 9,500 GWH of additional renewable electricity to be generated by 2010). This provided a framework for renewable generators to create certificates for every MWh of electricity produced above the generators baseline. By which in 2009, after two years of negotiations with State and Territory governments, it was agreed at COAG that the RET be expanded. The expanded RET was introduced in Parliament in June 2009, a month after the CPRS via The Amended Renewable Energy (Electricity) Bill 2000 (ARET). The ARET provided for a higher share of renewable electricity by 2020, an estimated 20% (or 45,000 GWH). The ARET is separated into two parts: Large scale renewable energy target (LRET) and Small scale renewable energy scheme (SRES). LRET is expected to deliver 41,000 GHW of the original 45,000 GWH 2020 target. SRES is expected to deliver the 4,000 GWH renewable energy generation and is an uncapped scheme (CCA, 2012 ; CCA,2014)

[15] The ERF is administered using three elements, 'crediting', 'purchasing' and 'safeguarding' emissions reductions. 'Crediting' emissions reduction involves the issuance of one Australian Carbon Credit Unit (ACCU) for each tonne of emission reduction delivered by emissions reduction projects approved under ERF methods. ACCUs are issued by the Australian National Registry of Emission Units (ANREU), administered by the Clean Energy Regulator (CER) and can be sold to the government through a reverse auction. Through competitive reverse auctions held by CER, CER will 'purchase' emissions reductions at the lowest available cost and contract with successful bidders. Payments under contract are upon delivery of emission reduction. 'Safeguarding' emissions reductions commenced on 1 July 2016 and set out to ensure ERF are not displaced by increases in emissions above normal business conditions elsewhere in the economy by requiring large emitters to maintain emissions within baseline levels (Department of Environment and Energy, 2016).

commits to reduce emissions by 26 to 28 per cent below 2005 levels by 2030, a step up from previous commitment (Department of Environment and Energy, 2017d). As at March 2016, the current government maintains the approach to use ERF to incentivise reduction in emissions, the RET to grow renewable energy, a national energy productivity plan (NEP) to reduce energy consumption for every dollar of economic activity and a $1 billion Clean Energy Innovation Fund (CEI)[16] to provide capital for emerging clean and renewable energy projects (Turnbull and Hunt, 2016). In October 2017, the coalition announced its new approach on energy policy, by adopting a National Energy Guarantee (NEG) strategy, which calls on energy retailers to use a percentage of electricity from sources such as coal, gas, batteries or pump hydro instead of the proposed Clean Energy Target (CET) approach which would see companies having to obtain a percentage of power from low emissions technology. The adoption of NEG will also see subsidies and incentives to renewables scrapped, as these will be phased out after 2020 (Yaxley and Sweeney, 2017).

As is evident from the aforementioned discussion, Australia's national debate on climate change policies have been well underway for over more than two decades. Australia has seen policy choices which swing from one end of the pendulum to the other, from policies in support of a legislative mechanism to price emissions to its subsequent abolishment, coupled with less than clear directive with regard to low carbon or mitigation initiatives. It remains to be seen if any reform or progress is in view, as the fluidity of Federal policies continue to create uncertainty for corporate Australia in this sphere. A timeline of developments since its early beginnings is presented in Table 2.1 below.

[16] The CEI commenced from July 2016 with an allocated $100 million for financial year 2016-2017 with additional $100 million each subsequent year up to a total of $1 billion (Department of Environment, 2017d).

**Table 2.1** Australian ECC policies and legislative measures (1970s – 2017)

| Prime Minister (party) | | Year | Legislative measures and significant policy developments (from 1970s to current) |
|---|---|---|---|
| Malcolm Fraser (Coalition) 1975 - 1983 | | **1975** | Corporations and Securities Industry Bill (Failed to be ratified by Senate)<br>First legislative proposal mandating SED in corporate annual reports, (Trotman and Bradley 1981) |
| | | **1979** | Australia ratified the Montreal Protocol on Substances that Deplete the Ozone Layer<br>Enactment of Acts to control the manufacture, import and export of Ozone depleting substances and synthetic GHG (Department of Environment and Energy, 2017a) |
| | | **1983** | Australia's National Strategy for Ecologically Sustainable Development (NCSA) founded on principles of the World Conservation Strategy (WCS) which established a greater role for federal government in environmental policies, a role traditionally in the hands of States and Territories (Emmery, 1994) |
| Bob Hawke (Labor) 1983 - 1991 | | **1988** | Intergovernmental Panel on Climate Change (IPCC) founded |
| | | **1990** | Emergence of "Climate Change" as a policy in Australia after 1988 Toronto Conference on Climate Change<br>(i) Australia adopted an Interim (emissions) Planning Target based on the Toronto Target for reduction of national carbon dioxide emissions by 20% below 1988 levels by 2005.<br>(ii) Federal Government established the National Strategy for Ecologically Sustainable development, (a) nine working groups guided by target<br>(b) based on market based approach where polluters pay<br>States already had their own emission reduction approaches and this led to State and Federal approaches which were incongruent with each other (Warren, Christoff and Green, 2016). In Victoria, the State Electricity Commission of Victoria manages large electricity generation assets in the Latrobe Valley pushed for aggressive demand side management and pushed for fuel substitution and injection of renewable technologies (Willis, 1992) |
| Paul Keating (Labor) 1991 - 1996 | | **1992** | Australia ratifies the United Nations Framework on Climate Change (UNFCC) at UN Summit in Rio de Janeiro (also known as the Earth Summit) |
| | | **1992** | Australia launches National Greenhouse Gas Response Strategy (NGRS) aimed at creating an integrated framework approach between industry and government at Commonwealth, State and Local levels<br>(i) The Greenhouse Challenge Program (GC) aimed at achieving maximum GHG abatement as was practicable<br>(ii) GC officially endorsed the Council of Australian governments (COAG) in May 1992 |
| | | **1992** | (iii) National Greenhouse Gas Inventory (NGGI) was established to facilitate Australia's international reporting obligations under UNFCC (Griffith, Haigh and Rassias, 2007). Today, this is called "Australia's National Greenhouse Accounts" which relies on data obtained under the NGER 2007 Act (Department of Environment and Energy 2017) |
| | | **1995** | First Conference of Parties (COP-1) in Berlin, Germany resolved to bind emissions within a time frame specified (UNFCC, 2017) |
| John Howard (Coalition) 1996 - 2007 | | **1997** | Third Conference of Parties (COP-3) in Kyoto, Japan - adoption of Kyoto Protocol, called for GHG approaches that reflect 'common but differentiated responsibilities' (UNFCC 2017) |
| | | **1997** | Australia signs Kyoto Protocol but refuses to ratify it<br>On basis that without US, India, China's participation, Kyoto Protocol unworkable and did not agree to the exclusion of developing nations to reduce GHG. John Howard government's response was also to introduce the National Greenhouse Strategy (the NGS) in response to failure to ratify the Kyoto Protocol. NGS focus on least cost abatement with least effect on competitiveness (Griffith Haigh and Rassias 2007, 420-421) |

**Table 2.1** Australian ECC policies and legislative measures (1970s – 2017) (continued)

| | | | |
|---|---|---|---|
| John Howard (Coalition) 1996 - 2007 | | **1997** | Howard government continued support for GC initiated by its predecessor and initiated broad climate strategy called 'Safeguarding the future: Australia's response to Climate Change' (SF). The SF included:<br>(i) establishment of Australian Greenhouse Office (AGO)<br>(ii) Mandatory renewable electricity target (MRET)<br>(iii) Replaced NGRS , introduced the Better Environment Program 1999, a four year program which included grants for GHG abatement, replacement of diesel-based power stations, photovoltaic systems and commercialisation of renewable energy (Senate Report 2000, Executive summary, xxviii) |
| | | **1997** | Business Leaders Roundtable (BLR) called on government to introduce a national emissions trading scheme, on grounds that delayed response would cost businesses and the economy (Griffith, Haigh and Rassias, 2007). |
| | | **1998** | The National Pollutant Inventory (NPI) developed under a legislative framework called the National Environmental Protection Measure (NEPMs). Today, Australian industries are required to measure and report on 93 substances (NPI, 2017) |
| | | **2000** | The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) commenced on 16th July. This national scheme enables Federal government and States to jointly provide a national scheme of environment and heritage protection and biodiversity conservation (Department of Environment and Energy,2017) |
| | | **2000** | The Renewable Energy (Electricity) Act 2000 (Cth) 2% of Australia's electricity generation must come from renewable energy sources by 2010 (Griffith 2007, 422) |
| | | **2001 -2005** | 2001 Federal Ministerial Council of Energy formed to have a national coordination of energy policy ; 2004 First ministers of all states and territories formed the National Emissions Taskforce (NETT) to research and develop a national emissions trading scheme; 2005 National Electricity market (NEM ) governance and structure was in place<br>(Warren et al 2016) |
| | | **2007** | Coalition government introduces the NGER Act 2007*, prior to change in govt. (29.9.2007) in preparation for a proposed Emission Trading Scheme for introduction in 2010 (Rankin, Windsor and Wahyuni 2011, 1040) |
| Kevin Rudd (Labor) 2007 - 2010 | | **2007** | Labour Government of Australia ratifies the Kyoto Protocol on 12 Dec 2007 |
| | | **2007** | Cap and Trade scheme called the Carbon Pollution Reduction Scheme (CPRS) Originally designed by Prof Ross Garnaut. Proposed CPRS is a market oriented solution to reduce GHG through price signalling and encouraging business to invest in GHG reduction initiatives. The CPRS was revised to appease mining and energy industries and was not supported by federal Greens party and conservation groups. They argued that these corporations received too many free permits. CPRS did not pass parliament. The Department of Climate Change and Energy Efficiency was also established.(Rankin, Windsor and Wahyuni, 2011, 1040; Warren,Christoff and Green 2016) |
| | | **2009** | UNFCC negotiations in Copenhagen failed to reach binding agreement (7-18 Dec). The weight of climate inaction, took its toll on movement and public (Warren, Christoff and Green, 2016; Pearse 2016) |
| Julia Gillard (Labor) 2010 - 2013 | | **2011** | Clean Energy Future Legislation (CEFL) package introduced in November and includes: |
| | | **2012** | Clean Energy Act 2011 which imposed a carbon price (CPM) on Australia's biggest carbon emitters (liable entities)**<br>Clean Energy Regulator Act 2011 established the Clean Energy Regulator (CER) in April 2012 tasked with the administration aspects of the CPM and renewable energy policies (Clean Energy Regulator 2017b);<br>Climate Change Authority Act 2011 established the Climate Change Authority (CCA) on 1 July 2012, tasked with periodic review and monitoring of CEFL package (Climate Change Authority, 2017)<br>Clean Energy Finance Corporation Act 2012 government's clean energy bank (Pearse 2016) |

**Table 2.1** Australian ECC policies and legislative measures (1970s – 2017) (continued)

| | | | |
|---|---|---|---|
| Tony Abbott (Coalition) 2013 - 2015 | | **2014** | Clean Energy Legislation (Carbon Tax Repeal) Bill 2014, passed the House of Representatives and Senate on 17 July 2014, carbon price abolished with effect from 1 July 2014. (Department of Environment and Energy, 2017a) |
| | | | Direct Action Plan - to support emerging technologies (eg. Renewable energy target (RET) and Emissions Reduction Fund (ERF) which allocates $2.55.billion over 4 years to incentivise new technologies in energy efficiency and low carbon technologies) and Clean Energy Innovation Fund to support |
| Malcolm Turnbull (Coalition) 2015 - current | | **2015** | UNFCC Paris Agreement adopted on 12 Dec 2015 at COP 21 . Went into force on 4 November 2016. As at 7 Nov 2017, 169 of 197 parties have ratified the Convention (UNFCC, 2017) |
| | | **2016** | Australia ratifies the Paris Agreement 9 November 2016 |
| | | **2016 – 2017** | Maintains use of ERF to incentivise reduction in emissions, RET to grow renewable energy and national energy productivity plan (NEP) to reduce energy consumption and $1 Billion Clean Energy Innovation Fund to provide capital to emerging clean technologies and projects. In 2017, government adopts the National Energy Guarantee (NEG) in place of the Clean Energy Target recommended by chief scientist. (Yaxley and Sweeney 2017) |
| KEYS | | Legislative measures impacting Australian corporations (trigger reporting obligations) | |
| | | Policies and initiatives impacting GHG emissions, pollutants, energy or others of environmental significance | |
| | | International developments on Climate Change | |

*NGER Act 2007 requires that liable entities with emissions above a threshold self-report GHG emissions annually to the government regulator. The first year of reporting under NGER was from 1 July 2008 (Rankin, Windsor and Wahyuni,2011)
**Carbon Pricing Mechanism
(i) CPM administered by Clean Energy Regulator from 2012 to 2015
(ii) Liable entities report emissions relating to 2012-2013 (FY13) and 2013-2014 (FY14) financial years
(iii) CPM repealed on 1 July 2014 (no carbon pricing effective from FY2015)
(CER, 2017)

### *2.2.2 Legislative/prescriptive guidance on ECC Disclosure in Corporate Reports*

ECC related policies of firms are principally designed to ensure proper adherence to reporting to relevant authorities (for example, NGER scheme requires reporting of emissions to Clean Energy Regulator if firms meet specified thresholds or NPI to state or territory environment protection agencies). There are no legislative requirements to report environmental information in corporate reports other than requirements under section 299(1)(f) of the Corporations Law. Only recently, greater measures have been introduced by corporate authorities, although not mandatory but they amount to prescriptive guidance expected of firms.

*Section 299(1)(f) of the Corporations Law* requires companies to report in their annual directors' report the entity's environmental performance in relation to environmental regulations if the operations of the entity are "subject to any particular

and significant environmental regulation under a law of the Commonwealth or of a State or Territory". Section 299(1)(f) took effect from 1 July 1998 and subsequently reissued in 2002 as *Corporations Act 2001 (Cth)* ("the Act"). Since its inception there have been practical difficulties over the application of the law (Frost, 2007). According to Frost (2007), the Parliamentary Joint Statutory Committee on Corporations and Securities (PJSC)'s examination of forty written submissions out of forty-six opposed the provision and recommended its removal. The main arguments against the provision were largely related to ambiguity of the requirements and arguments for voluntary reporting. Nevertheless, ASIC and industry groups such as Australian Industry Group (AIG) subsequently issued guidance materials in an attempt to address some of these ambiguities. However, since then, little has been done and remains the only explicit requirement in the Act requiring disclosure of environmental information in the Act today.

Other than section 299(1)(f) of the Act, although not explicit, requirements of section 296 and section 299A(1) of the Act have indirect implications. All corporations have to consider section 296 of the Act, which requires corporations to comply with Australian Accounting standards. There is currently no explicit carbon accounting standard devoted solely to its disclosure in corporate reports. However, some firms in specific industries may be required to provide certain types of disclosures if impacted. For example, existing accounting standards which may trigger certain aspects of disclosure for certain companies in certain industries (e.g. IAS 16/ AASB 116 Property, Plant and Equipment, IAS 37 /AASB 137 Provisions, Contingent liabilities and Contingent assets and IFRS 6 / AASB6 Exploration for and Evaluation of Mineral Resources, to name a few). Additionally, section 299A(1) of the Act requires annual director reports to include information reasonably required to allow users to make an informed assessment of its operation, financial position, business strategies and future prospects (this section is generally referred to as the 'operating and financial review' or 'review of activities' (OFR)). However, section 299A(1) does not include specificity regarding matters which need to be considered by companies to ensure they complied with the Act.

In March 2013, the Australian Securities and Investment Commission (ASIC) released Regulatory Guide 247 (RG247). RG 247 is prescribed guidance aimed at

providing guidance on how compliance with section 299A of the law may be achieved. It raised considerable attention on director's to consider the implications of social and environmental risks affecting the entity and to give due regard to appropriate disclosures in OFRs annual director reports.

> *"An OFR should include a discussion of environmental and other sustainability risks where those risks could affect the entity's achievement of its financial performance or outcomes disclosed, taking into account the nature and business of the entity and its business strategy. For example, environmental risks that may affect an entity's achievement of its financial prospects would be more likely for an industrial entity than for a financial services entity"* (ASIC 2013, 19).

As ASIC's guidance document serves as interpretative statements of the law, and according to section 344 of the Act, directors are exposed if they do not take all reasonable steps to comply. According to a review by KPMG on ASX 51-100 companies' annual reports from December 2012 to September 2013, more than 30 per cent of firms sampled had increased or provided new disclosures on "strategies and future prospects" while nearly half included information on "business risk". Some included enhanced disclosures while others provided new information compared to prior years (KPMG 2014, 6). For those that did provide material "business risk" disclosures and were considered companies which may have significant environmental or sustainability risks, 60 per cent provided some discussion of these types of risks in their annual report (KPMG 2014, 29). These positive developments suggest improvement in overall OFR disclosure practices following RG247, including the extent of environmental or social risks disclosures in corporate reports.

For Australian listed companies, compliance with requirements under section 299A(1) of the Act is echoed in ASX Listing Rule (LR) 4.10.17. All listed entities are bound contractually to comply by stated ASX listing rules, which have the force of law under the Corporations Act 2001 by virtue of sections 793B and 793C of the Act (ASX 2012). ASX provides prescriptive guidance to assist compliance with LR 4.10.17 through *Guidance Note 10 Review of Operations and Activities: Listing Rule 4.10.17* (GN10). GN10 was initially issued in September 1999, revised in March 2003 and the requirements relating to environmental issues impacting the

organisation are more descriptive than that in ASIC RG247. Prescribed guidance in some sections of GN10 would reasonably require companies to consider their climate-related impacts in their OFR disclosures[17].

More recently, in addition to the broad requirements under LR 4.10.17, ASX's Corporate Governance Principles and Recommendations (CGPR) call on firms to provide disclosures on a 'if not why not basis of disclosure' relating to environmental /sustainability risks. Listed firms are required under LR 4.10.3 to include a corporate governance statement in their annual report which considers the ASX's council's recommendations. The requirement does not force firms to adopt the recommendations but rather if their governance practices do not conform to the recommendations, listed entities are required to provide an explanation for not adopting the recommendation. The latest CGPR third edition makes explicit reference for listed entities to consider and disclose social and environmental risks:

> *"A listed entity should disclose whether it has any material exposure to economic, environmental and social sustainability risks and if it does, how it manages or intends to manage those risks"*
> (also known as Recommendation 7.4) (ASX 2014, 9).

[17] For example, GN10 refers to (i)Para 7 which prescribes that the OFR report the firm's objectives and corporate strategy giving regard to opportunities and risks which may affect the operations. For example, the impact of changing regulatory, legal, social and political environments due to climate issues on operations.
(ii) Para 8 prescribes discussion and analysis of key non-financial indicators including social and environmental performance measures (For example, if GHG emission targets apply, inclusion of discussion and analysis on its relative performance overtime or against industry benchmarks); (iii) Para 9 prescribes discussion relating to factors that may have significant impact on future results. GN10 Table 3 refers to environmental, legal, innovation and technological development factors. (For example, the impact of energy efficiency projects on operations); (iv) Para 28 prescribes discussion relating to the impact of changes in legislation, or external requirements impacting the company's current or future operations. (For example, the impact of the state or federal legislation relating to emissions or renewables on firm operations) ; (v) Para 29 prescribes discussion relating to the firm's assessment of risks and risk management strategies. GN10 Table 7 lists risks relating to availability of resources and environmental issues. (For example, risks management process and strategies to mitigate risks associated with contamination); (vi) Para 30 prescribes discussion of the firm's corporate governance practices (supervision, oversight, accountability) as well as incentives linked to business strategies. (For example, this would call for disclosures relating to firm governance practices relating to environmental issues and disclosure of remuneration incentives which may be linked to environmental indicators) (ASX,2003)

This third edition of ASX's CGPR takes effect from 1 July 2014, commencing with first full financial years ending 30 June 2015 and/or 31 December 2015. Guidance to this recommendation is spelled out in the December 2016 amendment to ASX *Guidance Note 9: Disclosure of Corporate governance practices (GN9)*[18] . GN9 recommends that such disclosure could refer to content in corporate sustainability reports (if there was one) or OFRs in annual director reports and ought to be specific, as general risks disclosures in effect to not met the requirements of Recommendation 7.4 (ASX 2016, 9).

In summary, other than requirements to report on contravention with any environmental laws of the Commonwealth, State or Territory under section 299(1)(f) of the Act, there is only at best, prescribed best practice approaches in relation to disclosure which call for firms to consider environmental or climate related impacts in corporate reports. ASIC's RG 247 is the regulator's guidance measure to assist compliance with section 299A(1) (OFR requirements) and is not explicit black letter law. According to section 344 of the Act, potential contravention of section 299A(1) occurs only when directors fail to take all reasonable steps to comply. For listed firms, GN10 provides additional guidance to assist compliance with OFR requirements and is more descriptive about how disclosures relating to environment and climate impacts may be relevant. The latest CGPR's Recommendation 7.4 to consider environmental risks disclosures on an 'if not why not' approach also adds to the bucket of 'non-mandatory recommended measures' approach toward environmental disclosures in Australia. Table 2.2 summarises the above mentioned changes.

[18] ASX Guidance Note 9: Disclosure of Corporate governance practices (GN9) , is intended to assist listed companies to comply with disclosure requirements under LR 4.7.3 (entity to furnish ASX with a completed Appendix 4G) , LR4.7.4 (requirement to prepare a corporate governance statement), LR4.10.3 (disclosure of the extent the entity has complied by ASX Corporate Governance Council's recommendations), LR12.7 (composition and operation of audit committee) and LR12.8 (composition and operation of remuneration committees) (ASX 2016).

**Table 2.2** Summary of legislative rulings and authoritative guidance for firms to disclose ECC information in corporate reports

| Legislative Ruling (R) / Guidance (G) | | Disclosure requirement | Issue/effective date(s) |
|---|---|---|---|
| Corporations and Securities Industry Bill 1975 (Sch 3, Clse 3) | R | Proposed disclosure relating to employees, health and safety, consumer protection and activities carried out by the company to protect the environment. | Failed to pass |
| Section 299(1)(f) of the Corporations Act 2001 | R | Companies are required to provide details if subject to any significant environmental regulation under the Commonwealth, State or Territory and to disclose their performance in relation to that regulation. | Issue date: 1998, revised 2001<br><br>With effect from 1 July 1998 |
| Regulatory Guidance 247 (RG 247) (assist compliance with Section 299A of the Corporations Act 2001(OFR requirements) | G | RG 247 states to consider the implications of social and environmental risks affecting the entity and to provide appropriate disclosures in OFRs of annual director reports. | Issued: March 2013<br><br>With effect from March 2013 |
| Guidance Note 10 Review of Operations and Activities: Listing Rule 4.10.17 (GN10) (assist compliance with Section 299A of the Corporations Act 2001) | G | GN10 provides guidance to listed companies to consider climate related impacts in OFR disclosures | Issued: September 1999, revised Sept 2001, and March 2003<br><br>With effect from 1 September 1999 |
| Corporate Governance Principles and Recommendations (CGPR) 3rd edition (Recommendation 7.4) | G | CGPR Recommendation 7.4 states to consider if firm has exposure to material economic, environmental and social sustainability risks and if it does, how it manages these risks | Issued: March 2014<br><br>With effect from 1 July 2014 |

Taken together, in light of incongruent Federal government politics and policies as well as legislative measures adopted by Australian corporate regulators on environmental and climate change issues (described in sections 2.2.1 and 2.2.2), it is not surprising that mandatory inaction has prompted a greater adoption of voluntary disclosure measures by corporate Australia.

## 2.3 Voluntary ECC reporting regimes

Reporting trends internationally have shown firms volunteer ECC disclosures beyond the prescribed disclosures (KPMG, 2017). The proliferation of voluntary reporting methodologies by coalitions and interest groups over the last decade have become

powerful forces which influence corporate disclosure practices today (Andrew and Cortese 2013). According to some scholars, it has become a form of civil regulation aimed at establishing norms and standards (Kolk, Levy and Pinkse 2008). The origin, aims, scope, developments and impact thus far of three prominent regimes relevant to ECC disclosures are discussed below.

### *2.3.1 Carbon Disclosure Project (CDP)*

The Carbon Disclosure Project (CDP) is an independent not-for-profit organization representing approximately 827 institutional investors with US$100 trillion in assets (CDSB, 2017). It was launched in 2000 in London through a collaboration of institutional investors who were concerned about climate change implications on businesses (Kolk, Levy and Pinkse 2008). CDP initiates self-reporting of climate related information through questionnaires which are aimed at gaining information relating to an organisation's climate risks, opportunities and management of climate related activities. CDP seeks to have a unified response toward climate change, by enlisting the support of institutional investors, also known as 'signatory investors' who advocate the environmental awareness agenda (Wegner et al. 2013). Each February, CDP sends questionnaires to global firms requesting for climate related information. From its first operative year in 2003, the response rates from the world's 500 largest publically-owned companies (FT500) to CDP questionnaires were positive. Response rates grew from 227 firms in 2003, which represents 46 per cent in 2003 and gradual increases to 59 per cent, 71 per cent, 72 per cent, 77 per cent in each consecutive year respectively until 77 per cent by 2007, representing 383 firms (Kolk, Levy and Pinkse 2008, 730). Kolk, Levy and Pinkse (2008)'s analysis of 2003 to 2007 responses and signatory participation suggests that CDP has successfully used investor pressure to urge firms to self-report climate related information. Cotter and Najah (2012) states the collective influence of institutional investors through CDP has driven firms to engage in ECC disclosures. Knox-Hayes and Levy (2011) concur with Kolk, Levy and Pinkse (2008) that CDP was successful in encouraging companies to report, but the data was criticised as not sufficiently detailed to assess carbon risks. Matisoff, Noonan and O'Brien (2013, 297) also describes the "complexity and changes" of early CDP surveys lead to difficulties in assessing responses. However, CDP has since strived to increase standardization of

reporting for successive surveys (Knox-Hayes and Levy 2011). By 2010, CDP questionnaires were sent to 4,500 companies worldwide, including 76 Australian companies who responded (Cotter, Najah and Wang 2011). According to CDP's website, at time of writing, over 5,600 companies globally currently respond to CDP's climate change, water, forests and supply chain questionnaires in 2017 (CDSB 2017). Today, CDP has become the largest depository of carbon related information but scholars like Andrew and Cortese (2011) averts CDP's claim as an independent organisation. They suggest that it appears problematic as they are funded largely by organisations with particular vested interests and that this form of 'corporate activism' is directly aimed at shaping, managing and containing regulation within acceptable boundaries.

### *2.3.2 Global Reporting Initiative (GRI)*

The Global Reporting Initiative (GRI) was launched in 1997 by the Coalition for Environmentally responsible economies (Ceres) and Tellus Institute. Tellus Institute was formed in 1976 and is a research and policy institute aimed at bringing scientific rigour into environmental and social issues. Ceres was initially founded by a group of investors in 1989, following the Exxon Valdez oil spill. The coalition is headquartered out of the U.S. with a largely North American member constituent. It currently includes a network of more than 130 members comprising social and environmental NGOs, institutional investors, a corporate network of 70 companies across 20 sectors and investor groups (Ceres 2016a). Ceres proclaims itself as a prominent contributor of climate related initiatives in the US. For example, its investor lead petitions with the U.S. regulator culminated in the requirement for U.S. public companies to disclose climate risks under the 2010 SEC disclosure standard and backed the EPA's Clean Power Plan (CPP) aimed at reducing GHG emissions by U.S. power plants (Ceres 2016b). GRI standards do not only involve disclosures pertaining to environmental aspects but also provide guidelines for firms to report on the organisation's economic, social, governance and environmental performance. These encompass a whole suite of disclosures which are regarded as 'sustainability disclosures'. The standards prescribe disclosure on the organisation's profile, context and scope, stakeholders and governance, management approach to aspects of sustainability and disclosure on performance indicators (GRI 2013). In prior

versions, GRI G3.1 for instance, included application level assessments. These application levels were self-graded by firms and are based on disclosure levels (i.e. A, B or C). Application levels were dropped in the current G4 guidelines launched in 2013. At the time of writing, the latest version, 'GRI Sustainability Reporting Standards' (GRI Standards) is proposed to take effect from 1 July 2018. The new GRI Standards merged the G4 Guidelines and implementation manual contents and presents them in 'modular' form to ease future developments in view of changing reporting practices and regulations (Hespenheide, 2016).

Its increasing adoption is evident from recent surveys. KPMG CSR surveys, conducted on a triennium basis since its inception in 1999, shows that GRI is the most commonly used 'sustainability' reporting guide used by companies surveyed. Their recent report showed that 75 per cent of top 250 of the world's largest companies apply GRI guidelines to report sustainability information (KPMG 2017, 28). Nevertheless, Vigneau, Humphreys and Moon (2015, 472) criticises that GRI guidance sets out the expected scope and quality of reporting by prescribing "how to report and what to report". Their case study on a global market leader in the manufacturing sector with operations in 30 countries, find that GRI was the organisation's ultimate guideline. Its management practices were focused on achieving greater compliance with reporting according to GRI, rather than on actual CSR performance outcomes. It was also a legitimacy tool which shaped management's activities which placed importance on collecting data for reporting with short term strategies and plans for actual CSR outcomes. Willis (2003) suggests that this voluntary framework may well elevate non-financial reporting practices but is questionable if this works as a code of conduct for actual performance.

### *2.3.3 Climate Change Reporting Framework (CCRF)*

The Carbon Disclosure Standards Board (CDSB), an international consortium of businesses was borne at the 2007 World Economic Forum (WEF) in response to an increasing demand from preparers and users for greater standardization of climate related disclosures (Cotter, Najah and Wang 2011). CDSB is supported by a technical working group comprised of representatives from major accounting firms, academics and international NGO groups. CDSB initiated the first Climate Change

Reporting Framework (CCRF) in May 2009 (CDSB 2015) at the Annual Meeting of the World Business Summit on Climate Change (WBSCC), as an Exposure Draft[19]. Following public consultations from May to October 2009 and research by CDSB, the first edition of the framework (CCRF v1.0) was released in September 2010. Content requirements in CCRF v1.0 spanned disclosures relating to (i) strategic analysis; (ii) risks and opportunities; (iii) management actions; (iv) future outlook; (v) governance and (vi) GHG emissions[20] (CDSB 2010, 19-23). It prescribes disclosure of information with "decision-useful" characteristics and aims to "consolidate and complement" existing voluntary and regulatory reporting initiatives to standardize climate related disclosures in mainstream reports (CDSB 2010, 2). CCRF v1.0 regards disclosure characteristics as useful to investors if they are relevant and provide faithful representation. Additionally, they should be "comparable, timely, understandable and verifiable" (CDSB 2010, 14-18). These characteristics are applied in determining, preparing and presenting disclosures, very much the same as principles applied in preparing financial information. CCRF v1.0 adopts the GHG Protocol categorisation of GHG emissions however, also recognises other international GHG reporting schemes (CDSB 2010, para 4.2.1). Boundary setting approach adopted by CCRF v1.0 in reporting GHG emissions results initially followed the financial control consolidation basis as prescribed in International Accounting standards (IAS/IFRS) on consolidation and equity accounting. This required results from entities within a group including subsidiaries, joint ventures and associates to be included in the results of the group. However, given the widespread adoption and recognition of the GHG Protocol, there were considerable interpretations and approaches on boundary setting, as the GHG Protocol's financial control approach considers associates outside the definition of the control of the parent. Although it is CDSB's position to adopt a technical approach which aligns

[19] The draft in 2009 focused on content disclosure requirements encompassing disclosure on strategy, risks and opportunities, quantification of GHG emissions and firm mitigating activities (Cotter, Najah and Wang, 301).

[20] (i) Strategic analysis refers to disclosures pertaining to the implications of climate change on the organisation's competitiveness, resources, innovation or reputation. (ii) Risk and opportunities disclosures entail qualitative assessments of short and long term risks or opportunities associated with climate change (eg. regulatory, physical, reputational and litigation risks). (iii) Management actions refer to disclosures relating to nature of plans, targets and assessments against targets or other benchmarks. (iv)Future outlook are decision useful information pertaining to key dependencies or assumptions which may affect the organisation's strategies or objectives, may include costs or investment estimates. (v) Governance disclosures describe governance process such as responsibility and delegation roles relating to climate issues, reliability of climate related information and its control processes. (vi) GHG emissions disclosure prescribes reporting emissions by scope 1 (direct emissions) and scope 2 (indirect emissions) in conformance with the GHG Protocol categorization but also recognises other GHG emission reporting schemes (CDSB 2010).

with financial reporting boundaries but in the interest of practicability and comparability, CDSB subsequently clarified a change via an update to boundary settings to exclude GHG emissions results from associates within scope 1 and 2 for entities with interest in associates (CDSB 2012a). Thus, in October 2012, CDSB released CCRF edition 1.1 (CCRF v1.1) incorporating the June 2012 boundary update, whereby GHG emissions from associates although excluded from scope 1 and 2 (i.e. part 1 GHG emissions) should still be disclosed (as part 2 GHG emissions) and distinguished from part 1 GHG emissions (CCRF 2012b, para 4.22 – 4.27). Guidance material issued in March 2013 was then released to assist preparers to make appropriate climate related disclosures which would complement the CCRF.

More recently, following a period of public consultation, where up to 500 organisations and individuals expressed interest in the process, the latest CDSB framework was released in June 2015. The CCRF June 2015 was expanded to include reporting on other types of environmental information, such as disclosure pertaining to waste, land use, food and additional improvements to address more adequate disclosure relating to GHG, water and forest commodities. CCRF 2015 sets out its reporting requirements via twelve requirements, a few echo requirements set forth in earlier versions. They include disclosures relating to (i) management's environmental policies, strategies and targets; (ii) risk and opportunities; (iii) governance; (iv) source of environmental impact; (v) performance and comparative analysis; (vi) outlook; (vii) organisational boundary (viii) reporting policies; (ix) reporting period; (x) restatements; (xi) conformance and (xi) assurance[21] (CDSB 2015, 18). Changes were also driven by compliance disclosure requirements in some countries like UK, Denmark, Canada, South Africa and France to name a few (CDSB 2014, 3). On the same premise as earlier versions, the 2015 framework sets out

[21] Briefly, the requirements explained: (i) Management's environmental policies, strategy and targets refer to disclosures which provide understanding of firm policies, targets, strategies, timelines and disclosures of dependencies on any natural capital (ii) Risks and opportunities which may be direct or indirect and can include regulatory, physical, reputation or litigation. (iii) Governance refers to environmental governance measures taken, such as appointment of senior executive or Board or Committee for environmental matters. If responsibility is delegated, disclosures on how accountability is implemented promotes transparency (iv) Sources of environmental impacts involve disclosures relating to the quantitative and qualitative outputs from the firm which potentially impact the environment ( e.g. GHG, land use, water, pollutants, waste) (v) performance and comparative analysis refers to disclosures of results with comparatives with prior results, targets or baselines (vi) Outlook refer to how its strategies, risks and opportunities limit or support the firms' future performance (vii) Organisational boundary which information is determined (viii) Reporting provisions applied in preparing disclosures (ix) Reporting period shall be provided on an annual basis. (x) Restatements shall be explained and reported (xi) Conformance to CCRF shall be disclosed and extent to which requirements have been applied (xii) Assurance over environmental information to be disclosed if performed (CDSB 2015, 19-26).

similar guiding principles aimed at providing disclosures which are "decision useful" to investors[22] aimed at "encouraging analysis of the dependence of economic and financial stability on sustainable and healthy environment" (CDSB 2014, 3). The CDSB framework 2015 draws on existing accounting standards and provisions, such as financial reporting standards (e.g. IASB's qualitative characteristics), international legislation (e.g. EU Directive 2014/95EU on non-financial information, US Securities and Exchange Commission guidance on disclosures related to climate change, UK Companies Act 2006), regulatory sources for specific elements (e.g. Australian Water Accounting Standards, UK Department of Environment, Food and Rural Affairs guidance on environmental reporting) and other international voluntary frameworks (e.g. GRI G4, IIRC, ISO, OECD) (CDSB 2015, 9).

As far as the researcher is aware, the extent that current practices may conform to this framework has only been examined in one academic study by Cotter, Najah and Wang (2011). Even so, authors assessed ECC disclosures of only one large Australian energy company against criteria set out in draft CCRF at its inception. Although their findings are not generalisable or reflective of other Australian company disclosures, but findings suggests the company's ECC disclosures lack technical detail, are positively skewed and lacks compliance with some authoritative guidance that have been issued. In contrast, this thesis, examines 25 Australian firms from various industry groups and benchmarks ECC disclosures against an evaluation tool based on the most recent CCRF issued in 2015.

## 2.4 Importance of governance in the ECC performance-disclosure link

### *2.4.1 Determinants of ECC disclosures*

In the 1980s to 1990s environmental and climate change (ECC) disclosure literature have been preoccupied with the view that firms voluntarily adopt ECC practices for legitimacy reasons (Guthrie and Parker 1989; Brown and Deegan 1998; Deegan and Gordon 1996; Deegan and Rankin 1996). In some situations it is an important tool to

[22] "Investors" as defined by CDSB refer to International Accounting Standards Board (IASB)'s definition : "existing and potential investors, lenders and other creditors in making decisions about providing resources to the entity" (CDSB 2015, 8)

manage public perception, particularly in response to severe environmental incidents (Valand and Heide 2005; O'Donovan 2002; Cho 2009; Deegan, Rankin and Voght 2000; Walden and Schwartz 1997). From late 1990s, studies suggest that firms respond to increasing pressures from institutional actors to provide ECC disclosures (Delmas and Toffel 2004; Delmas and Toffel 2010). Delmas and Toffel (2004)'s model outlines how various parties impose institutional pressures on firms which in turn influence their responses to environmental practices. Aside from competition and industry and interest group pressures, coercive power which promulgate enforcement through regulatory actions, which authors coin as 'government pressures' play a role in how managements adopt certain environmental practices. In other words, political pressure or perceived stringent regulatory action can impede or threaten a company's environmental strategy. More importantly, authors refer to the important mediating role of firm characteristic in that process, to explain why firms' adopt certain environmental practices that they do. In their subsequent work, Delmas and Toffel (2010) emphasises that institutional pressures on organisations do well to drive firms to adopt practices which may go beyond compliance measures however, the heterogeneous manner in which firms respond to similar institutional pressures reveals the importance for greater understanding of firm specific conditions that "magnify or diminish the influence of such institutional pressures" (Delmas and Toffel 2010, 19). These studies provide hints of the importance of the influence of 'institutional/regulatory' pressures on firms' governance measures in environmental management.

By the early 2000, global interest in carbon emissions reporting saw increased participation by firms adopting voluntary reporting using prominent voluntary initiatives and coincided with the emergence of independent non-for-profit interest groups which promote proactive firm engagement in ECC related initiatives (e.g. Ceres, WBCSD) (Kolk, Levy and Pinkse 2008). Scholars also embarked on examining a variety of firm specific characteristics in explaining determinants of GHG disclosures against broadly accepted measurement indices benchmarked against various schemes like GRI, CDP, Kyoto Protocol, ISO 14064-1 related-standards. These studies broadly agree that variables like firm size, industry, geographical location, operating markets and listing status are associated with the level and quality of disclosures (Prado-Lorenzo et al. 2009; Freedman and Jaggi

2005; Stanny and Ely 2008; Brammer and Pavelin 2006; Rankin, Windsor and Wahyuni 2011; Choi, Lee and Psaros 2013; Ghomi and Leung 2013). For example, Prado-Lorenzo et al. (2009)'s global study on firms' 2005 sustainability reports for firms in US, Australia, Canada and European Union find large firms and firms in environmentally sensitive sectors disclose information according to GRI G3 indicators and multinationals which operate in countries that have ratified the Kyoto Protocol show positive association with GHG disclosures. Freedman and Jaggi (2005)'s study on 2002 edition of Fortune 500 firms also report higher GHG disclosures for multinationals whose headquarters are in countries that ratify the Kyoto Protocol compared to those that do not, using a Protocol-related disclosure index.

To this end, it is apparent that firms' view corporate dissemination of voluntary ECC disclosures as a key to altering perceived stakeholder perceptions (Cho 2009) and an important firm strategy in managing its corporate environmental responsibility (Hooghiemstra 2000). However, the way firms are governed is central to firm characteristic, but early literature on ECC determinants appear to have not considered much of its role. Additionally, given that institutional pressures from regulatory actors play an important role in how firms respond (Delmas and Toffel, 2010) literature on ECC disclosure and performance is examined to consider its influence on firm environmental governance.

### *2.4.2 ECC disclosures and ECC performance*

Generally, scholars find substantive disclosure associated with lower cost of equity and higher firm value, particularly for firms in environmentally sensitive industries (Blacconiere and Patten, 1994; Bachoo, Tan and Wilson, 2013). However, the relation between substantive disclosure and environmental performance is less clear. If, the practical case for their decisions to provide substantive environmental disclosure also upholds the moral case of improved environmental performance, firms may have greater incentives to provide voluntary disclosure.

Examination of literature on the link between ECC performance and ECC disclosure are traceable to periods as early as the 1970s. These studies then commonly find

environmental disclosure bears no relation to actual environmental performance (Ingram and Frazier 1980, Wiseman 1982; Freedman and Wasley 1990), which appear to concur with early studies on ECC determinants that find legitimacy motives for disclosure (Patten 1992; Brown and Deegan 1998; Deegan and Rankin 1996). However, from the 1990s, mixed empirical findings emerged, with some finding support for negative relations between ECC performance and ECC disclosures (Patten 2002; Cho et al. 2012) and others positive associations (Clarkson, et al., 2008; Clarkson, Overell and Chapple, 2011). For those that find positive ECC performance-disclosure association, they argue that superior performers have greater incentive to provide disclosures. In contrast, a negative ECC performance-disclosure association is evident when firms find themselves in disparity with social expectations and may engage in legitimising activities through increased disclosures.

Given the lack of equivocality of findings, scholars aptly extended their analyses to include the intervening element of firm governance in the firms' ECC performance and disclosure relation to consider the interplay of firm governance in this relationship (Al-Tuwaijri, Christensen and Hughes 2004; Mallin, Michelon and Raggi 2013). When this is done, it is more common to see studies examine associations for one or the other (i.e. governance-disclosure or governance-performance) rather than both in one study. For example, Al-Tuwaijri, Christensen and Hughes, 2004, Mallin, Michelon and Raggi 2013, Arena, Bozzolan and Michelon 2015, Cong and Freedman 2011 are among few studies that consider both aspects in respective studies. These studies have utilised publically available measures of pollution (Al-Tuwaijri, Christensen and Hughes, 2004; Cong and Freedman, 2011) and external environmental ratings (Arena, Bozzolan and Michelon 2015; Mallin, Michelon and Raggi 2013) for environmental performance and disclosure extensiveness of pollution data for ECC disclosure, yet have produced inconclusive findings. This could be due to the vast available methodologies to measure both ECC disclosures and performance (Ilinitch, Soderstrom and Thomas 1998) and variation in specific measures of governance. This augments the importance of understanding broader literature on the association between specific aspects of firm governance in this respect.

In this thesis, review of prior literature is limited to studies on ECC performance and disclosures rather than broader corporate sustainability studies. This is because corporate social responsibility is a multidimensional construct and each aspect is treated very differently by firms in practice and governance mechanisms work differently for each (Bansal, Gao, and Qureshi, 2008). As corporate objectives become more preoccupied with environmental engagement, there is increasing interest to understand aspects of firm governance which are associated with substantive ECC accountability, initiatives and performance.

## 2.5 Corporate governance determinants of ECC disclosures

Literature suggests some scholars sought to examine if specific aspects of firm governance are associated with ECC disclosures. Details of these studies are discussed below and a summary table detailing governance variables examined in each can be found in Table 2.3 at the end of section 2.5

### *2.5.1 International studies (governance-ECC disclosure)*

In Peters and Romi (2014)'s US study, scholars find that firms with *environmental committees* and *chief sustainability officers* are more likely to respond to the 2002 to 2006 CDP questionnaires and the probability of disclosure increases with *size of environmental committee, number of meetings and expertise of its committee members*. The extent of disclosure transparency is also related to the *expertise of its chief sustainability officer and environmental committee* members. Rupley, Brown and Marshall (2012)'s study on global firms belonging to five specific industries listed on DJSI [23] (chemical, oil and gas, electrical utilities, pharmaceutical and bio technology and food and beverage industries) around the same period (2000 to 2005) report significant positive association between environmental disclosures in annual reports and the *presence of independent boards, gender diverse boards and board members with multiple directorships.* However, contrary to Peters and Romi (2014), their results do not find statistically significant associations between *sustainability committees* and quality of environmental disclosures. Additionally, *CEO-duality* and

[23] DJSI – Down Jones Sustainability Index is a family of indicies which measures the environmental, social and governance factors of firms (see http://www.sustainability-indices.com/)

environmental disclosures as measured according to GRI indicators did not report significant association in Rupley, Brown and Marshall (2012)'s study. Arena, Bozzolan and Michelon (2015)'s examination of 288 US oil and gas companies from 2008 to 2010 find firms with high board monitoring and stakeholder orientation associated with firms which disclose to signal superior environmental performance. They did not regard disclosures as opportunistic managerial behaviours rather as transparency tools. Arena, Bozzolan and Michelon (2015)'s monitoring and stakeholder orientation factors include *board size, CEO-duality, proportion of independent directors, director connections, board diversity and presence of CSR committees*.

Ben-Amar and McIlkenny (2015)'s Canadian study on disclosures to CDP from 2008 to 2011 find effective boards (as measured by CCBE BSCI[24], a composite measure of governance which evaluates *director independence, attendance, stock ownership, CEO duality, committee independence, share structure, results of board decisions*) are more likely to voluntarily disclose to CDP, are associated with greater disclosure transparency and are firms who provide high quality disclosures. Quality of disclosures includes greater information pertaining to GHG emissions and risks and opportunities related to climate change. Authors contend that firms with effective boards have greater alignment with stakeholders and are more likely to voluntarily disclose environmental information to reduce information asymmetry with investors.

Similarly, Liao, Luo and Tang (2015)'s study on 2011 data for UK firms on the FTSE350 index find *the presence of independent directors, gender diverse boards and the presence of an environmental committee* associated with firms propensity to disclose to CDP, as well as the firms' level of GHG disclosure. The context of their study was during the second trading period of the European ETS (i.e. between January 2008 to December 2012) and during the operative commitment period of the Kyoto Protocol. Liao, Luo and Tang (2015)'s results resonate Griffiths, Haigh and Rassias (2007)'s institutional governance framework as their results show that firms operating in a market governance system which is characterised by market based

[24] The Clarkson Centre for Business Ethics and Board Effectiveness (CCBE) Board Shareholder Confidence Index (BSCI) monitors Canadian corporate governance trends and has become the standard by which Canadian governance best practice is measured (Ben-Amar and McIlkenny, 2015)

mechanisms (in UK's case, ETS) tend to decide on their participation in environmental initiatives and if they do, will tend to make those efforts publically known.

### *2.5.2 Australian studies (governance-ECC disclosure)*

Australian studies have generally chosen to use mostly composite governance variables. For instance, Choi, Lee and Psaros (2013)'s study examined if a composite measure of firm governance quality using an independent rating measure (Horwath Corporate governance rating[25]) is associated with environmental disclosures to CDP. Authors find *quality of governance* positively associated with environmental disclosures to CDP for disclosures on climate risk, emissions accounting, energy consumption, GHG reduction and GHG accountability. Choi, Lee and Psaros (2013)'s results show that the 'governance-disclosure' relation was significant even during a period when GHG emission reporting was imminent (i.e. 2006 to 2008 periods are periods prior to NGER operative date of 1 July 2009). Their study indicates the governance-disclosure association is significant both for mandatory and discretionary disclosures. Also, in Rankin, Windsor and Wahyuni (2011)'s study on 187 top ASX firms in 2007, scholars find *quality of governance* using a composite measure which considers *the presence of an environmental committee and firms with environmental management systems (EMS)* positively associated with GHG disclosure to CDP. The credibility of disclosure using a credibility disclosure index formulated from ISO 14064-1 is positively associated with the chosen governance measure. A subsequent examination of ECC disclosures in 2008 annual reports of 96 top ASX firms in Rao, Tilt and Lester (2011)'s study also find support for statistically significant positive associations between disclosures and the *presence of independent boards, female board representation, institutional ownership and board size*. In a subsequent study on 2009 to 2011 data by Ghomi and Leung (2013), authors argue that as firm size is a significant determinant of voluntary disclosure, this could render bias results in the above mentioned studies (Ghomi and Leung 2013, 110). Thus, they sought to examine only firms which were not liable to the

[25] Horwath Corporate governance report ranks Australia's 250 largest companies according to its market capitalisation based on its corporate governance structures (Choi et al 2013). It focuses on *board independence and committee independence* based related party disclosures and publically available information (Rankin et al 2011).

NGER Act. Their resulting final sample of 151 firms, were companies which were not required to meet mandatory GHG reporting requirements and therefore the public disclosure of environmental information would be purely voluntarily driven. Given these considerations, their results nevertheless were also consistent with findings from earlier studies. Their evidence supports a positive association between the *proportion of non-executive directors* and GHG disclosures relating to actions, targets, reduction achievements, measures and verifications.

### *2.5.3 Governance-ECC disclosure considerations*

In summary, recent prominent US, Canadian, UK and Australian studies find more often than not, aspects associated with good corporate governance are positively associated with extent and quality of firm ECC disclosures. Collectively, these studies examine ECC disclosures from early 2000 to 2011. The US samples examined data of top US FT500 and S&P 500 firms (Peters & Romi, 2014), firms in environmentally sensitive industries listed on Dow Jones Sustainability Index (DJSI) (Rupley, Brown and Marshall, 2012) and top US oil and gas companies (Arena Bozzolan and Micelon, 2015) and encompass examination of corporate ECC disclosures in annual reports, sustainability reports, SEC Form-10K and disclosure with CDP from 2002 to 2010. Canadian (Ben-Amar and McIlkenny, 2015) and UK (Liao, Luo and Tang, 2015) results echo US findings in relation to disclosure transparency via CDP for data from 2008 to 2011 and Australian studies examined corporate annual report disclosures and CDP disclosures from 2006 to 2011 (Choi, Lee and Psaros 2013; Rankin, Windsor and Wahyuni 2011; Rao, Tilt and Lester 2011; Ghomi and Leung 2013).

From these studies, governance factors like *board independence* conclusively report statistically significant positive associations with ECC disclosure in international and Australian studies up to 2011 (Liao, Luo and Tang, 2015; Rupley, Brown and Marshall 2012; Arena, Bozzolan and Michelon 2015; Rao, Tilt and Lester 2011; Ghomi and Leung 2013). Other board characteristics like *board tenure, board size, board diversity, multiple directorships* although less extensively examined, also report positive associations for all studies examined with the exception of *CEO-Chair duality* (Rao, Tilt and Lester, 2011; Liao, Luo and Tang, 2015; Rupley, Brown

and Marshall, 2012; Arena, Bozzolan and Michelon, 2015) and *Environmental/CSR committees* (Rupley, Brown and Marshall, 2012). Examination of *director characteristics* and ECC disclosure is scant in recent Australian, UK, US and Canadian studies.

Furthermore, studies like Liao, Luo and Tang (2015) provide indicative evidence that the 'governance-disclosure' relation remains a significant determinant even during periods of greater environmental regulatory intervention (i.e. research period covers commencement period of ETS) in UK. This is similarly observed in Choi, Lee and Psaros (2013) in the Australian context when NGER Act was imminent. However, although the regulatory context is evident, the effect of regulatory change is not explicitly[26] tested in their statistical models.

## 2.6 Corporate governance determinants of ECC performance

There is far more controversy in relation to whether governance mechanism are associated with firms' ECC performance. These studies are discussed in a chronological manner below. Similarly, governance variables and ECC performance variables examined in each are summarised in Table 2.3 presented at the end of section 2.6.2

### *2.6.1 International studies (governance-ECC performance)*

Using a *composite measure* for firm governance quality which considers the presence of an *environmental committee, frequency of environmental reporting and firm participation in Environmental Protection Agency (EPA)'s voluntary programs*, Al-Tuwaijri, Christensen and Hughes (2004)'s early US study on 198 S&P firms in 1994 find positive association between governance quality and environmental performance and environmental disclosure. Al-Tuwaijri, Christensen and Hughes (2004)'s joint estimation research design incorporates governance in the environmental performance-disclosure relation to illustrate the execution of the

[26] In this study, unlike earlier mentioned studies, the researcher includes interaction variables in test models to capture the regulatory effects due to recent collective amendments following CPM, ASIC RG247 and ASX requirements, on the governance-disclosure association. Refer Chapters 4 for research methodology.

endogenous factor of "managerial influence" in the equation. Their results concluded that good governance is associated with good environmental performance and more extensive environmental disclosures and ultimately even improved economic performance. Al-Tuwaijri, Christensen and Hughes (2004)'s study echoes views of early proponents to the "business case" argument for environmental management consistent with Michael Porter[27], who advocates the advantages of innovative solutions for environmentalism.

Drawing from broader social and environmental (SED) literature at that time, although Johnson and Greening (1999)'s study did not consider the governance-disclosure relation, authors observed similar results as Al-Tuwaijri, Christensen and Hughes (2004)'s study for their governance-performance relation. Using a lagged structural equation modelling approach, Johnson and Greening (1999)'s sample of 300 firms from KLD[28] database for 1993 find *ownership* and *outside director representation* positively related to the firms' stance on the natural environment.

In contrast, Cong and Freedman (2011)'s study on a sample of high polluting US firms a decade later find no significant association between governance and environmental performance and only minimally with environmental disclosure. This appears somewhat surprising, given that their study follows governance enhancements following the introduction of the Sarbanes-Oxley Act (SOX)[29] in 2002. Cong and Freedman (2011) used a composite corporate governance ratings system which measures *firm governance on management supervision and accountability* to the board (Gov-Score index[30]). They reported statistically significant association with environmental disclosure for only one (in 2003) out of their three year analyses (2003 to 2005) and no association with environmental performance. They concluded that enhanced governance structures aimed at

[27] Michael Porter is distinguished professor at Harvard Business school who is a prominent scholar famous for propagating positive firm strategies with positive environmental initiatives that increase firm competitiveness and economic benefits (Porter and Van der Linde 1995)

[28] KLD database is developed by Kinder, Lydenberg, Domini and Company and rates firms on their corporate social performance. Johnson and Greening (1999) applies five of nine dimensions of CSP measured by KLD (community, women and minorities, employee relations, environment, product quality). Mallin, Michelon and Raggi (2013).

[29] Sarbanes-Oxley Act of 2002 (SOX) was introduced to improve financial accountability through changes to corporate board structures, responsibilities, committees and officers (Cong and Freedman, 2011).

[30] Gov-Score index is a Corporate Governance ratings system derived from data used to generate institutional shareholder information. It measures firm governance using 51 specific measures of governance which focus on management supervision and accountability to the board (Cong and Freedman 2011).

enhanced financial accountability do not render more extensive environmental disclosures and the extent of disclosure was not related to actual environmental performance.

In Martin, Stuebs and Sun (2014), authors measured governance using a scoring index (i.e G-index[31]) which Cong and Freedman (2011) cited as being similar to its Gov-score index. Martin Stuebs and Sun (2014) examined US firms listed on Russell 3000 index for periods 2004 to 2007. Despite the apparent similarity with regard to its measurement index and sample periods, Martin Stuebs and Sun (2014)'s findings were contrary to Cong and Freedman (2011) as their evidence supports a statistically significant and positive association between their composite governance measure and firm environmental performance.

In these post-SOX years, US literature also reports a number of studies using more specific measures of firm governance to examine the said associations but with inconclusive findings (De Villiers, Naiker and Van Staden 2011; Mallin, Michelon and Raggi 2013; Rodrigue, Magnan and Cho 2013; Arena, Bozzolan and Michelon 2015). De Villiers and van Staden (2011) employed larger sample datasets (981 observations for 2003 and 1,170 for 2004) and find positive association between governance and environmental performance as measured by KLD's indicator for firm environmental strength (i.e. beneficial product and service, pollution prevention, recycling, clean energy). From their examination of at least nine governance aspects encompassing monitoring and resource provision roles of board, De Villiers, Naiker and Van Staden (2011) find environmental performance positively associated with the *presence of independent boards, presence of active CEO and presence of a law experts,* and no significant association with *CEO-duality, director ownership*, *multiple directorship* and *board tenure*.

Thereafter, Mallin, Michelon and Raggi (2013)'s study on US 100 best corporate citizens from periods 2005 to 2007, authors find empirical support for firm specific governance factors (e.g. *board independence, presence of CSR committee and*

[31] G-index assigns total score based on 24 firm specific governance measures which enhance the overall supervision and accountability to board. It was initially developed by a few researches based on Gompers, Ishii, & Metrick (2003). Data obtained from the IRRC (Investor Responsibility Research Centre Inc.) who provide research on corporate governance and corporate responsibility issues. (Cong and Freedman 2011)

*presence of community influential*) which drive monitoring and stakeholder orientation of boards positively associated with firms' corporate social and environmental performance, particularly in relation to product and environmental dimensions.

In contrast, Rodrigue, Magnan and Cho (2013)'s study spanning periods covered by both De Villiers, Naikers and Van Staden (2011) and Mallin, Michelon and Raggi (2013) examined periods from 2003 to 2008 however, did not find statistically significant association generally between aspects of its governance mechanisms (i.e. *presence of environmental committee, director environmental awareness and environmental incentives in compensation*) and environmental performance measured in three areas (regulatory, pollution prevention and environmental investment). Rodrigue, Magnan and Cho (2013) examined a sample of 219 firms in environmentally sensitive industries included in S&P 500 index and sourced its measure of firms' environmental performance indicators from a comprehensive web-based database the KLD Socrates[32] which was also used in both De Villiers, Naikers and Van Staden (2011) and Mallin, Michelon and Raggi (2013)'s studies. Arguably, Rodrigue, Magnan and Cho (2013)'s study appears to have adopted the narrowest environmental performance measure in comparison with Mallin, Michelon and Raggi (2013) and De Villiers, Naikers and Van Staden (2011)'s study. Rodrigue, Magnan and Cho (2013)'s concludes that their results show that the likelihood for any breach in regulatory environmental issues and intensity of environmental investments are associated with firm economic characteristics rather than any of the three governance aspects which they examined. Only the firms' pollution prevention performance showed some indication of being positively impacted by environmental incentives as did other firm economic variables. Their quantitative tests corroborates with results from interviews with corporate leaders. Authors conclude that environmental governance practices adopted at board level are symbolic rather than substantive, as interviewees contended that practices tend to be employed to address organizational reputation or to prevent regulatory harm.

[32] KLD Socrates database is a research database measuring social and environmental performance and rates firms using a proprietary framework based on positive and negative indicators. Authors cite the use of KLD data in management and environmental accounting research include Cho et al 2010; Johnson and Greening 1999.( Malie et al 2013 and Rodrigue et al 2013)

As Rodrigue, Magnan and Cho (2013)'s study involves firms in environmentally sensitive industries, it is also appropriate to contrast it with Arena, Bozzolan and Michelon (2015)'s study examining a sample of US oil and gas companies from 2008 to 2010. Using factors like *board size, CEO-duality, proportion of independent directors, director connections through multiple appointments, board diversity and presence of CSR committees* as proxies for monitoring and stakeholder orientation of boards, Arena Bozzolan and Michelon (2015)'s results provide empirical support that firms with high board monitoring and stakeholder orientations are associated with superior future environmental performance. In Arena, Bozzolan and Michelon (2015)'s study, authors segregated results of governance measures according to whether firms scored above or below the median and classified their sample into high or low monitoring or stakeholder orientated firms. In doing so, their results do not provide explicit evidence regarding which particular governance variable(s) may be strong determinants. Nevertheless, authors conclude that overall, environmental disclosure tone signals a firms' future environmental performance and firms with low board monitoring and stakeholder orientation is associated with future environmental concerns (i.e poor performance). Contrary to Rodrigue, Magnan and Cho (2013), Arena, Bozzolan and Michelon (2015)'s evidence supports the view that environmental disclosures act as accountability mechanisms and not merely symbolic concern for the environment.

### *2.6.2 Governance-ECC performance considerations*

To this end, it is evident that since the emergence of such literature from the early 1990s, US studies dominate. Results have been mixed. Using *composite measures of governance*, Martin, Stuebs and Sun, (2014) report positive associations with ECC performance and Cong and Freedman (2011) do not find statistically significant associations. Board characteristics like *multiple directorships, board tenure* and *board size* report positive associations (Arena, Bozzolan and Michelon, 2015) and no association (De Villiers, Naiker and Van Staden, 2011) with ECC performance. With the exception of Rodrigue, Magnan and Cho (2013), studies generally find support for a positive association for *environmental/CSR committees* and ECC performance (Mallin, Michelon and Raggi 2013; Arena, Bozzolan and Michelon, 2015; Al-Tuwaijri, Christensen and Hughes, 2004). Director characteristics such as their

*influence in communities* and *expertise in law* are associated with ECC performance (Arena, Bozzolan and Michelon, 2015; Mallin, Michelon and Raggi, 2013, De Villiers, Naiker and Van Staden, 2011) but the presence of directors who are *environmentally aware* are not (Rodrigue, Magnan and Cho, 2013).

**Table 2.3** Governance variables and their association with ECC disclosure and performance

| Governance measure | *sign* | ECC disclosure measure (i.e. level, quality, transparency or propensity to disclose) | *sign* | ECC performance measure (i.e. performance indicators) |
|---|---|---|---|---|
| **Board characteristics** | | | | |
| Presence of Environment/CSR Committee [a,b,c,d,e, h] | +ve | GHG disclosure via CDP (Peters and Romi 2014; Liao, Luo, Tang 2015) [a, h] and CDP disclosure ranking (Peters and Romi 2014) [a] | +ve | KLD Socrates database: social and environmental indicators on 100 best corporate citizens in 2005, 2006 and 2007 (Mallin, Michelon and Raggi 2013) [i] |
| *Includes:* (a) environment Committee characteristics (expertise, size, number of meetings, overlap with audit committee) [a] & (b) presence and characteristics (expertise) of Chief Sustainability Officer [a] | +ve | Disclosure index based on 4 indicators: (i) total amount of toxic waste generated and transferred or recycled (ii) financial penalties resulting from violation of 10 Federal environmental laws (iii) responsible party designated for hazardous waste site clean-up (iv) occurrence of reported oil and chemical spills. (Al-Tuwaijri, Christensen and Hughes, 2004). [b] | ***no asso*** | Obtained from KLD database: (i) environmental regulatory performance (ii) pollution prevention performance (presence of pollution prevention programs) (iii) intensity of environmental capital expenditures (ece) from 10-K reports calculated by scaling ece to total expenditures (Rodrigue, Magnan and Cho, 2013) [j] |
| | +ve | Disclosure measure based on ISO 14064-which address these areas: (i) reporting period (ii) documentation of organisational boundary (iii) quantification of direct and indirect GHG emissions (iv) historical base year (v) description of GHG policies, strategies or programs (vi) statement describing assurance or verification of GHG report (vii) assessment of performance against internal or external benchmarks (Rankin, Windsor and Wahyuni, 2011). [c] | +ve | KLD database rating which assigns scores for environmental 'strength' and 'concern' on a five point scale (concerns cover regulatory problems, ozone depleting chemicals, substantial emissions, agricultural chemicals, climate change and other) (Arena, Bozzolan and Michelon, 2015).[e] |
| | ***no asso*** | Disclosure index based on GRI framework encompassing: (i) compliance (ii) pollution prevention (iii) product stewardship (iv) sustainable development (Rupley, Brown and Marshall, 2012). [d] | +ve | Quantitative measure : ratio of toxic waste recycled to total toxic waste generated (based on CERES's first three principles of good environmental performance) (Al-Tuwaijri, Christensen and Hughes, 2004). [b] |
| | +ve | Disclosure tone of environmental disclosures and environmental performance (Arena, Bozzolan and Michelon, 2015).[e] | | |
| Board Independence (non-executive representation) [d,e,f] | +ve | Disclosure index based on GRI framework encompassing: (i) compliance (ii) pollution prevention (iii) product stewardship (iv) sustainable development (Rupley, Brown and Marshall, 2012)[d] | +ve | KLD database which measures five dimensions but grouped into two factors being 'people dimension' and 'product quality dimension'(i.e includes product and environmental ratings) (Johnson and Greening, 1999) [l] |
| | +ve | Disclosure tone of environmental disclosures and environmental performance (Arena, Bozzolan and Michelon, 2015) [e] | +ve | KLD Socrates database: social and environmental indicators on 100 best corporate citizens in 2005, 2006 and 2007 (Mallin, Michelon and Raggi 2013) [i] |
| | +ve | GHG disclosure via CDP (Liao, Luo, Tang 2015) [h] | +ve | KLD database: environmental strengths (beneficial products/services, pollution prevention, recycling, clean energy, other) (De Villiers, Naiker and Van Staden, 2011) [m] |
| | +ve | Disclosure of environmental issues (by word count and percentage of total words in annual report) (Rao, Tilt and Lester, 2011) [f] | | |
| | +ve | GHG disclosure index modified from e Aguiar and Fearfull (2010) according to NGER Act requirements (Ghomi and Leung, 2013) [k] | | |

Keys: Australian studies; International studies

**Table 2.3** Governance variables and their association with ECC disclosure and performance (continued)

| Governance measure | *sign* | ECC disclosure measure (i.e. level, quality, transparency or propensity to disclose) | *sign* | ECC performance measure (i.e. performance indicators) |
|---|---|---|---|---|
| **Board Characteristics (continued)** | | | | |
| Multiple directorships [d, m,] | +*ve* | Disclosure index based on GRI framework encompassing: (i) compliance (ii) pollution prevention (iii) product stewardship (iv) sustainable development (Rupley, Brown and Marshall, 2012). [d] | ***no asso*** | KLD database measure of five environmental strengths (beneficial products/services, pollution prevention, recycling, clean energy, other environmental strengths) (De Villiers, Naiker and Van Staden, 2011) [m] |
| Board tenure [m] | | | ***no asso*** | KLD database measure of five environmental strengths (beneficial products/services, pollution prevention, recycling, clean energy, other environmental strengths) (De Villiers, Naiker and Van Staden, 2011) [m] |
| Board size [e,f] | +*ve* | Disclosure tone of environmental disclosures and environmental performance (Arena, Bozzolan and Michelon, 2015) [e] | +*ve* | KLD database rating which assigns scores for environmental 'strength' and 'concern' on a five point scale (concerns cover regulatory problems, ozone depleting chemicals, substantial emissions, agricultural chemicals, climate change and other) (Arena, Bozzolan and Michelon, 2015).[e] |
| | +*ve* | Disclosure of environmental issues (by word count and percentage of total words in annual report) (Rao, Tilt and Lester, 2011) [f] | | |
| Board diversity (includes female representation) [d,e,f,h] | +*ve* | Disclosure index based on GRI framework encompassing: (i) compliance (ii) pollution prevention (iii) product stewardship (iv) sustainable development (Rupley, Brown and Marshall, 2012).[d] | +*ve* | KLD database rating which assigns scores for environmental 'strength' and 'concern' on a five point scale (concerns cover regulatory problems, ozone depleting chemicals, substantial emissions, agricultural chemicals, climate change and other) (Arena, Bozzolan and Michelon, 2015).[e] |
| | +*ve* | Disclosure tone of environmental disclosures and environmental performance (Arena, Bozzolan and Michelon, 2015) [e] | | |
| | +*ve* | Disclosure of environmental issues (by word count and percentage of total words in annual report) (Rao, Tilt and Lester, 2011) [f] | | |
| | +*ve* | GHG disclosure via CDP (Liao, Luo, Tang 2015) [h] | | |
| CEO-Chair duality [d,e,m] | ***no asso*** | (1d) Disclosure index based on GRI framework encompassing: (i) compliance (ii) pollution prevention (iii) product stewardship (iv) sustainable development (Rupley, Brown and Marshall, 2012) [d] | ***no asso*** | KLD database on five environmental strengths (beneficial products/services, pollution prevention, recycling, clean energy, other environmental strengths) (De Villiers, Naiker and Van Staden, 2011) [m] |
| | +*ve* | Disclosure tone of environmental disclosures and environmental performance (Arena, Bozzolan and Michelon, 2015) [e] | | |

Keys: Australian studies; International studies

**Table 2.3** Governance variables and their association with ECC disclosure and performance (continued)

| Governance measure | *sign* | ECC disclosure measure (i.e. level, quality, transparency or propensity to disclose) | *sign* | ECC performance measure (i.e. performance indicators) |
|---|---|---|---|---|
| **Director/CEO characteristics** | | | | |
| (a) Director connections [e]<br>(b)Directors influential in the community [i] | *+ve* | Disclosure tone of environmental disclosures and environmental performance (Arena, Bozzolan and Michelon, 2015) [e,] | *+ve* | KLD database rating which assigns scores for environmental 'strength' and 'concern' on a five point scale (concerns cover regulatory problems, ozone depleting chemicals, substantial emissions, agricultural chemicals, climate change and other) (Arena, Bozzolan and Michelon, 2015).[e] |
| (c ) Directors with environmental awareness [j] | | | *+ve* | KLD Socrates database: social and environmental indicators on 100 best corporate citizens in 2005, 2006 and 2007 (Mallin, Michelon and Raggi 2013) [i] |
| (d ) Directors who are law experts [m] | | | ***no asso*** | Obtained from KLD database: (i) environmental regulatory performance (ii) pollution prevention performance (presence of pollution prevention programs) (iii) intensity of environmental capital expenditures (ece) from 10-K reports calculated by scaling ece to total expenditures (Rodrigue, Magnan and Cho, 2013) [j] |
| **Composite measures of governance** | | | | |
| *Includes:*<br>(a) Independent rating Horwath Corporate Governance Report 2008 (considers existence of EMS and envirocommittee) [g,c] | *+ve* | Disclosure measure based on ISO 14064-which address these areas: (i) reporting period (ii) documentation of organisational boundary (iii) quantification of direct and indirect GHG emissions (iv) historical base year (v) description of GHG policies, strategies or programs (vi) statement describing assurance or verification of GHG report (vii) assessment of performance against internal or external benchmarks (Rankin, Windsor and Wahyuni, 2011). [c] | *+ve* | KLD's net environmental performance score (scores for 'environmental strength' include beneficial products, pollution prevention, recycling, alternative fuels, communications, property; while scores for 'environmental concerns'are hazardous waste, regulatory problems, ozone depleting chemicals, substantial emissions, agricultural chemicals and climate change) (Martin, Stuebs and Sun, 2014) [o] |
| (b) Gov-score index (management supervision) [n] | *+ve* | Disclosure measure based on CDP questionnaire : (i) climate risk and opportunities (ii) GHG emissions accounting (iii) energy consumption accounting (iv) greenhouse gas reduction and cost of carbon emissions accountability (iv) carbon emissions accountability (Choi, Lee and Psaros,2013) [g,] | | |
| (c ) G-index (considers 24 specific governance items that enhance supervision) [o] | ***no asso*** | Disclosure extensiveness relating to five categories: (i) toxic release inventory (TRI) amount for period 2003-2005; (ii) chemical compound releases (iii)emissions data by plant (iv) TRI for previous three years (v) categorisation of releases by method (e.g. air,water,land) (Cong and Freedman, 2011) [n,] | ***no asso*** | Pollution measure according to risk-related RRR metric which is a composite measure of chemical release, pollution pathway, toxicity, surrogate dose and the exposed population (Cong and Freedman, 2011) [n] |
| (d ) CBBE BSCI (considered Canadian's best practice governance) [p] | *+ve* | Measures (i) decision to disclose to CDP (ii) disclosure transparency (iii) quality of disclosure relates to completeness of responses on risks, opportunities, strategy, GHG accounting and management and climate governance (Ben-Amar and McIlkenny, 2015) [p] | | |

Keys: Australian studies; International studies

## 2.7 Summary of Chapter 2

This chapter begins with the background and developments relating to Australia's environmental and climate change policies from its early beginnings, including legislative outcomes which have come to play since. Specific mention regarding legislative and recent prescriptive guidance requiring firms to disclose ECC disclosures in corporate reports are also discussed in section 2.2. Thereafter, details of three prominent voluntary reporting regimes, their aims, developments and extent of adoption by firms today is presented in section 2.3. This informs about the regulatory and institutional influences impacting corporate Australia in relation to environmental and climate change issues.

Section 2.4 details the importance of examining firm governance within the context of prior and current social and environmental literature. Firstly, examination of literature on determinants of ECC disclosures uncovers the view that literature has been preoccupied with a myriad of external factors like pressures from interest groups, societal and media influence or events which heighten scrutiny on firms to explain motivations for disclosure (Patten 1992; Deegan and Gordon 1996; Deegan, Rankin and Tobin 2002; Walden and Schwartz 1997; Deegan, Rankin and Voght 2000; Cho 2009). Institutional pressures, including regulatory pressures which can promulgate certain environmental practices (Reid and Toffel 2009; Delmas and Toffel 2004; Delmas and Toffel 2010) and firm specific characteristics also play a significant role (Prado-Lorenzo et al. 2009; Freedman and Jaggi 2005; Stanny and Ely 2008; Brammer and Pavelin 2006). However, the role of firm governance is less apparent in prior ECC disclosure literature until recently. Incidentally, literature also seem to suggest that the importance of firm governance was incited through studies which sought to consider the link between ECC disclosures and performance (Al-Tuwaijri, Christensen and Hughes, 2004; Patten 2002; Cho et al. 2012).

In sections 2.5 and 2.6 respectively, pertinent literature examining the relation between governance and ECC disclosures and performance are discussed. Literature examining *specific governance variables* emerging mostly since 2000s, with US (Peters and Romi 2014, Rupley, Brown and Marshall 2012 and Arena, Bozzolan and Michelon 2015), UK (Liao, Luo and Tang 2015) or Canadian (Ben-Amar and

McIlkenny 2015) evidence finding more often than not, enhance governance characteristics associated with ECC disclosures. Australian studies are limited in that only *composite measures* of governance and *board independence* have been examined (Choi, Lee and Psaros 2013; Rankin, Windsor and Wahyuni 2011; Rao, Tilt and Lester 2011; Ghomi and Leung 2013). For ECC performance, US studies dominate and results have been mixed. Studies find enhanced governance measures associated with improved environmental performance in some (Al-Tuwaijri, Christensen and Hughes, 2004; Johnson and Greening 1999; Martin, Stuebs and Sun 2014; De Villiers and Van Staden, 2011; Mallin, Michelon and Raggi, 2013; Arena Bozzolan and Michelon, 2013) and not in others (Rodrigue, Magnan and Cho 2013; Cong and Freedman 2011; De Villiers and Van Staden, 2011).

Taken together, literature on governance measures which enhance or inhibit ECC disclosures and performance should be further examined, as its evidence is still at infancy, particularly for Australia. Understanding aspects of firm governance in relation to the ECC disclosure and performance is indicative of whether firm governance mechanisms are symbolic means to project the firms' environmental initiatives or are in fact substantive accountability measures of firms' environmental strategies. Furthermore, the importance of the interaction between institutional or regulatory pressures with firm governance measures, in the adoption of the firms' environmental disclosure strategy and initiatives are also often ignored in prior studies. This informs us about implications of these pressures on the 'governance-disclosure' and 'governance-performance' association and is particularly relevant in Australia's institutional governance context during a period preoccupied by policy and regulatory uncertainly.

# CHAPTER THREE
# THEORETICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

## 3.1 Introduction

This thesis examines the association between firm governance and environmental disclosure practices and indicators of environmental performance. The underlying theoretical framework of this study applies the theoretical concepts found in both governance and social and environmental literature.

## 3.2 Theoretical Concepts

In the governance literature, governance initiatives of firms are administered through monitoring mechanisms and director characteristics which are also commonly referred to as *monitoring roles and resource dependent roles* of boards (Denis and McConnell, 2003). Monitoring roles of boards are rooted in agency theory and refer to governance mechanisms which assist boards to monitor actions of managers in order to protect shareholders or owners, from potential conflicts of interest which may arise with the separation of ownership and control (Jensen and Meckling, 1976). Common monitoring governance mechanisms which enhance monitoring intensity include the presence of independent directors, separation of CEO and chair duties, presence of board committees, managerial rewarding incentives or ownership concentration (Hillman, Nicholson and Shropshire, 2008). Resource dependence theory highlights the importance of directors' abilities to bring resources to the firm which could enhance or add to firm value, such as elements of human capital (experience, skill, expertise) and social capital (network ties) (Wernerfelt, 1984). Broadly, directors therefore assume two complementary functions, in that they are expected to monitor managerial action with regard to optimal use and allocation of firm resources in the interest of stakeholders, and to act in an advisory capacity with regard to strategic decision-making functions of the firm (Hillman, Nicholson and Shropshire, 2008), including its fiduciary duties with regard to the firms' environmental responsibilities.

Firm governance considered within the context of the firms' environmental performance and disclosure strategies suggests two competing perspectives: *substantive* or *symbolic* environmental governance (Rodrigue, Magnan and Cho 2013). The theoretical argument for the *substantive* perspective incorporates agency and stakeholder theorists' rationale. Agency theorists' suggest that firms with effective monitoring and resource dependence governance will volunteer information as a means to narrow information asymmetry between managers and owners (Healy and Palepu, 2001). Stakeholder theorists' extend the agency theorists' perspective in that managerial accountability extends to a wider range of legitimate parties beyond only value creation to shareholders (Ghomi and Leung 2013). Therefore, with climate change and environmental issues being at the forefront of shareholders, investors, employees and societal concerns today, corporate leaders are incentivised to engage in positive environmental initiatives, reduce information asymmetry through voluntary disclosure of its environmental strategies or utilise disclosures to signal its positive environmental performance (Clarkson, Richardson and Vasvari, 2008).

In contrast, the *symbolic* perspective suggest that internal monitoring and resource governance mechanisms do not improve firm environmental disclosure or initiatives and are instead used only as a symbolic representation to appease stakeholders (Rodrigue Magnan and Cho, 2013, Mallin, Michelon and Raggi, 2013). This perspective incorporates the legitimacy theorists' views which suggests that monitoring and advisory capabilities are ineffective in being able to initiate substantial change or to constrain managerial opportunistic actions or able to bring critical knowledge or expertise which can benefit firms' environmental strategies. Overall, the *symbolic perspective* does not enhance the firms' environmental performance or accountability through disclosure (De Villiers, Naiker and Staden, 2011).

### 3.3 Hypothesis development

This study examines three important board monitoring aspects and three areas of director affiliation which contribute to a directors' human and social capital (Hillman and Dalziel 2003). The choice for each governance item examined is discussed and

findings from recent literature forms the basis of hypotheses presented below. Additionally, the implication of regulatory changes observed during the research period is examined for each of the associations examined.

### *3.3.1 Board independence*

Following major corporate collapses[33], for example in the UK in the 1990s, the *Cadbury Committee* in 1992 recommended improvements to corporate governance practices to restore investor confidence. The recommendations included that listed boards should have non-executive directors, to bring independent perspectives and to monitor or oversee managerial responsibilities. Similar events and changes in the U.S. saw the enactment of the *Sarbanes-Oxley Act* in 2002 (SOX). New reforms introduced a suite of requirements for firms publically listed on both NYSE and NASDAQ by 2003. This included the requirement for listed firms to have a majority non-executive / independent directors[34] on boards of listed companies to strengthen the role of boards as representatives of shareholders. In Australia, since the introduction of ASX's Corporate Governance Council's recommendations in 2003, the presence of independent directors on boards have been adhered to generally, although research evidence remains inconclusive in relation to the effect of director independence on firm economic performance (Brooks, Oliver and Veljanovski 2009; Finegold, Benson and Hecht, 2007).

Today, the debate also extends to whether the same governance code should apply in relation to the firms' environmental accountability and environmental performance. Literature more often than not finds independent boards associated with an increased extent of environmental disclosures and positive environmental performance (Rupley, Brown and Marshall, 2013; Choi, Lee and Psaros, 2013; Liao Luo and Tang, 2015). Studies suggest that independent directors are objective decision-makers as a higher proportion of independent board members are associated with

[33] Major corporate collapses in the UK include Maxwell Communications Corporation, Bank of Credit and Commerce International (Brooks et al 2009) and Enron, Worldcom, Lehman Brothers in the US (Finegold, Benson and Hecht 2007).

[34] Independent board members are directors who do not have any material business relationship with the company or were formerly employed in an executive capacity with the firm, or has substantial interest or association which could interfere with or reasonably perceive to interfere with their independent exercise of judgement (ASX CGC,2014).

better decision making by boards. Better decision making have been associated with a boards' ability to be objective and better able to represent multiple views in relation to the overall strategic decisions of the firm (Denis and McConnell, 2003) and in relation to its corporate environmental policies (Kassinis and Vafeas, 2002). Independent directors are better monitors as they have shown to be better able to reduce opportunistic managerial behaviours in the firms' stance on environmental matters (Mallin, Michelon and Raggi, 2013). Independent directors are likely to be more effective monitors, as their lack of material interest with the organisation increases their ability to act in the interest of stakeholders (Rao, Tilt and Lester, 2012). As such, boards dominated by independent directors are able to exert pressure on the organisation to engage in actions which are congruent with societal and stakeholder values (Haniffa and Cooke, 2005). Independent directors are driven by personal incentive and reputational goal for performance. A survey of ASX 200 firms find that independent directors regard their role in strategic decision making concerning the firms' social and environmental goals and performance important fiduciary duties (Brooks, Oliver and Veljanovski, 2009). Being generally stakeholder orientated, independent directors have greater incentive to pursue environmental objectives which may prove to be innovative and reflect positively on their social and environmental reputation (Johnson and Greening 1999). Their role to provide objective views in relation to the firms' environmental decision making include accountability through environmental disclosures (Rao, Tilt and Lester, 2012). Their incentives to pursue positive environmental initiatives and disclose positive performance also enhances their reputation for continued director appointments (De Villiers, Naiker and Van Staden, 2011). Therefore, given the congruence between independent director responsibilities and directors' personal incentives, they are more likely to pursue initiatives with positive performance outcomes and volunteer disclosures. Independent directors are environmentally exposed and engaged as independent boards have exposure to environmental initiatives and reporting in other advisory settings due to their directorships on other boards (Rupley, Brown and Marshall, 2012). Therefore, in the context of environmental governance, they are likely to provide value-add expertise (Fama and Jensen 1983) due to experience and knowledge gained from a related industry (De Villiers, Naiker and Van Staden, 2011). Independent directors are better able to balance financial and environmental accountability. Independent directors will be less preoccupied with short term

economic goals relative to their executive counterparts. They are more likely to act in the long term interest of the firm particularly when dealing with costly investments, as they are normally less restraint by short term economic goals (Liao, Luo and Tang, 2015). This rationale suggests that independent directors would take a broader approach, in view of their long term interest in the firm. They are willing to accept responsibility for the environmental implications of the firms' operations and adopt proactive strategies to reduce inefficiencies (De Villiers, Naiker and Van Staden, 2011). In line with the independent director's ability to influence strategic decision making, independent boards will have a greater capability then to balance short term economic goals with environmental accountability, which tend to have positive longer term implications for the firm. Thus, the following hypotheses are proposed:

*H1a: There is a positive association between board independence and the extent of ECC disclosures*

*H1b: There is a significant*[35] *association between board independence and firm ECC performance*

In the Australian context, prior studies report statistically significant governance-disclosure relations before the introduction of the NGER Act (Choi, Lee and Psaros, 2013, Rankin, Windsor and Wahyuni, 2011) and during its operative periods (Rao et al 2012). On this premise, the regulatory changes with the enactment the *Clean Energy Act 2011* which established the carbon pricing mechanism, ASIC regulatory guidance RG 247, and ASX recommendations in latest 3rd version, are not expected to significantly affect positive associations between governance measures like independent boards and environmental disclosure practices of ASX sample firms over the research period. Evidence for the governance-performance relation is somewhat limited in the Australian context. According to Griffiths, Haigh and Rassias (2007), in a market governance system like Australia, which is characterised by voluntary measures by corporations, it is expected that monitoring governance measures by firms will remain significantly associated with firms' engagement with

[35] Hypotheses in relation to ECC performance does not predict a directional relationship due to mixed results from prior literature, refer section 2.6

environmental activities which reflect both positive and negative performance of the firm. Thus, these hypotheses are proposed:

*H1c: The positive association between board independence and ECC disclosure is impacted by regulatory change*

*H1d: The significant association between board independence and ECC performance is impacted by regulatory change*

### *3.3.2 Environmental/CSR Committee*

Firms commonly establish board committees to provide specialised responsibilities for key firm activities and decision making (Dixon-Fowler, Ellstrand and Johnson, 2017). In Australia, section 198D of the *Corporations Act 2001* allows directors to delegate powers to board committees, but remains responsible for the exercise of the delegation (section 190) and are reasonably able to rely on advice or information given by the committee in good faith (section 189). Delegation of powers by the Board to Committees does not lessen the boards' overall responsibilities (Australian Institute of Company directors, 2016). ASX Corporate Governance Council recommends firms establish an Audit, Nomination and Remuneration Committee[36]. Additionally, a Risk committee is also recommended to oversee risk and some firms combine this function with the Audit Committee or as a stand-alone Committee (ASX, 2016). The presence of an environmental/CSR Committee is a voluntary measure of the board.

Some studies find the presence of environmental committees are positively associated with the extent of environmental disclosures and performance (Peters and Romi 2014; Liao, Luo and Tang, 2011; Dixon-Fowler, Ellstrand and Johnson 2017) while others find no statistically significant association (Rupley, Brown and Marshall, 2012; Rankin, Windsor and Wahyuni, 2011; Rodrigue, Magnan and Cho, 2013). Results from Rankin, Windsor and Wahyuni (2011)'s Australian study and

[36] Similarly, for publically listed US firms, mandated Board committees required by the Securities and Exchange Commission (SEC) include audit, nomination and compensation committees (https://www.sec.gov/rules/sro/34-47672.htm)

Rupley, Brown and Marshall (2012)'s U.S. study were contrary to their predictions, as they did not find the presence of environmental committees associated with firms' likelihood to disclose GHG information to CDP or associated with disclosures in annual reports. Additionally, Rupley, Brown and Marshall (2012)'s study which incorporates an interaction term between the presence of an environmental committee and negative media in their model, produced a statistically significant positive association with pollution prevention disclosure. They suggest that their evidence implies that the presence of an environmental committee may contribute toward more disclosures in the face of bad publicity. Similarly, Rodrigue, Magnan and Cho (2013) U.S. study on firms in environmentally sensitive industries, did not find a statistically significant association between the presence of environmental committees and environmental performance as measured in terms of regulatory compliance, pollution prevention and intensity of environmental investment. Corroborating its quantitative evidence with a limited sample of semi-structured interviews, they find that the role of environmental committees are largely related to policy and regulatory compliance and did not involve decisions regarding environmental investment decisions. Rodrigue, Magnan and Cho (2013) suggest this is indicative of environmental committees complying with regulatory provisions instead of mechanisms geared toward pro-active environmental performance improvements. Nevertheless, informants often stated that their role included provision of recommendations and advice to the board. These studies collectively tend to suggest that environmental committees act more for symbolic environmental governance purposes or as tools to manage stakeholder perceptions rather than providing actual environmental accountability or enhanced environmental performance.

Conversely, other scholars suggest that the role of environmental committees with respect to environmental matters of the firm is similar to the role of audit committees' in relation to financial decision making of the board (Peters and Romi 2014; Liao, Luo and Tang, 20015). Peters and Romi (2014)'s U.S. results find that the presence of an environmental committee is positively associated with firms' propensity to disclose GHG information. The likelihood of disclosure is further associated with committee size, activity of committee and expertise of committee members. The size of its committee and expertise of its chief officer also plays an

important role in determining transparency of disclosure. Liao Luo and Tang (2014)'s U.K. findings concur with Peters and Romi (2014)'s study by similarly reporting a positive governance-disclosure relation for its sample. However, using segregated data, Liao, Luo and Tang (2014)'s multivariate results show that firms in carbon-intensive sectors did not report a significant positive coefficient with the presence of environmental committees. But firms in less carbon-intensive sectors showed a positive statistical association. Liao, Luo and Tang (2014)'s evidence suggests that this is indicative of the influence of corporate governance mechanisms particularly, on sectors which may face less regulatory or institutional requirements. Furthermore, in the U.K., within a policy landscape based on a market governance system where firms determined their participation in industry or government environmental programs, research shows that pronounced governance tends to be more effective in less stringent environments. In relation to environmental performance, Dixon-Fowler, Ellstrand and Johnson (2017) find a positive committee-performance association and this relation is moderated by the presence of a senior-level sustainability manager. Furthermore, its moderating influence was not found in their committee-weak performance test but instead for committee-proactive performance tests. Thus, firms with environmental committees and senior managers responsible for environmental performance are likely to pursue substantive performance rather than symbolic measures. These studies suggest environmental committees are substantive measures when they act as environmental governance mechanisms for the board's disclosure policies and environmental performance strategies.

Thus, as firms are seen to have an environmental mandate when they have environmental/CSR committees (Kolk, Levy and Pinkse, 2008), their presence is indicative of the board's perspectives on risks, opportunities, commitments to stakeholders and managerial accountability towards an environmental agenda (Peters and Romi 2014). Its existence also signals proactive policies toward managing environmental issues (Rankin, Windsor and Wahyuni, 2011). The board also relies on an environmental committee to provide recommendations to the board, including advice relating to risks and regulatory compliance (Rodrigue, Magnan and Cho, 2013) as well as reputational management (Rupley, Brown and Marshall, 2012) concerning the firm's environmental strategies. Nevertheless, its effectiveness may

depend on specific committee characteristics like size, activity, expertise and senior managerial involvement (Peters and Romi 2014; Dixon-Fowler, Ellstrand and Johnson 2017). Given the ECC disclosure index and performance indicators used in this study encompass both quantitative and qualitative measurement items, it is expected that the monitoring and advisory role of the environmental committee will be associated with more extensive disclosures and enhanced performance measures. Thus, the following hypotheses are proposed:

*H2a: There is a positive association between the presence of environment/CSR committees and ECC disclosure.*

*H2b: There is a significant association between firms with environment/CSR committees and firm ECC performance.*

Literature suggests that the substantive role that environmental committees play may be less important when firms face more stringent regulatory conditions (Liao et al 2014). Peters and Romi (2014) finds a significant governance-disclosure association from its largely non-ESI sample (mean 20.4%) and firms with lower exposure to litigation (mean 29.1%) while Rupley, Brown and Marshall (2013) finds no significant governance- positive association for its sample of firms skewed toward firms in ESI sectors (three out of five sectors are ESI). With the introduction and operation of carbon pricing, ASIC regulatory guidance and introduction of ASX governance recommendations for risks disclosures, the regulatory changes over the research period may affect the prominence of committee governance over firms' environmental disclosure and performance plans. Nevertheless, as this examination involves top ASX listed firms in a variety of industries operating in an institutional governance setting characterised by corporate environmental volunteerism (Griffiths Haigh and Rassias, 2007) with relatively minimal stringent conditions, the expectation remains that environmental committees remain effective measures of firm governance in relation to ensuring adequate environmental disclosure and performance decisions. Thus the following hypotheses are proposed, given Australia's recent climate regulation:

*H2c: The positive association between the presence of environmental/CSR committees and ECC disclosure is impacted by regulatory change*

*H2d: The significant association between the presence of environmental/CSR committees and ECC performance is impacted by regulatory change*

### *3.3.3 Third party environmental assurance*

The practice of obtaining third party assurance over environmental information began around the early 1990s (Deegan, Cooper and Shelly, 2006a). Assurance over reported environmental information is regarded as a tool to add credibility and reliability of reported information, just as independent assurance enhances financial reporting (Simnet, Vanstraelen and Chua, 2009; Coram, Monroe and Woodliff, 2009) Additionally, it reflects proactive governance and transparency toward stakeholders (Peters and Romi 2015). From a matched pairs study on global firms for periods 2003 to 2007, Moroney, Windsor and Aw (2012) find that quality of disclosures as measured using the GRI index is associated with environmental assurance, and firms with assurance scored higher disclosure scores than unassured firms. Furthermore, Braam, deWeerd, Hauck, Huijbregts (2016)'s study on Dutch firms from 2009 to 2011 also find positive associations between the level and nature of environmental disclosures and environmental assurance.

Evidence is often mixed in relation to environmental performance. Studies with competing theories suggest that firms engage in environmental assurance to enhance the firms' competitive advantage (legitimacy perspective) or do so to provide more credible information to distinguish themselves from poor environmental performers (voluntary/signalling or stakeholder perspective). Braam et al. (2016)'s study supports the legitimacy perspective as their evidence suggests that although higher disclosing firms engage in environmental assurance but they are also associated with poorer environmental performers. On the other hand, Moroney, Windsor and Aw (2012)'s results provide evidence of higher quality disclosures for firms with environmental assurance, as stakeholder focus firms tend to use assurance to meet the increasing demands by investors for quality information to make investment decisions. Additionally, in qualitative studies like Edgley, Jones and Solomon

(2010), from semi-structured interviews with accountant and consultant assurance providers, there is also greater stakeholder involvement in the process of assurance in recent years compared to earlier periods (O'Dwyer and Owen 2005). Mix evidence is often due to variation in environmental performance measures (Dragomir, 2012). In any case, a significant association is expected and the following hypotheses are proposed:

*H3a: There is a positive association between the presence of environmental audits and the extent of ECC disclosures. .*

*H3b: There is a significant association between the presence of environmental audits and ECC performance.*

The association between environmental assurance and environmental disclosures examined in Kolk and Perego (2010) find that firms operating in countries with higher stakeholder orientation with less stringent regulatory regimes enable voluntary corporate practices like firm engagement in sustainability assurance. In their cross country analyses of Fortune 500 firms belonging to four industries in 1999,2002 and 2005, authors find firms in countries like US with higher litigation risks also meant that assurance services would be less affordable as the potential penalties outweighs the benefits. Similarly, countries, like UK, Germany, Netherlands, are more likely to engage in assurance practices as these mechanism serve as a substitute to constrain managerial behaviour given the prevalent institutional pressures on firms from various stakeholder interest groups. For this reason, it is expected that effects of changes in environmental and climate related policies and regulation for corporate reporting will affect the said associations being examined. The following hypotheses are proposed:

*H3c: The positive association between the presence of environmental audits and the extent of ECC disclosure is impacted by regulatory change*

*H3d: The significant association between the presence of environmental audits and ECC performance is impacted by regulatory change*

### *3.3.4 Board member characteristics: director affiliations*

Literature on board member characteristics and firm environmental disclosure and performance suggest that firms' decision to voluntarily disclose environmental information is associated with a director's human and social characteristics (Peters and Romi 2014; Lewis, Walls and Dowell, 2014; Rupley, Brown and Marshall 2012; Mallin, Michelon and Raggi, 2013; Arena, Bozzolan and Michelon, 2015; De Villiers, Naiker and Van Staden, 2011; Rodrigue, Magnan and Cho, 2013). These characteristics are referred to by resource dependence theorists to encompass directors' 'expertise' and 'experience based-human capital' characteristics. Director 'expertise' tend to be related to their education background or training. Evidence shows that the expertise of the chief sustainability officer and board members on firms' environmental committees are associated with environment disclosure transparency (Peters and Romi 2014). Legal experts on the board are associated with better environmental performance (De Villiers, Naiker and Van Stadenm, 2011) but their presence are not associated with firms being more likely to provide voluntary environmental information (Lewis, Walls and Dowell, 2014).

In relation to 'experience based-human capital,' scholars identify these characteristics as resource-rich directors who accumulate external expertise through a broad spectrum of governance environments and bring these critical resources to the firm (De Villiers, Naiker and Van Staden, 2013; Hillman, Nicholson and Shropshire, 2000). We identify one valuable aspect of 'experience-based human capital' which is the social capital aspect of a 'director's affiliation', not previously examined in the Australian context. Director affiliation is commonly formed through current or former professional or industry appointments and involvements within various social networks or groups, either in their professional capacity or personal relations. Related 'experience-based human capital' characteristics examined in the context of firm environmental performance and disclosure so far as the researcher is aware, include the measure of the proportion of 'community influentials'[37] on the board (Mallin, Michelon and Raggi 2013; Arena, Bozzolan and Michelon, 2015) and the

[37] Mallin, Michelon and Raggi (2013) and Arena Bozzolan and Michelon (2013) adopt the classification used by Hillman, Nicholson and Shropshire (2000), where directors who are classified as community influential if he/she was/is an academic, politician, military officer, and member or director of social not for profit organisation, including clergy and religious persons.

measure of 'environmentally aware directors'[38] (Rodrigue, Magnan and Cho, 2013). However, although both aspects are linked to stakeholder orientation of boards and examined in the US context, studies arrived at contrary findings. Mallin, Michelon and Raggi (2013) and Arena, Bozzolan and Michelon (2015) find positive association with environmental performance and disclosure, while Rodrigue, Magnan and Cho (2013) fail to find any statistically significant associations. Nevertheless, these studies suggest that directors' reputation among stakeholders in the community enables directors to negotiate and influence better outcomes for the firm (Mallin, Michelon and Raggi, 2013) and their familiarity with environmental issues associated with the firm or its peer organisations is expected to better equip the firm to achieve and communicate their strategic environmental agendas (Rodrigue, Magnan and Cho, 2013).

Stakeholder studies coin the examination of attitudes of individuals' including their affiliation preferences as 'fine-grained understanding' of stakeholder theory (Cordano, Frieze and Ellis, 2004). These studies demonstrate the significance of behavioural attitudes which influence associated behaviours, particularly in relation to environmental issues (Stern et al. 1995).

In this thesis, directors' affiliations are identified as belonging to the following three distinct areas: (i) Board members/directors with *environmental affiliations* refer to directors who are presently or were formerly affiliated with environmental, climate related or conservation organizations (including government sponsored institutions and not for profit environmental organisations); (ii) Directors with *social/humanitarian affiliations* refer to directors who are presently or were formerly affiliated with social and humanitarian organisations (i.e. social/humanitarian organisations include organisations focused on alleviation of poverty, food aid, disability support, medical or health related support and research organisations) and; (iii) Directors with *community affiliations* refer to directors who are presently or have former local and international affiliation in the following manner: (a) Board member(s) who also sit on boards of sporting clubs or art organizations or are

[38] Rodrigue, Magnan and Chol (2013) classifies directors as 'environmentally aware' when director of the firm (i) had prior experience in an environmental organisation; or (ii) prior experience in a peer industry (authors classified peer industries as firms which had the same first two digits according to SIC industry codes)

members or trustees of funds or foundations run for these purposes (e.g. museums, art institutions, sporting leagues), (b) Board member(s) with significant affiliation with government bodies or organizations locally and internationally, through their former appointments or engagements as Ministers (or equivalent) or prominent industry alliance representatives and (c) Board member(s) who are also represented on boards of Academic institutions or have significant affiliations as advisors or contributors to these institutions.

Therefore, the influence of directors with significant affiliation is likely to positively impact firm environmental performance and their communication strategies to stakeholders. Drawing from a resource dependence theory perspective, directors are resource rich when they hold significant roles, connections and networks through their affiliations and bring legitimacy, experience, value-add advisory skills and negotiation skills to the board room and to external constituents in the interest of the firm. Therefore, the following hypotheses are proposed:

*H4a: There is a positive association between the presence of Board members with environmental affiliations and the extent of ECC l disclosures.*

*H4b: There is a significant association between the presence of Board members with environmental affiliations and firm ECC performance.*

*H5a: There is a positive association between the presence of Board members with social/humanitarian affiliations and the extent of ECC disclosures.*

*H5b: There is a significant association between the presence of Board members with social/humanitarian affiliations and firm ECC performance.*

*H6a: There is a positive association between the presence of Board members with community affiliations and the extent of ECC disclosures.*

*H6b: There is a significant association between the presence of Board members with community affiliations and firm ECC performance.*

Scholars observe that changes in the operating environment due to regulation often require organisations to consider associated changes needed in their corporate strategies (Delmas and Toffel, 2010), including aspects of board composition related to directors' 'experience-human based capital'(Hillman, Nicholson and Shropshire 2000). It is therefore appropriate to consider the effect of regulatory changes observed during our research period on the above stated associations. Without precedence in environmental and social literature, reference is drawn from Hillman Nicholson and Shropshire (2000) which examined the resource dependent role of directors' during increased uncertainty associated with industry deregulation. Resource dependence roles include directors' roles as business experts, support specialists and their influence on the community. Their findings suggest that increased uncertainty associated with deregulation highlights the importance of directors to address the firms' legitimacy or access to resources through their network and ties. In the context of this study, it is likely that new climate regulation and related political debacle surrounding climate politics continue to create uncertain implications for businesses in relation to their environmental strategies. The value-add expertise which directors' bring through their affiliations is likely to play a significant role to firms' in making objective decisions, develop strategies and connections which will benefit the firm in new regulatory conditions. Therefore, these hypotheses are proposed:

*H4c: The positive association between the presence of Board members with environmental affiliations and the extent of ECC disclosure is impacted by regulatory change*

*H4d: The significant association between the presence of Board members with environmental affiliations and ECC performance is impacted by regulatory change*

*H5c: The positive association between the presence of Board members with social/humanitarian affiliations and the extent of ECC disclosure is impacted by regulatory change*

*H5d: The significant association between the presence of Board members with social/humanitarian affiliations and ECC performance is impacted by regulatory change*

*H6c: The positive association between the presence of Board members with community affiliations and the extent of ECC disclosure is impacted by regulatory change*

*H6d: The significant association between the presence of Board members with community affiliations and ECC performance is impacted by regulatory change*

## 3.4 Summary of Chapter 3

The theoretical framework of this study is founded on concepts found in governance and environmental disclosure literature. Governance literature states the importance of board monitoring and resource dependence role of Boards in relation to firm performance, including their fiduciary duties toward the firms' environmental responsibilities. Environmental disclosure literature suggests that firms are motivated to provide disclosures as a means to reduce information asymmetry between shareholders and management (agency theorists) and this extends to a wider group of legitimate stakeholders (stakeholder theorist). On the contrary, legitimacy theorists' view applies when accountability is absent. Taken together, effective governance toward the firms' environmental responsibilities are *'substantive'* measures when Board monitoring mechanisms and advisory capabilities are effective measures to constrain managerial opportunistic behaviours. These are governance measures which benefit the firms' environmental accountability or environmental performance. When the opposite prevails, governance measures and capabilities are only *'symbolic'* measures.

Monitoring governance measures examined in this study are Board independence, presence of environmental/CSR committees and use of environmental assurance. Resource dependence capabilities measured refers to director affiliations with regard to their environmental, social and community affiliation. The hypotheses proposed in this study examine the relations between these six governance variables and ECC disclosures and ECC performance, to provide evidence of whether these prove to be 'substantive' or 'symbolic' environmental governance measures. Furthermore, given the regulatory and policy changes observed during the five year research period, the researcher also examines the regulatory effect on governance-disclosure and governance–performance relations examined.

# CHAPTER FOUR
# RESEARCH DESIGN

## 4.1 Introduction

Chapter four presents the research methodology to test the association between the extent of ECC disclosures and performance indicators of and attributes that capture the monitoring and resource dependence role of boards of directors (Boards). Specifically, monitoring roles of Boards examines (a) board independence, (b) the presence of environmental/CSR committees at the Board level and (c) firm use of environmental audits. The Resource dependence role examines the presence of board members with (a) environmental affiliation, (b) social/ humanitarian affiliation or (c) community affiliation and its association with the extent of ECC disclosures and ECC performance indicators.

Details on data selection and the development of the dependent variable (ECC disclosure index), independent variables and control variables are also presented.

## 4.2 Data and sample selection

In this study, ECC disclosure patterns are examined using a final panel of 125 firm-year observations. This is done by first using DatAnalysis[39] to obtain the top 200 ASX listed firms by market capitalisation at 30 June 2015. From that initial sample, the top 25 ASX listed firms are derived with the following selection criteria.

(i) firms involved in mergers, demergers or divestitures during the period are excluded from the sample;
(ii) firms belonging to GISC sector classifications that comprise GISC Financials, GISC Australian Real Estate Investment Trusts (A-REITs), GISC Real Estate and GISC Financials excluding A-REITs are also excluded, as the nature of business operations do not directly result in the

[39] DatAnalysis is a web based research tool which provides information on companies listed on the Australian Stock Exchange (ASX).

production of emissions, water usage or energy consumption in relation to production and or other land and biodiversity impacts;

(iii) all listing of iShares fund (exchange traded funds) which do not fall under any GISC classifications are excluded from the final sample; and

(iv) each firm must be continuously listed on the Australian Stock Exchange (ASX) throughout the 2011-2015 period

Data for the top 25 companies is then hand-collected for each financial year (2011 to 2015) from Annual and Corporate sustainability reports. These encompass information from reports for financial years ending 30 June 2011 (or 31 March 2011 or 31 December 2011) to 30 June 2015 (or 31 March 2015 or 31 December 2015). A list of the final sample of these top 25 firms is presented in Appendix I

The five year examination period ( 2011 to 2015 ) coincides with observed regulatory changes during this period: (i) carbon pricing mechanism (CPM) operative from 1 July 2012 to 30 June 2014; (ii) introduction of Australian regulator's regulatory guidance 247 (ASIC RG 247) effective from March 2013 and (iii) ASX Corporate Governance Recommendation 7.4 effective from 1 July 2014. Table 4.1 presents changes encompassing periods before, during and after CPM operative periods and the effective operation of ASIC and ASX pronouncements. The reference years used in statistical analyses discussed in this chapter and following chapters in this thesis are also presented.

**Table 4.1** Operative periods of regulatory provisions and financial reporting periods

| Reference year for Statistical Analyses | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| ***Legislation / Authority*** | | | | | |
| Clean Energy Act 2011 | pre-CPM | | Carbon Pricing operative (from 1 July 2012 – 30 June 2013) | | CPM repealed |
| Australian Securities Industry Commission (ASIC) | | | ASIC RG247 operative (from March 2013) | | |
| Australian Stock Exchange (ASX) | | | | | ASX CG (3rd ed) (from 1 July 2014) |
| Financial reporting data / Environmental data from corporate sustainability reports (data collection) | 1.4.10 - 31.3.11 | 1.4.11 - 30.3.12 | 1.4.12 - 30.3.13 | 1.4.13 - 30.3.14 | 1.4.14 - 30.3.15 |
| | 1.7.10 - 30.6.11 | 1.7.11 - 30.6.12 | 1.7.12 - 30.6.13 | 1.7.13 - 30.6.14 | 1.7.14 - 30.6.15 |
| | 1.10.10 - 30.9.11 | 1.10.11 - 30.9.12 | 1.10.12 - 30.9.13 | 1.10.13 - 30.9.14 | 1.10.14 - 30.9.15 |
| | 1.1.11 - 31.12.11 | 1.1.12 - 31.12.12 | 1.1.13 - 31.12.13 | 1.1.14 - 31.12.14 | 1.1.15 - 31.12.15 |

Note: For 30 June financial year ending companies, data covers two years pre-CPM, two years during CPM operative period and one year post-CPM. For 31 December financial year ending companies, data covers one year pre-CPM, two years during CPM operative period and one year post-CPM. For 31 March and 30 September financial year ending companies, data covers at least two years during CPM operative periods with at least one year pre-CPM.

## 4.3 Dependent variables

A broad spectrum of environmental disclosure measures have been employed in prior studies. Early studies generally employed measures that examine the volume or associated quantity of disclosure by measuring word, sentence or page count (Deegan 2002; Deegan and Gordon 1996). More recently, in line with increasing adoption of voluntary reporting initiatives such as reporting via CDP and the use of GRI standards, social and environmental scholars have also adapted their measurement tools using these and other voluntary disclosure standards to construct measures relevant to their studies (Kolk, Levy and Pinkse 2008). The promulgation of these disclosure practices continues to be considered 'prescriptive' in nature among voluntary adopters (Vigneau, Humphreys and Moon 2015). For example, Peters and Romi (2014) measured firm GHG disclosure by using CDP data, Rupley Brown and Marshall (2012) used an environmental disclosure index based on GRI framework related to compliance, pollution prevention, product stewardship and sustainable development. Recent Australian studies like Rankin, Windsor and Wahyuni (2011) examined disclosures using an index based on ISO 14064 which focuses on GHG disclosure quantification, strategies, programs, assurance verification and assessments against benchmarks. Rao, Tilt and Lester (2012)'s

measurement method arguably is less progressive for its time as they measured disclosure of environmental issues by word count and percentage of total words in annual report. Choi, Lee and Psaros (2013) used CDP questionnaires to address disclosures on climate risk and opportunities, GHG emissions, energy consumption and carbon emissions accountability. A large proportion of these measures focus on greenhouse gas disclosures and to a lesser extent relate to the firm's overall environmental results and programs.

In this study, an extensive disclosure index constructed from the Climate Change Reporting Framework (CCRF) June 2015 release is used to measure the extent of environmental and climate change disclosures of sample firms (ECCI disclosure index). The latest CCRF is an expanded version to its predecessor edition following public consultation in 2014[40]. It includes reporting other types of environmental information beyond GHG to include the use of natural capital resources and other environmental information (CDSB 2015). The latest edition was prompted by compliance requirements in some jurisdictions[41] and the increasing shift of emphasis in corporate reporting on risks arising from the use of natural sources like water and forest commodities. CDSB June 2015 framework draws on existing financial reporting standards like IASB's qualitative characteristics, international legislation[42], regulatory sources for specific elements like water[43] and other voluntary frameworks (e.g. GRI G4, IIRC, ISO, OECD, PRI, SASB, UN Global Compact) (CDSB 2015,9). The CCRF, being widely supported by international business groups, technical work groups represented by international accounting firms, academics and international not for profit groups, has also been hailed as an international standard aimed at achieving greater standardization of environmental and climate related disclosures (Cotter, Najah and Wang 2011).

[40] According to the latest consultation summary report in July 2014, up to 500 organisations and individual expressed interest in the consultation (CDSB 2014,7)
[41] For example, In UK, quoted companies are required to report on GHG emissions in their Strategic Report and Director's Report (Companies Act 2006 Regulations 2013) where reference to the use of CCRF as guidance material has been recommended. In Denmark, the Act amending the Danish Financial Statement Act (2008) requires large and listed companies to report on their policies for human rights and reduction of climate impact (Danish Business Authority 2016).
[42] For example, EU Directive 2014/95EU on non-financial information, US Securities and Exchange Commission guidance on disclosures related to climate change, UK Companies Act (2006) (CDSB, 2014)
[43] For example, Australian Water Accounting Standards, UK Department of Environment, Food and Rural Affairs guidance on environmental reporting (CDSB 2015,9).

### *4.3.1 Environment and Climate Change disclosure index ('ECC disclosure Index')*

The constructed environmental and climate change disclosure index (ECC disclosure index) is an index which measures the extent of disclosures against five categories of possible disclosure types. Category ECC1 measures the quantitative disclosure of environmental performance results. Quantitative ECC1 measures include disclosures relating to GHG, energy, water, forest commodities, waste, paper, raw material, land and other pollutants. ECC2 measures qualitative aspects of ECC1 disclosures, such as whether environmental results are presented (i) to assist understanding through appropriate disaggregation or categorisation of data; (ii) provides disclosure of methodologies applied in the calculation of environmental results; and (iii) if disclosure provides comparative analysis of actual performance data against prior, baselines or target data. ECC3 measures disclosure pertaining to reporting scope and policies applied, while ECC4 measures if third party assurance has been obtained over environmental and sustainability data ('environmental audit') and the extent of disclosure relating to the scope of assurance engagement. Finally, ECC5 measures method of presentation of environmental data disclosed.

Each ECC category is made up of individual measurement items. ECC1 is comprised of 24 items, ECC2 14 items, ECC3 4 items, ECC4 18 items and ECC5 2 items respectively. The sum of all items which forms the ECC Index comprises 59 individual items. For details on each disclosure item, refer to Appendix C. Each item is scored according to methodology and assumptions described in section 4.3.3. The final ECC index is the total score of all items (i.e.59) divided by total possible maximum score for all items (i.e. independent variable ECC_Total).

### *4.3.2 ECC performance ('ECC performance indicator')*

In addition to the ECC index which measures the extent of environmental and climate change information disclosed, an additional index was constructed that measures climate change performance. A positive or negative performance indicator was derived for each of the disclosure items. The ECC performance indicator index is comprised of items which reflect a firms' positive or negative environmental performance activities. Items which reflect negative performance include disclosures

pertaining to quantitative and qualitative disclosures regarding the negative effects of the firm's operations on the environment, such as its' greenhouse gas emissions, disposal of chemical waste or release of toxic gases and other pollutants. Positive performance indicators are disclosures relating to aspects which reflect a firm's pro-active responses to mitigate its negative impacts or innovative contributions to bring about positive environmental impacts. Some examples of positive indicators identified include disclosure relating to renewable energy production, recycling programs, land rehabilitation initiatives. A listing of some examples of negative and positive performance indicators are presented in Appendix F. This performance measure is similar to approaches previously done in literature (Deegan and Gordon 1996, Brown and Deegan 1998).

The ECC negative performance indicator (NEG_ECC_Total) is comprised of 22 items and the ECC positive performance indicator (POS_ECC_Total) 34 items. Four items are not scored for positive or negative aspects as they pertain to format and presentation aspects. Both negative and positive ECC performance indicators are calculated as a proportion of total possible maximum scores for each respectively. Assumptions underpinning the construction of the indicator are dependent on the construction of the ECC disclosure index which is described in section 4.3.3.

### *4.3.3 Assumptions and criteria applied in the construction of the ECC disclosure index and ECC performance indicator*

The ECC disclosure index comprising five categories is adapted from eight[44] out of the twelve requirements proposed in CCRF June 2015 edition. The following assumptions apply in the construction of the ECC disclosure index and ECC performance index:

(i) Each disclosure category in the ECC disclosure index is applicable to all companies in the sample. However, all items listed within each category may not be applicable to all companies. To overcome this, for categories which may have such items, the total score will be calculated as a

[44] The proposed guidance for corporate environmental reporting in mainstream reports set out in CCRF which have been adapted for this study are outlined in REQ-04, REQ-05, REQ-07, REQ-8, REQ-9, REQ-10, REG-11 and REQ-12 (CDSB 2015,18).

proportion of items which are relevant to companies in those industries only. For that reason, company scores will not be biased in favour of companies who operate in environmentally sensitive industries which could potentially report overall higher scores.

(ii) Sample firms' corporate sustainability reports (if they produce one) and annual reports are examined to identify if disclosures meet each ECC index criteria. Each item is scored 1 if the disclosure item meets the specified criteria and 0 if not. Where disclosure meets the specified criteria, no further work will be performed to locate if similar disclosure is present in another report. If disclosures in sustainability and annual reports provide links to company web pages relating to said disclosure item(s), the links are examined. Items are scored 1, if disclosure is present on web pages, otherwise, they will be scored 0 (e.g. some links may expire or no longer available at time of research). Disclosure items score 0 if there is no further indication that disclosure item is present in any of the reports examined.

(iii) For ECC4 disclosure criteria, assurance reports are examined to determine if disclosures pertaining to assurance aspects of environmental data meet the stated criteria of items in this category. Some assurance reports do not form part of corporate sustainability reports but are stand-alone reports which are available via web links stated in sustainability or annual reports of sample firms.

(iv) All 59 items in the ECC index are scored as described in (ii) above, except for item 57 in ECC4 category. The level of assurance conclusion reached for specified areas of environmental assurance is given a higher score if the assurance statement reflected better conclusions (i.e. (a) no qualification = 3; (b) with recommendations = 2; (c) with emphasis of matter =1; (d) no assurance = 0). The total maximum possible score for item 57 is therefore 6.

(v) The use of a researcher constructed disclosure index may inevitably involve some level of judgement. The extent of subjectivity depends on the extent that the construction index involves researcher judgement (Healy and Palepu 2001, 427). To overcome this, the researcher ensures clear criteria are set in order to allow results to be replicated. In this ECC

disclosure index, criteria mimic closely the proposed guideline requirements outlined in CCRF which therefore limits the degree of researcher subjectivity. The disclosure index, despite some level of subjectivity, is a reliable method of testing the extent of environmental disclosures, as is also commonly adopted by other scholars in corporate disclosure research (Cotter, Najah and Wang 2011).

## 4.4 Independent variables

Some studies apply composite measures of firm governance to examine the association between corporate governance with extent of environmental disclosures and environmental performance (Cong and Freedman 2011; Al-Tuwaijri, Christensen and Hughes, 2004; Ben-Amar and McIlkenny 2015; Rankin, Windsor and Wahyuni 2011; Choi, Le and Psaros 2013) while others focus on specific measures of firm governance (Peters and Romi 2014; Arena, Bozzolan and Michelon 2015; Rodrigue and Magnan 2013; Liao, Luo and Tang 2014). Generally, broad measures provide evidence in support of the significance of firm governance on environmental performance and disclosure but provide little to assist in understanding how firms can better structure their governance mechanisms to bring about positive implications on firms' actions or accountability policies. The choice for each of the governance variables are discussed below.

### *4.4.1 Monitoring governance variables*

#### *(i) Board Independence ('BOD_IND')*

International evidence support the positive association between board independence and environmental performance (Johnson and Greening 1999; de Villiers, Naiker and van Staden 2011; Mallin, Michelon and Raggi 2013) and disclosures (Rupley, Brown and Marshall 2012; Liao, Luo and Tang 2014). Recent Australian studies that use this governance measure and examines its association with firm environmental disclosure (Rao, Tilt and Lester 2012) or GHG disclosures (Ghomi and Leung 2013) provide evidence up to 2011.

Common measures adopted in prior research consider a director to be independent when they have "no personal or professional relationship to a firm" (Johnson and Greening 1999, 570; Rupley, Brown and Marshall 2012, 618) or are "not involved in a financial relationship with the firm" (de Villiers, Naiker and van Staden 2011, 1649). In this study, the classification of independent director is according to that ascribed by firms in their annual report disclosures. Accordingly, as our sample firms are top ASX listed firms', their categorisation of whether a director is independent follows principles set out in ASX CG Principles and Recommendations (ASX CGPR). ASX CGPR states that an independent director is "a director who is free of any interest, position, association or relationship that might influence, or reasonably be perceived to influence, in a material respect his or her capacity to bring an independent judgement to bear on issues before the board and to act in the best interests of the entity and its security holders generally" (ASX 2013, 37).

The variable measurement of board independence, BOD_IND used is the proportion of independent non-executive directors on the board to total board members. This proportional measure has similarly been adopted in prior literature (Liao, Luo and Tang 2014; Rupley Brown and Marshall 2012). This is a continuous variable with a value from 0 to 1.

*(ii) Environmental / CSR Committee ('CSR_COM')*

Some studies incorporate the presence of an environmental/CSR committee in their composite measure of firm governance and report positive association with environmental performance (Al-Tuwaijri, Christensen and Hughes 2004; Mallin, Michelon and Raggi 2013) and extent of environmental disclosures (Arena, Bozzolan and Michelon 2015). However, when the presence of CSR Committee is applied as a factor measurement on its own, some studies report positive associations (Peters and Romi 2014; Liao, Luo and Tang 2015; Rankin, Windsor and Wahyuni 2011) or no significant associations with disclosure (Rupley, Brown and Marshall 2012) or performance measures (Rodrigue, Magnan and Cho 2013).

The variable measure CSR_COM is a dichotomous variable with firms coded 1 if firms have an environmental/CSR committee responsible for environmental issues,

or coded 0 if the firm does not have such a committee. Where firms have committees which may function to also address responsibilities regarding environmental issues, however do not explicitly establish a stand-alone CSR committee, these are also coded 1. Therefore, if disclosures in sustainability or annual reports do not provide any indication that environmental issues are dealt with at the Board level via a Board committee, the sample firm will be coded 0. Other common titles for CSR committees include, but not limited to include Sustainability Council, Sustainability Committee, Environmental Committee or Health and Safety Committee. In some instances, the function also falls under the responsibilities of the firms' Risk Committee.

*(iii) Third party environmental assurance ('ENV_AUDIT')*

Studies report that third party assurance over environmental information (environmental audits) are regarded as tools which add credibility and reliability to reported information and show proactive environmental governance (Simnet, Vanstraelen and Chua, 2009; Moroney, Windsor and Aw, 2012). Recent evidence finds the nature and level of ECC disclosures associated with the presence of environmental assurance (Braam et al. 2016). Furthermore, in Moroney, Windsor and Aw (2012) authors find the quality of ECC disclosures higher in firms with environmental assurance compared to unassured firms. These also signal increasingly greater stakeholder orientation by management in addressing the firms' environmental objectives (Edgley, Jones and Solomon, 2010).

Similar to prior studies, the variable ENV_AUDIT is a dichotomous variable which is coded 1 if the firm engages third party assurance providers to provide assurance over environmental data disclosed (i.e. engages environmental audits) and 0 if otherwise.

### *4.4.2 Resource dependence variables*

The resource dependence role of directors' refers to as their 'human and social capital' capabilities and commonly relate to their "expertise, experience, skills and network ties" (Hillman, Nicholson and Shropshire 2008, 444). In this study, the

researcher identifies directors' 'social capital' capabilities through their environmental, social and community affiliations, which in turn complement their 'human capital' capabilities as these directors' bring expertise, experience and value added skills to the boardroom through their affiliation which may stem from prior appointments, employments or engagements in any other consultative capacity or through their personal connections. Examination of the association between directors' environmental, social and community affiliations' and firm environmental disclosures and performance indicators have not been previously examined in Australian social and environmental literature. Furthermore, identification of 'environmental' and 'social and community' affiliation have been explored in only in a few recent US studies, these are discussed in turn below.

*(iv) Director affiliation: environmental, social and community*

For each director affiliation, a score of 1 is given to each director who meets the stated criteria and 0 otherwise. Each independent variable measure for director affiliation (BOD_ENV_AFFIL, BOD_SOC_AFFIL and BOD_COM_AFFIL) is calculated using the total score for each affiliation type as a proportion of total board members. The scoring assigned to each affiliation is not mutually exclusive as one director can have more than one kind of affiliation. Appendix H presents a list of examples of organisations found from sample data which relate to each affiliation discussed below.

From company annual reports, directors' biographies are examined to identify directors with environmental, social and community affiliations as follows:

(a) Directors with *environmental affiliation* ('BOD_ENV_AFFIL') are directors who are presently or were formerly directors who serve on boards of environmental, climate related or conservation organizations (i.e. environmental related government sponsored institutions, not for profit environmental organisations or peer organisations) and include their connection in any other professional or personal capacity, wherever explicitly disclosed.

(b) Directors with *social or humanitarian affiliation* ('BOD_SOC_AFFIL') are directors who are presently or were formerly directors who serve on boards of

social or humanitarian organisations (i.e. social or humanitarian organisations include organisations focused on alleviation of poverty, food aid, disability support, medical or health related support and medical research organisations) and include their connection in any other professional or personal capacity, wherever explicitly disclosed.

(c) Directors with *community affiliation* ('BOD_COM_AFFIL') are directors who are presently or were formerly (a) directors on boards of sporting clubs, music art and culture organizations or are members or trustees of funds or foundations run for these purposes (e.g. museums, art institutions, sporting leagues), (b) directors on boards of government related organizations both locally and internationally, government ministers (or the equivalent) or are directors with prominent group alliances (c) directors who serve on boards of academic institutions as advisors or contributors to these institutions, and may do so in any other professional or personal capacity, wherever explicitly disclosed.

Directors with environmental affiliation described in (i) is similar to "environmental stakeholder representation" on boards described by Dixon-Fowler, Ellstrand and Johnson (2017, 431). Authors identified these directors as directors "who are currently or formerly employed in an environmentally related environmental agency or NGO" or "are directors who hold directorships on the board of such organizations, including academics or scientists working in environmentally related disciplines (e.g., natural sciences)". Additionally, Rodgrigue, Magnan and Cho (2013, 114) describes these directors as "environmentally aware directors" who "can be expected to be knowledgeable about environmental issues given their prior experience in environmental organizations or a peer industry company". Directors identified as having 'environmental affiliation' in this thesis, is broader than Dixon-Fowler, Ellstrand and Johnson (2017) and Rodgrigue, Magnan and Cho (2013) as it also captures directors who may have involvement with environmental organisations on a personal level, wherever explicitly disclosed. The nature of 'environmental' organisations in this study also includes organisations with conservation initiatives with positive environmental objectives, which has also not been previously examined.

The identification of directors with social and community affiliation (i.e. (ii) and (iii) above) is closely related to 'community influential' directors described in two US studies (Arena, Bozzolan and Michelon 2015; Mallin and Michelon 2013). They consider a director a 'community influential', "if he/she is an academic, politician, military officer, member or director of social or not for profit organisations, (including member of clergy or religious leaders)," including persons who may have retired from those roles (Arena, Bozzolan and Michelon 2015, 352). As social and community groups refer to a broad spectrum of organisations, in this thesis a distinction is made between two groups of social and community organisations: Firstly, organisations which function for social efforts directed at improving health, providing humanitarian aid or advancement in medicine. Secondly, organisations which function for the purpose of addressing wider general community interests like organisations related to areas like sport, music, art or culture. This rationale is adopted as corporations may commonly channel monetary contributions to social and humanitarian organisations in their efforts to address the organisation's corporate social responsibility and as a result may have directors on such boards for these same reasons. Directors who are affiliated to community groups applicable to the wider general community are grouped together with directors who are or were formerly government officials, academics, advisors to academic institutions or leaders of certain prominent groups to capture directors who would have significantly greater stakeholder orientation due to their prominence and influence on the wider community. Nevertheless, director affiliation described in both groups (social/humanitarian and community affiliation) follows Hillman, Cannella and Paetzold (2000, 242)'s perspective, in that these are individuals who have the ability to provide "experience and linkages relevant to the firm" and "possess knowledge about or influence over important non-business organizations," and are influential due to their "connections to community constituencies".

## 4.5 Control variables

Other than dependent and independent variables, the researcher controls for several firm specific variables which have commonly been identified in extant literature to affect firms' environmental performance and disclosure initiatives. Additional variables used in robustness or sensitivity tests are also discussed.

*(i) Firm Size ('SIZE')*

Early studies (Cowen, Ferreri and Parker 1987; Patten 1991; Patten 1992; Deegan and Gordon 1996) find overwhelming support for firm size as a significant determinant of environmental disclosures. US (Stanny and Ely 2008), UK (Brammer and Pavelin 2006), Australian (Ghomi and Leung 2013; Rankin, Windsor, and Wahyuni 2011) German (Cormier, Magnan, and Velthoven 2005) and global (Freedman and Jaggi 2005; Prado-Lorenzo et al. 2009) studies also observe voluntary environmental disclosures are significantly associated with larger firms. Brammer and Pavelin (2006) suggest that being large firms, they are more likely to provide disclosures as well as better quality disclosures due to their prominence among various stakeholder groups. Freedman and Jaggi (2005) similarly find firm size a significant determinant of environmental disclosures, despite the composition of firms in their sample which is made up of 120 of the world's largest global firms. They suggest large firms face greater pressure and are more likely to operate according to norms or protocol expected compared to smaller firms, and do so to avoid potential political costs from scrutiny due to their size. In short, as larger firms tend to attract more scrutiny from stakeholders, media or regulators, they are more likely to provide higher levels of disclosure in order to legitimise their activities and avoid regulatory risks. Given prior evidence, SIZE is expected to be positively associated with the extent of disclosures.

The control variable SIZE uses the logarithm of total assets as proxy for corporate size, to avoid the impact of outliers and skewness of data, as commonly also applied in prior studies (Rankin, Windsor, and Wahyuni 2011).

*(ii) Return on Assets ('ROA')*

Measures of profitability have been employed in prior studies (Brammer and Pavelin 2006; Freedman and Jaggi 2005). Some studies find more profitable firms associated with greater environmental disclosures (De Villiers, Naiker and Van Staden 2011) but some do not find significant association (Brammer and Pavelin 2006; Freedman and Jaggi 2005; Rankin, Windsor and Wahyuni 2011). Those that find statistically significant positive associations suggest that more profitable firms have more

resources or are better able to afford spending on environmental abatement initiatives and in turn are motivated to provide these disclosures (Ben-Amar and McIlkenny 2015). On the contrary, those that do not find statistically significant associations suggest that environmental performance and disclosure is not influenced by firm's economic performance rather by other characteristics (Brammer and Pavelin 2006; Freedman and Jaggi 2005).

The control variable ROA is used as a proxy for profitability. This study controls for the potential influence of firms' profitability using profit before tax divided by total assets (i.e. profit before tax/total assets).

*(iii) Market to Book Ratio ('SQRT_MKT')*

Prior studies suggest that firms with growth opportunities are more likely to provide greater discretionary disclosures to reduce information asymmetry, to attract investors (Healy and Palepu 2001). Stanny and Ely (2008) predicted that firms with growth opportunities are more likely to respond to voluntary environmental disclosure. Prado-Lorenzo and Garcia-Sanchez (2010) also suggest that companies with higher market to book ratio are expected to disclose more information. In Choi, Lee Psaros (2013), authors also considered the market to book value ratio as an important additional control variable in their robust regression models.

Market to book ratio as is a common proxy measure for firm growth. Control variable (SQRT_MKT) is the ratio of market to book value transformed using the square root of market value of equity to book value ratio (price/book value).

*(iv) Leverage ('SQRT_LEV')*

Firm leverage is a firm specific variable commonly considered in prior studies but have produced mixed results. Freedman and Jaggi (2005)'s hypothesis proposed that firms with higher indebtedness are more likely to adopt disclosure strategies in favour of greater environmental disclosures, mainly to address information asymmetry. They argue highly leveraged firms are expected to provide greater disclosures to assist lenders in their evaluation of the firms' risks. However, their

results did not support their predictions. Ghomi and Leung (2013) however find support for this perspective as their results showed higher leveraged firms associated with voluntary environmental disclosures. They suggest highly leveraged firms face pressures from debt holders to provide greater disclosures. In contrast, Brammer and Pavelin (2006)'s UK study found less leveraged firms associated with greater environmental disclosures, as did Ben-Amar and McIlkenny (2015)'s Canadian study. Authors suggest that firms with lower leverage are not subject to creditor pressures and are better able to provide voluntary disclosures. Thus, although findings are inconclusive on the directional association of firm indebtedness with environmental performance and disclosures, the researcher controls for its effects in research models used in this study.

SQRT_LEV is the control variable measurement used for firm indebtedness, calculated as the square root of total debt to total equity ratio (total debt/total equity) where transformation is performed to avoid any significant departures from normality.

*(v) Foreign Listing ('FOR_LIST')*

Foreign listing or companies' exposure to more than one country's regulatory and institutional requirement is an important factor associated with the extent of discretionary environmental disclosure. According to Ben-Amar and McIlkenny (2015), authors control for firm cross-listing in their study and report that firms which are listed on both TSX and NYSE are more likely to respond to CDP questionnaires than those listed only on TSX. Their findings suggest that cross listed firms are more likely to face increase scrutiny from regulators and investors and therefore volunteer information to reduce information asymmetry. Similarly, Ghomi and Leung (2013) also predicted that listing status of firms influences voluntary disclosure decisions. However, their results did not support their predictions. This may be because most of their sample firms are listed only on ASX. Stanny and Ely (2008)'s find that its US sample firms with a higher proportion of foreign sales are more likely to voluntarily provide GHG disclosures. Therefore, firms with exposure to more than one geographical constituency, or listed in more than one exchange are likely to have greater need to address more diverse stakeholder groups. The effect of

this firm specific characteristic is an important control variable for inclusion in this study.

This variable measurement FOR_LIST is a dichotomous variable, where firms are scored 1 if they are listed on one or more foreign stock exchanges other than in Australia and 0 if otherwise.

*(vi) Industry Classification ('INDSEC')*

Early social and environmental studies like Cowen Ferreri and Parker (1987) find industry categorization significantly associated with disclosures, particularly disclosures relating to energy and community. Deegan and Gordon (1996), find environmentally sensitive firms (uranium mining, chemicals, coal, transport, oil and gas, plastics manufacturing, paper and timber) associated with higher levels of disclosure. Similarly, Bramer and Pavelin (2006) find firms in environmentally sensitive sectors (ESI) have a higher propensity to provide environmental disclosures. From their sample, firms in ESI sectors like chemicals, utilities and resources produced significantly higher quality disclosures compared to non-ESI sectors like high technology and finance. Authors find results consistent with their expectation as these firms' activities are perceived to be associated with highly "visible environmental issues" (Bramer and Pavelin 2006, 1183). Similarly, Rankin, Windsor and Wahyuni (2011) also find firms in energy, mining and industrial sectors more likely to provide GHG disclosures. These collectively echo Kolk, Levy and Pinkse (2008)'s perspective that firms in environmentally sensitive industries face greater business risks as their business operations generate greater public and regulatory concern. Additionally, global studies like Prado-Lorenzo et al. (2009) document deviation in GHG disclosures across Fortune 500 companies associated with the firm's activity sector. This is in line with Reid and Toffel (2009)'s perspective that firms' operating in the same industries are also more likely to adopt similar practices as their peers particularly when certain practices are congruent with the objectives of important stakeholder groups. Therefore, these studies reveal the relevance of the influence of industry association in relation to the level and quality of environmental disclosures and performance and are controlled for in statistical analyses performed in this study.

INDSEC is industry or sector classification represented by dummy variables which are coded as 1 if the firm is represented in a specific GICS category, 0 if otherwise. The composition of industries in the final sample according to GICS classifications are commercial services and supplies, consumer services, energy, food and staples retailing, health care equipment and services, materials, pharmaceuticals, biotechnology and life sciences, telecommunication services, transportation and utilities. In this thesis, environmentally sensitive industries (ESI) firms are those operating in the following GICS classifications: energy, materials, transportation and utilities.

*(vii) Regulatory effects ('PD')*

This study incorporates the effect of regulatory changes observed during the research period in our analyses. Extant literature report the significance of regulatory change in relation to environmental disclosures (Frost 2007; Choi, Lee and Psaros 2013; Knox and Levy 2011). For example, results from a global study by Freedman and Jaggi (2005) showed that multinational firms which operate in countries that ratified the Kyoto Protocol provided higher disclosures compared to those in other countries. Furthermore, firms with head officers in countries that did not ratify the Kytoto Protocol are associated with lower levels of disclosure. In the Australian context, Frost (2007) find that the introduction of s299(1)(f) of the Corporations Act 2001 requiring companies to report on their environmental performance in relation to environmental regulation had increased the level of environmental disclosure. According to Choi, Lee Psaros (2013, 58) the introduction of NGER Act "may have enhanced" voluntary GHG disclosure of listed ASX firms during periods prior to the effective operative date of the Act (i.e from 2009 financial year).

In this study, the regulatory effect constitutes changes brought about by the introduction of the carbon price mechanism (CPM), ASIC's regulatory guide 247, change in the 3rd edition of ASX Corporate Governance Council's recommendations and subsequent repeal of CPM. The effect of the first change commenced from 1 July 2012 onwards. As these consecutive changes were introduced at different times during the five year research period, the researcher assigns PD as a dummy variable which is scored as 0 to represent pre-REG periods belonging to pre 1 July 2012

periods (for statistical analyses they are referred to as Yr1 and Y2) and 1 for post-REG periods referring to post 1 July 2012 periods (i.e. Yr3 and Y4 data).

## 4.6 Model specification and Statistical Analysis

To address the objectives set out in this study, the researcher performs various statistical analyses to test research hypotheses. Initially, univariate tests are performed to report on characteristics of sample data which spans over a five year research period from 2011 to 2015. These include descriptive statistics which informs us of the mean, median, standard deviation of dependent, independent and control variables. An examination of Pearson's correlation coefficients is performed to ensure there are no significant multicollinearity issues present. T-tests are performed to examine differences in means of total environmental disclosures (dependent variables) from one consecutive period to the next. This facilitates comparison of the extent of environmental disclosures before and after the introduction of new regulatory and prescriptive guidance during the research period. Similarly, t-tests performed on firm governance aspects (independent variables) allowed observation of changes over time. Furthermore, frequency analyses of items which form the dependent variable index is computed to report on year on year changes observed for each item and also uncovers disclosure items which have changed significantly over the research period.

Multivariate tests are employed to test statistical significance of associations between dependent and independent variables, while controlling for certain firm specific aspects using applicable control variables. Using a pooled sample comprising 125 firm data set, the researcher uses OLS regression models (i.e. termed 'base regression model') to examine the association between governance variables (BOD_IND, CSR_COM, ENV_AUDIT, BOD_ENV_AFFIL, BOD_SOC_AFFIL and BOD_COM_AFFIL) and extent of total environmental disclosures (ECC_TOTAL) measured using the constructed ECC Index. The same model is used to examine the association between predictor variables and each category of disclosure which forms the index (ECC1, ECC2, ECC3, ECC4 and ECC5), by which each will represent the dependent variable in each case

.

Following which, 'average regression models' which incorporates the effect of regulatory change, using a dummy variable 'PD' which represents pre and post regulatory change is employed. The 'average regression model' is adapted from the 'base regression model' by using average values of Yr1 and Y2 data (representing the pre-regulation period) and averages of Y3 and Y4 data (representing the post-regulation period) for all dependent, independent and control variables. This is firstly performed to consider if the effect of regulatory change is significantly associated with average environmental disclosures during the period. Secondly, interaction terms comprised of each independent variable multiplied by PD is then incorporated into the average models separately on each occasion. This is performed to examine if the association between dependent and each independent variable could be statistically significantly different due to regulatory changes during the research period.

Additionally, examination of the association between negative or positive environmental performance and predictor variables is also performed. These OLS 'performance regression models' are similar to 'base regression models' and uses negative ECC performance indicators and/or positive ECC performance indicators (described in section 4.3.2 above) as new dependent variables in the statistical models. All other variable definitions in the 'performance regression models' are the same as the base regression models. Similarly, interaction analyses are also performed to test the regulatory effect on the governance-performance relation. The performance model with interaction effects uses a similar 'average regression model' which incorporates PD and the average positive/negative ECC performance indicator as dependent variables. This 'average performance regression model' examines if the association between negative/positive environmental performance indicators (dependent variables) and predictor variables are different due to regulatory change during the research period.

## 4.7 Sensitivity Analysis

Further statistical analyses are performed to provide robustness checks to test the research propositions and hypotheses proposed. Examination of the association between predictor and dependent variables are further explored using logistic

regression models. Given that the regression models involve time series data, there is likelihood that the lag effect of independent variables could have an effect on dependent variables in the regression models. A lagged regression model is therefore used to address potential endogeneity issues. The researcher addresses potential self-selection bias which may result in bias coefficient estimates by performing propensity matching score analysis. Additionally, as size is a significant disclosure determinant, the researcher adjusts for the effect of size on total environmental disclosure in a regression model which scales for size. Finally, although variables in regression models do not depart significantly from normality, from frequency distributions results show the presence of outliers. These are analyzed in order to minimize the effect of possibly spurious outliers, which in this case proved to not pose significant problems in the multivariate statistical analyses performed.

## 4.8 Summary of Chapter 4

This is a longitudinal study which employs quantitative research techniques to test research hypotheses. Drawing from top ASX listed firms by market capitalisation at 30 June 2015, sample information is hand-picked from 125 firms' annual and corporate sustainability reports. The dependent variable to measure extent of environmental disclosure (using the ECC Index, 'ECC_Total') is a constructed disclosure scoring index based on guidance set out in the Climate Change Disclosure Reporting Framework, June 2015 release. This scoring index is arguably one of the most comprehensive as the CCRF incorporates principles and requirements promulgated by prominent voluntary reporting regimes (e.g. ISO, GRI, SASB, UN Global Compact). The dependent variable which measures positive and negative environmental performance (ECC performance indicators are 'NEG_ECC_Total' and 'POS_ECC_Total') is adapted from the ECC Index and used to provide a measure of firm engagement in positive or negative environmental activities. The ECC Index is employed in statistical analyses to test the association between governance variables and environmental disclosure ('governance-disclosure' relation) and the ECC performance indicator is used to test the association between governance variables and environmental performance ('governance-performance' relation).

Independent variables applied in this study constitute elements of monitoring and resource provision roles of boards (Hillman et al 2000). Monitoring governance mechanisms include the presence of independent boards (BOD_IND), CSR/Environment Committee (CSR_COM) and environmental audit (ENV_AUDIT). Resource provision measures relate to directors' human and social capital aspects through their affiliations in three areas, environmental, social and community. Examination of director affiliation in these areas have not been previously examined in Australian environmental literature and only recently to a limited extent in international literature (Dixon-Fowler, Ellstrand and Johnson 2017; Rodgrigue, Magnan and Cho 2013; Arena, Bozzolan and Michelon 2015; Mallin and Michelon 2013). Aside from dependent and independent variables, the study controls for firm specific variables (SIZE, ROA, SQRT_MKTBK, SQRT_LEV, FOR_LIST) which are commonly associated with environmental performance and disclosures. In Chapter 5, univariate statistical analyses are presented. Multivariate statistical analyses with details on model specifications and results on proposed hypotheses are presented in Chapter 6 and 7.

# CHAPTER FIVE
# UNIVARIATE STATISTICS

## 5.1 Introduction

This Chapter presents the analysis of items that make up the dependent variable (environment and climate change disclosure index or ECC index), independent variables (comprising aspects of firm governance: BOD_IND, CSR_COM, ENV_AUDIT, BOD_ENVIR_AFFIL, BOD_SOC_AFFIL and BOD_COMM_AFFIL) and control variables used in this study. Univarate Statistics presented here include descriptive statistics, pearson product-moment correlations, paired t-tests and frequency analysis.

Our sample companies comprise of firms across ten sectors. They are firms in Commercial services and supplies, consumer services, energy, food and staples retailing, health care equipment and services, materials, pharmaceuticals, biotechnology and life sciences, telecommunication services, transportation and utilities. Out of 125 firm year observations over a five year research period, 64% are firms in environmentally sensitive industries (ESI) and 36% are firms not in ESI. Firm industry classifications are illustrated in a pie chart in Appendix B.

## 5.2 Descriptive Statistics

### *5.2.1 Dependent variable*

Descriptive Statistics in Table 5.1 show that environmental and climate (ECC) disclosure levels for sample firms are relatively low, with mean ECC_Total of 25.313% in Yr1 and 35.974% by Yr5. Although at low levels, much progress has been made over the five years, with observed year on year increases (Yr1: 25.313%, Yr2: 28.703%, Yr3: 31.297%, Yr4: 34.435% and Yr5: 35.974%). Overall, mean disclosures rose by 42 per cent over the five year period. Sample firms exhibit variable levels of disclosure, as evident from standard deviations around 18% to 21%. Furthermore, disclosure levels ranged from a minimum of zero (none of the items achieved) to maximum of around 54 % in Yr1 and 65% by Yr5.

**Table 5.1** Descriptive Statistics Sample Firms Yr1 to Yr5

| YR1 | ECC_ TOTAL | BOD_ ENVIR_AFFIL | BOD_ SOC_AFFIL | BOD_ COMM_AFFIL | BOD_IND | SIZE | ROA | SQRT_MKTBK | SQRT_LEV | *No of Board members* | *Independent Directors* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean | 25.313 | 8.616 | 17.270 | 39.247 | 76.522 | 23.115 | 7.557 | 1.441 | 6.940 | 9.320 | 7.160 |
| Standard Error | 4.087 | 2.122 | 2.705 | 5.501 | 2.599 | 0.212 | 1.448 | 0.090 | 0.747 | 0.368 | 0.399 |
| Median | 33.333 | 6.250 | 12.500 | 37.500 | 80.000 | 22.995 | 7.310 | 1.428 | 6.032 | 9.000 | 7.000 |
| Standard Deviation | 20.433 | 10.610 | 13.527 | 27.507 | 12.995 | 1.059 | 7.239 | 0.452 | 3.737 | 1.842 | 1.993 |
| Sample Variance | 4.175 | 1.126 | 1.830 | 7.566 | 1.689 | 1.122 | 52.401 | 0.204 | 13.965 | 3.393 | 3.973 |
| Kurtosis | -1.651 | 0.665 | -0.762 | -0.607 | -0.291 | 0.108 | 5.576 | 3.419 | 0.852 | 6.350 | 2.234 |
| Skewness | -0.103 | 1.144 | 0.312 | 0.384 | -0.927 | 0.553 | -1.178 | -0.921 | 0.682 | 2.224 | 1.064 |
| Range | 54.098 | 37.500 | 45.455 | 90.909 | 41.667 | 4.127 | 39.210 | 2.182 | 16.855 | 8.000 | 9.000 |
| Minimum | 0.000 | 0.000 | 0.000 | 0.000 | 50.000 | 21.365 | -17.380 | 0.000 | 0.000 | 8.000 | 4.000 |
| Maximum | 54.098 | 37.500 | 45.455 | 90.909 | 91.667 | 25.491 | 21.830 | 2.182 | 16.855 | 16.000 | 13.000 |
| Count | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 |
| CL(95.0%) | 8.434 | 4.380 | 5.584 | 11.354 | 5.364 | 0.437 | 2.988 | 0.186 | 1.543 | 0.760 | 0.823 |
| YR2 | ECC_ TOTAL | BOD_ ENVIR_AFFIL | BOD_ SOC_AFFIL | BOD_ COMM_AFFIL | BOD_IND | SIZE | ROA | SQRT_MKTBK | SQRT_LEV | *No of Board members* | *Independent Directors* |
| Mean | 28.703 | 8.924 | 18.231 | 41.575 | 77.568 | 23.196 | 8.692 | 1.666 | 7.930 | 9.400 | 7.320 |
| Standard Error | 4.250 | 2.011 | 3.176 | 5.458 | 2.556 | 0.212 | 1.091 | 0.165 | 0.639 | 0.356 | 0.390 |
| Median | 33.333 | 7.692 | 14.286 | 37.500 | 78.571 | 23.028 | 8.100 | 1.549 | 7.087 | 9.000 | 7.000 |
| Standard Deviation | 21.250 | 10.057 | 15.878 | 27.292 | 12.781 | 1.058 | 5.455 | 0.827 | 3.195 | 1.780 | 1.952 |
| Sample Variance | 4.516 | 1.011 | 2.521 | 7.448 | 1.633 | 1.119 | 29.757 | 0.684 | 10.205 | 3.167 | 3.810 |
| Kurtosis | -1.527 | -0.270 | 0.829 | -1.015 | 0.043 | 0.183 | 3.530 | 15.753 | 1.875 | 0.772 | 0.575 |
| Skewness | -0.167 | 0.865 | 0.764 | 0.230 | -1.010 | 0.601 | 1.522 | 3.625 | 1.209 | 1.215 | 0.569 |
| Range | 57.377 | 33.333 | 62.500 | 90.000 | 42.308 | 4.102 | 24.270 | 4.298 | 13.458 | 7.000 | 8.000 |
| Minimum | 0.000 | 0.000 | 0.000 | 0.000 | 50.000 | 21.464 | 2.230 | 0.959 | 3.950 | 7.000 | 4.000 |
| Maximum | 57.377 | 33.333 | 62.500 | 90.000 | 92.308 | 25.566 | 26.500 | 5.256 | 17.408 | 14.000 | 12.000 |
| Count | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 |
| CL(95.0%) | 8.772 | 4.151 | 6.554 | 11.266 | 5.276 | 0.437 | 2.252 | 0.341 | 1.319 | 0.735 | 0.806 |

Legend: Standard Error (SE); Standard Deviation (SD); Sample Variance (SV); Confidence Level (CL). Refer Appendix A for variable definition

**Table 5.1** Descriptive Statistics Sample Firms Yr1 to Yr5 (continued)

| YR3 | ECC_ TOTAL | BOD_ ENVIR_AFFIL | BOD_ SOC_AFFIL | BOD_ COMM_AFFIL | BOD_IND | SIZE | ROA | SQRT_MKTBK | SQRT_LEV | *No of Board members* | *Independent Directors* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean | 31.297 | 9.710 | 19.314 | 44.104 | 79.032 | 23.280 | 7.618 | 2.166 | 7.829 | 9.400 | 7.440 |
| Standard Error | 4.346 | 1.849 | 3.119 | 4.813 | 2.564 | 0.210 | 0.869 | 0.581 | 0.597 | 0.316 | 0.352 |
| Median | 35.000 | 9.091 | 18.182 | 50.000 | 81.818 | 23.076 | 6.930 | 1.466 | 7.300 | 9.000 | 7.000 |
| Standard Deviation | 21.732 | 9.247 | 15.593 | 24.067 | 12.822 | 1.048 | 4.343 | 2.904 | 2.986 | 1.581 | 1.758 |
| Sample Variance | 4.723 | 0.855 | 2.431 | 5.792 | 1.644 | 1.098 | 18.866 | 8.431 | 8.919 | 2.500 | 3.090 |
| Kurtosis | -1.580 | -0.631 | 0.772 | -0.921 | 0.610 | 0.568 | 2.206 | 23.495 | 0.970 | -0.418 | 1.180 |
| Skewness | -0.260 | 0.572 | 0.649 | 0.356 | -1.288 | 0.616 | 1.265 | 4.787 | -0.134 | 0.715 | 0.058 |
| Range | 57.377 | 30.000 | 62.500 | 81.667 | 42.308 | 4.299 | 18.310 | 15.048 | 13.576 | 6.000 | 8.000 |
| Minimum | 0.000 | 0.000 | 0.000 | 10.000 | 50.000 | 21.427 | 2.600 | 0.866 | 0.000 | 7.000 | 4.000 |
| Maximum | 57.377 | 30.000 | 62.500 | 91.667 | 92.308 | 25.727 | 20.910 | 15.914 | 13.576 | 13.000 | 12.000 |
| Count | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 |
| CL(95.0%) | 8.971 | 3.817 | 6.436 | 9.934 | 5.293 | 0.433 | 1.793 | 1.199 | 1.233 | 0.653 | 0.726 |
| YR4 | ECC_ TOTAL | BOD_ ENVIR_AFFIL | BOD_ SOC_AFFIL | BOD_ COMM_AFFIL | BOD_IND | SIZE | ROA | SQRT_MKTBK | SQRT_LEV | *No of Board members* | *Independent Directors* |
| Mean | 34.435 | 11.429 | 20.506 | 47.099 | 79.377 | 23.315 | 8.153 | 1.610 | 8.120 | 9.440 | 7.520 |
| Standard Error | 3.696 | 1.874 | 3.337 | 5.018 | 2.766 | 0.209 | 0.887 | 0.129 | 0.814 | 0.404 | 0.444 |
| Median | 38.333 | 12.500 | 20.000 | 50.000 | 85.714 | 23.151 | 7.410 | 1.493 | 7.539 | 9.000 | 7.000 |
| Standard Deviation | 18.480 | 9.371 | 16.684 | 25.091 | 13.829 | 1.047 | 4.433 | 0.644 | 4.069 | 2.022 | 2.220 |
| Sample Variance | 3.415 | 0.878 | 2.783 | 6.295 | 1.912 | 1.096 | 19.649 | 0.415 | 16.557 | 4.090 | 4.927 |
| Kurtosis | -1.181 | -1.067 | 0.160 | -1.185 | 1.403 | 0.616 | 1.836 | 0.848 | 4.852 | 1.659 | 1.667 |
| Skewness | -0.286 | 0.104 | 0.580 | 0.134 | -1.565 | 0.687 | 1.194 | 0.036 | 1.442 | 1.376 | 0.866 |
| Range | 62.295 | 30.000 | 62.500 | 81.667 | 48.413 | 4.254 | 18.660 | 3.068 | 21.853 | 8.000 | 9.000 |
| Minimum | 0.000 | 0.000 | 0.000 | 10.000 | 44.444 | 21.549 | 2.750 | 0.000 | 0.000 | 7.000 | 4.000 |
| Maximum | 62.295 | 30.000 | 62.500 | 91.667 | 92.857 | 25.803 | 21.410 | 3.068 | 21.853 | 15.000 | 13.000 |
| Count | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 |
| CL(95.0%) | 7.628 | 3.868 | 6.887 | 10.357 | 5.708 | 0.432 | 1.830 | 0.266 | 1.680 | 0.835 | 0.916 |

Legend: Standard Error(SE); Standard Deviation (SD); Sample Variance (SV); Confidence Level (CL). Refer Appendix A for variable definition

**Table 5.1** Descriptive Statistics Sample Firms Yr1 to Yr5 (continued)

| YR5 | ECC_TOTAL | BOD_ ENVIR_AFFIL | BOD_ SOC_AFFIL | BOD_ COMM_AFFIL | BOD_IND | SIZE | ROA | SQRT_MKTBK | SQRT_LEV | *No of Board members* | *Independent Directors* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean | 35.974 | 12.271 | 23.660 | 49.701 | 82.082 | 23.440 | 6.565 | 1.648 | 8.958 | 9.120 | 7.440 |
| Standard Error | 3.745 | 1.947 | 3.188 | 4.906 | 2.062 | 0.198 | 1.595 | 0.157 | 0.957 | 0.296 | 0.265 |
| Median | 39.344 | 12.500 | 25.000 | 42.857 | 87.500 | 23.373 | 6.450 | 1.389 | 8.180 | 9.000 | 7.000 |
| Standard Deviation | 18.723 | 9.733 | 15.941 | 24.531 | 10.312 | 0.992 | 7.975 | 0.785 | 4.786 | 1.481 | 1.325 |
| Sample Variance | 3.505 | 0.947 | 2.541 | 6.018 | 1.063 | 0.983 | 63.595 | 0.616 | 22.903 | 2.193 | 1.757 |
| Kurtosis | -0.958 | -0.596 | 0.395 | -0.879 | 1.752 | 0.675 | 8.934 | 0.406 | 4.377 | -0.644 | -0.514 |
| Skewness | -0.336 | 0.252 | 0.635 | 0.544 | -1.649 | 0.595 | -2.082 | 0.562 | 1.512 | 0.446 | 0.374 |
| Range | 65.574 | 33.333 | 62.500 | 80.000 | 35.354 | 4.104 | 45.740 | 3.352 | 24.943 | 5.000 | 5.000 |
| Minimum | 0.000 | 0.000 | 0.000 | 20.000 | 55.556 | 21.708 | -23.890 | 0.000 | 0.000 | 7.000 | 5.000 |
| Maximum | 65.574 | 33.333 | 62.500 | 100.000 | 90.909 | 25.812 | 21.850 | 3.352 | 24.943 | 12.000 | 10.000 |
| Count | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 | 25.000 |
| CL(95.0%) | 7.728 | 4.018 | 6.580 | 10.126 | 4.257 | 0.409 | 3.292 | 0.324 | 1.975 | 0.611 | 0.547 |

Legend: Standard Error(SE); Standard Deviation (SD); Sample Variance (SV); Confidence Level (CL).

ECC_Total = Proportion of total environmental and climate change disclosure (ECC disclosure) score divided by total maximum score for all categories; BOD_ENVIR_AFFIL = Proportion of Board members who are presently or were formerly affiliated with environmental, climate related or conservation organizations (including government sponsored institutions and not for profit) to total board members; BOD_SOC_AFFIL = Proportion of Board members who are presently or were formerly affiliated with social and humanitarian organisations (i.e. social /humanitarian organisations include organisations focused on alleviation of poverty, food aid, disability support, medical or health related support and research organisations) to total board members; BOD_COMM_AFFIL = Proportion of Board members who are presently or have former community affiliation, (both locally and internationally) to total board members; these include: (a)Board member(s) who also sit on Boards of sporting clubs or art organizations or are members or trustees of funds or foundations run for these purposes (e.g. museums, art institutions, sporting leagues) ; (b)Board member(s) with significant affiliation with government bodies or organizations locally and internationally, through their former appointments or engagements as Ministers (or equivalent) or prominent industry alliance representatives; (c) Board member(s) who are also represented on Boards of Academic institutions or have significant affiliations as advisors or contributors to these institutions.; BOD_IND = Proportion of Independent Board members to total board members; SIZE = The natural logarithm of total assets at the beginning of year t; ROA = Return on assets (Profit before tax / Total assets); SQRT_MKTBK = Square root of market to book ratio (price / book value); SQRT_LEV = Square root of Leverage (Total debt/total equity).

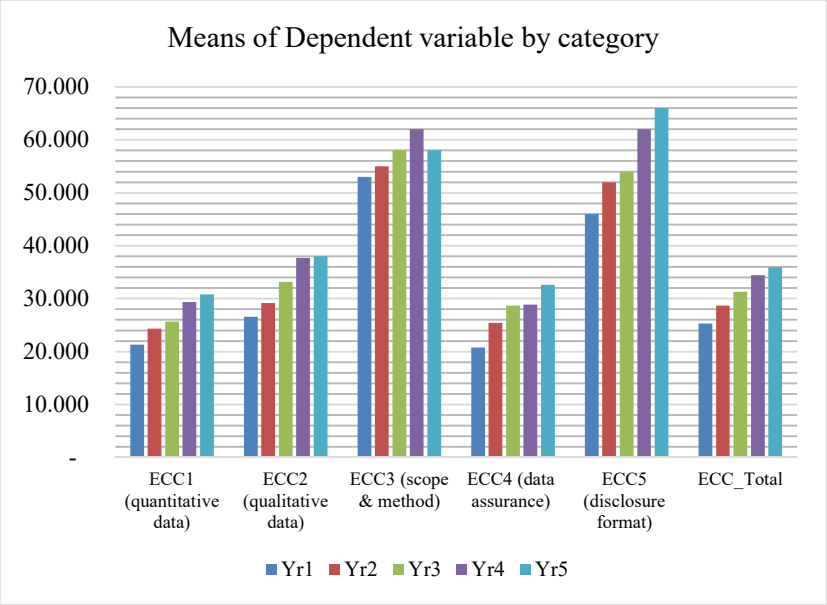
The ECC disclosure index contains five disclosure categories. Changes in means of these disclosure categories are presented in Table 5.2. Key observations of ECC disclosure by category are as follows: (i) all disclosure categories observed significant increases in mean disclosures over the research period (all at above 40 % over five years except ECC3 with 9.434% increase); (ii) the greatest change is category ECC4, being disclosure of details relating to third party assurance. This 57.237% change in Yr5 compared to Yr1 for ECC4 shows that third party assurance providers have increased disclosure pertaining to details on the scope of data being examined within their assurance engagements. In other words, there is more specificity on types of environmental data being assured and reported on; (iii) improvements in quantitative disclosures are marginally greater than qualitative aspects, as percentage change observed in Yr5 compared to Yr1 for ECC1 and ECC2 are 44.532% and 43.013% respectively; (iv) a change of 43.478% for ECC5 over the research period show positive improvements in the way data is presented, with firms reporting quantitative results via a performance results summary page and a continued increase in the practice of reporting via separate sustainability reports; (v) With most sample companies already meeting disclosure in category ECC3 by more than 50 per cent in each of the five years, the 9.434% increase in Yr5 compared to Yr1, shows that firms also continue to improve in the way they report on scope and reporting methodologies applied in disclosure of environmental data. The above is also illustrated in Figure 5.1.

**Table 5.2** Means of Dependent Variable by disclosure category for Yr1 to Yr5

| No of items in category | ECC Category | Yr1 | Yr2 | Yr3 | Yr4 | Yr5 | % change (Yr5-Yr1) |
|---|---|---|---|---|---|---|---|
| 24 | ECC1 (quantitative data) | 21.333 | 24.333 | 25.667 | 29.333 | 30.833 | 44.532 |
| 14 | ECC2 (qualitative data) | 26.571 | 29.143 | 33.143 | 37.714 | 38.000 | 43.013 |
| 4 | ECC3 (scope & method) | 53.000 | 55.000 | 58.000 | 62.000 | 58.000 | 9.434 |
| 15 | ECC4 (data assurance) | 20.735 | 25.441 | 28.691 | 28.868 | 32.603 | 57.237 |
| 2 | ECC5 (disclosure format) | 46.000 | 52.000 | 54.000 | 62.000 | 66.000 | 43.478 |
| 59 | ECC_Total | 25.312 | 28.702 | 31.297 | 34.434 | 35.973 | 42.118 |

Legend: ECC1= Proportion of total quantitative disclosure of environmental performance results to total possible maximum score in category ECC1; ECC2= Proportion of total qualitative disclosure of environmental performance results to total maximum score in category ECC2; ECC3= Proportion of total disclosure on reporting scope and polices to total maximum score in category ECC3; ECC4 = Proportion of total disclosure relating to assurance over environmental and sustainability data to total maximum score in category ECC4; ECC5 = Proportion of Total disclosure relating to environmental disclosure format to Total maximum score in category ECC5

**Figure 5.1** Graph of ECC_Total by Disclosure Categories Yr1 to Yr5




ECC_Total Disclosure by industry classification in Table 5.3 shows that there is an increase in total disclosure levels across all sectors over the research period. Firms in Food and Staples Retailing sector observes the highest disclosure levels across all five years (FOOD_STAP: Yr1 at 47.500%, Yr2 at 50.833%, Yr3 at 53.333%, Yr4 at 51.667% and Yr5 at 55.833%). Telecommunication reports the second highest mean for all five years (TEL: Yr1 at 36.667%, Yr2 at 46.667, Yr3 at 48.333%, Yr4 at 51.667% and Yr5 at 53.333%) except in Yr1, when it is only marginally lower than Materials (MAT: Yr1 at 38.525%). In comparison, firms in both the Consumer Services sector and Health Care Equipment Services sector are the least pro-active disclosures of environmental information over the research period (CONSUM with 0% in Yr1 to 25.000% in Yr5; HEALTH with 0% in Yr1 and 13.333% in Yr5).

Firms in environmentally sensitive industries (ESI) such as those belonging to the Energy and Utilities sector show moderate increases in mean disclosure levels of about 36 per cent over five years (ENE: 36.667% and UTIL: 35.718% increase). The Transportation sector observed the highest change in mean disclosure levels (TRANSP: 230%), while firms in the Materials sector reported the lowest increase (MAT: 3.546%) over the research period. All four sectors in ESI show mean disclosures at relatively varied levels in Yr1 initially (ENE: 27.000%, MAT: 38.525%, TRANSP: 11.111% and UTIL: 23.333%) but report closely similar mean disclosures of about 30 per cent or more by the end of Yr5 (ENE: 36.667%, MAT:

39.891%, TRANSP: 36.667% and UTIL: 31.667%). These results may suggest an increasing upward trend toward greater conformity to achieve what may be perceived as minimum disclosure levels, for firms which operate in industries which are prone to greater environmental scrutiny.

For firms that operate in non-ESI, results show Food and Staples Retailing and Telecommunication sectors report the highest mean disclosure levels across most of the years and are at levels greater than means of firms operating in ESIs (e.g. In Yr5: FOOD_STAP at 55.833% and TEL at 53.333% compared to MAT at 39.981% or ENE at 36.667%). The Telecommunication sector observed a greater increase in disclosure levels compared to Food and Staples Retailing (TEL: 45.452% and FOOD_STAP: 17.543% increases). Although at lower means, other non-ESI sectors also report significant improvements in mean disclosure levels over the research period (COMMERC: 91.665% change, CONSUM and HEALTH: >100% change) and minimal change for firms in Pharmaceuticals sector (PHARM: 5% change).

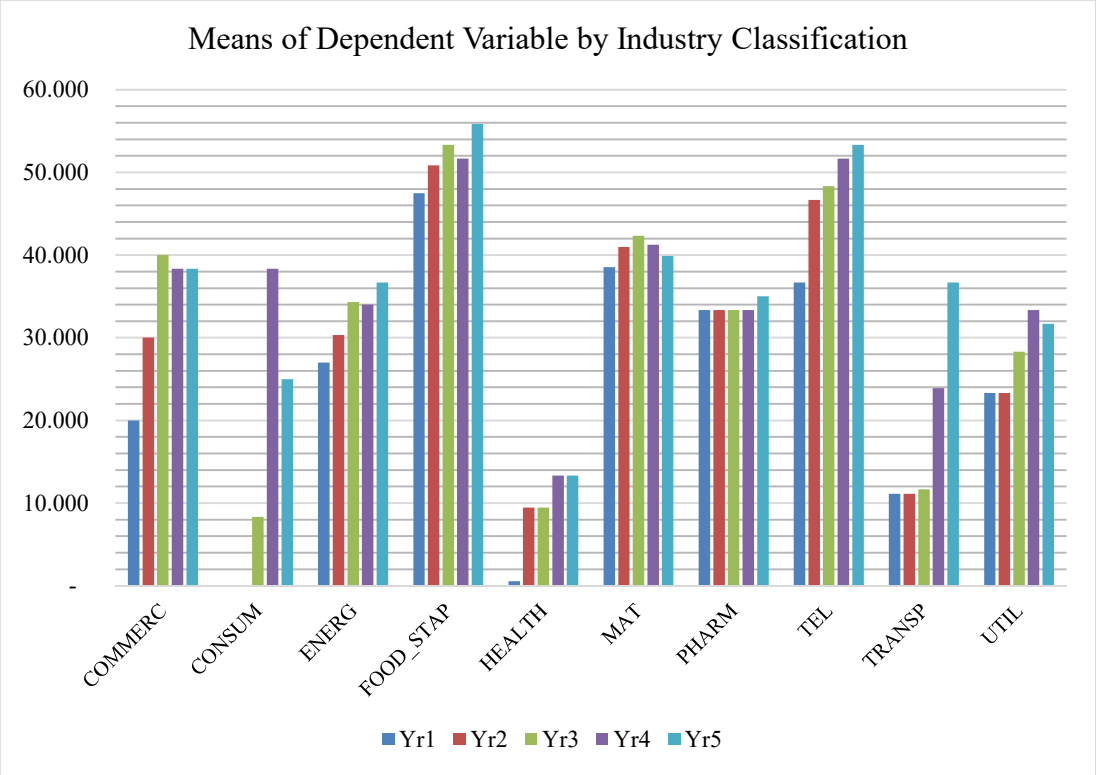
**Table 5.3** Means of Dependent Variable by industry classification Yr1 to Yr5

| GISC Industry Description | IND SEC | Yr1 | Yr2 | Yr3 | Yr4 | Yr5 | % change (Yr5-Yr1) |
|---|---|---|---|---|---|---|---|
| Commercial Services and Supplies | COMMERC | 20.000 | 30.000 | 40.000 | 38.333 | 38.333 | 91.665 |
| Consumer Services | CONSUM | 0.000 | 0.000 | 8.333 | 38.333 | 25.000 | >100% |
| Energy (ESI) | ENERG | 27.000 | 30.333 | 34.333 | 34.000 | 36.667 | 35.804 |
| Food and Staples Retailing | FOOD_STAP | 47.500 | 50.833 | 53.333 | 51.667 | 55.833 | 17.543 |
| Health Care Equipment and Services | HEALTH | 0.556 | 9.444 | 9.444 | 13.333 | 13.333 | >100% |
| Materials (ESI) | MAT | 38.525 | 40.984 | 42.350 | 41.257 | 39.891 | 3.546 |
| Pharmaceuticals, Biotechnology & Life Sciences | PHARM | 33.333 | 33.333 | 33.333 | 33.333 | 35.000 | 5.001 |
| Telecommunication Services | TEL | 36.667 | 46.667 | 48.333 | 51.667 | 53.333 | 45.452 |
| Transportation (ESI) | TRANSP | 11.111 | 11.111 | 11.667 | 23.889 | 36.667 | >100% |
| Utilities (ESI) | UTIL | 23.333 | 23.333 | 28.333 | 33.333 | 31.667 | 35.718 |

Legend: ESI= Firms that operate in environmentally sensitive industries and where not indicated, refers otherwise (Cho and Patten 2007).

The changes in means of ECC_Total over the five consecutive periods by industry classification are illustrated in Figure 5.2.

**Figure 5.2** Graph of ECC_Total by Industry Classification Yr1 to Yr5




The level of dispersion of disclosure scores (ECC_Total) by companies for this sample is further illustrated in Appendix J. ECC_Total represents total scores attained by the company as a proportion of total maximum score possible. High disclosure scores for companies in the FOOD_STAP, TEL and MAT industry classifications are driven primarily by (i) BHP Billiton, Woolworths, Rio Tinto, (i.e. ECC_Total > 50% for each of the five years); (ii) Westfarmers, Amcor, NewCrest Mining (i.e. ECC_Total> 40% for each of the five years);and (iii) Orica and Telstra, (i.e. ECC_Total >30% for each of the five years). Similarly, other proactive disclosures in the ENERG sector include Santos, and Woodside (i.e. ECC_Total>40% for all years). Conversely, lagers in the sample are found across all sectors, with the least pro-active in HEALTH, CONSUM and TRANSP. However, over the five years, notable improvements in disclosure levels for CONSUM and TRANSP are observed for Crown Resorts, and Aurizon Limited (from scores of 0% or 8 % to 30% plus) particularly from Yr3 onwards. Overall, 48 per cent of firms in

the sample do not attain disclosure scores of more than 30% in Yr1 but that improves, to at least 36 per cent by the end of Yr5.

### *5.2.2 Independent variables*

A summary of Means of Independent variables in Table 5.4 shows that sample firms exhibit strong aspects of corporate governance mechanisms over the research period. The proportion of independent board members to total members is at high levels and increased over the period (BOD_IND of 76.52% in Y1 to 82.08% in Y5). The median for all years shows that sample firms generally have 7 independent members out of a total of 9 board members (Table 5.1). The most common type of board member affiliations of sample firms are members with community affiliation, BOD_COMM_AFF (e.g. 39.247% of Board members in Yr1). There are higher proportions of board members with social/humanitarian affiliation compared to environmental affiliation, (e.g. BOD_SOC_AFF at 17.270%, compared to BOD_ENVIR_AFF at 8.616% in Yr1) and is the case for all five years. Changes overtime show that there is an increasing trend of: (i) board member with environmental affiliation, evidenced by a rise in BOD_ENVIR_AFF means from 8.616% in Yr1 to 12.271% in Yr5; (ii) board members with social/humanitarian affiliation, with BOD_SOC_AFF means of 17.270% in Yr1 to 23.660% by Yr5; (iii) board members with community affiliation, with BOD_COM_AFF of 39.247% in Yr1 to 49.701% in Yr5. Descriptive statistics in Table 5.1 presented earlier also show considerable variation across sample firms for all years, with some who have no affiliation to any of the three aspects (range reports minimum of zero) and others with significant affiliation (maximum range is in the vicinity of 30% for BOD_ENVIR_AFF, 40% to 60% for BOD_SOC_AFF and 90% or higher for BOD_COMM_AFF).

Additionally results in Table 5.4 show that, at the least, 48% of sample firms have an environmental/sustainability Committee at Board level in the earlier periods (CSR_COM: 48% in Yr1) and that increased to 60% by Yr5. Close to half of sample firms in Yr1 obtain third party assurance over their environmental data (ENV_AUD: 48%), and that rose to 52% in Yr2 and maintained at that level for three years until

Yr5 when it then increased to 64% of sample firms. The above results are also graphically illustrated as Figure 5.3 and 5.4 below.

**Table 5.4** Means of Independent Variables Yr1 to Yr5

| Continuous variables | Yr1 | Yr2 | Yr3 | Yr4 | Yr5 | % change (Yr5-Yr1) |
|---|---|---|---|---|---|---|
| BOD_IND | 76.522 | 77.568 | 79.032 | 79.377 | 82.082 | 7.267 |
| BOD_ENVIR_AFFIL | 8.616 | 8.924 | 9.710 | 11.429 | 12.271 | 42.422 |
| BOD_SOC_AFFIL | 17.270 | 18.231 | 19.314 | 20.506 | 23.660 | 37.006 |
| BOD_COM_AFFIL | 39.248 | 41.575 | 44.104 | 47.099 | 49.701 | 26.635 |
| **Dichotomous variables** | **Yr1** | **Yr2** | **Yr3** | **Yr4** | **Yr5** | **% change (Yr5-Yr1)** |
| CSR_COM | 48.000 | 48.000 | 56.000 | 56.000 | 60.000 | 25.000 |
| ENV_AUD | 48.000 | 52.000 | 52.000 | 52.000 | 64.000 | 33.333 |

**Figure 5.3** Graph of proportion of Board members with affiliation & Board independence

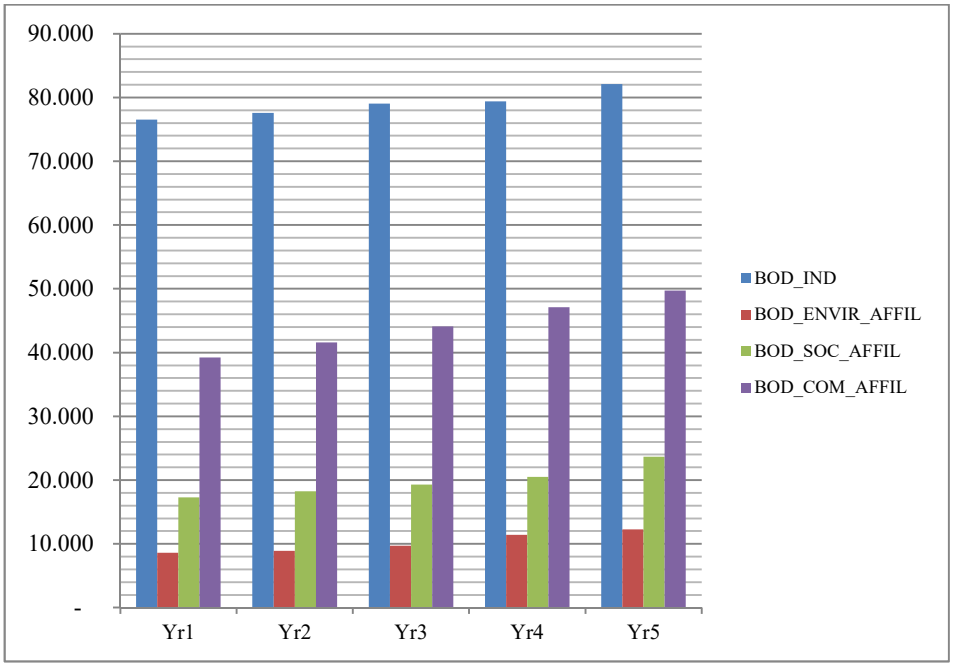
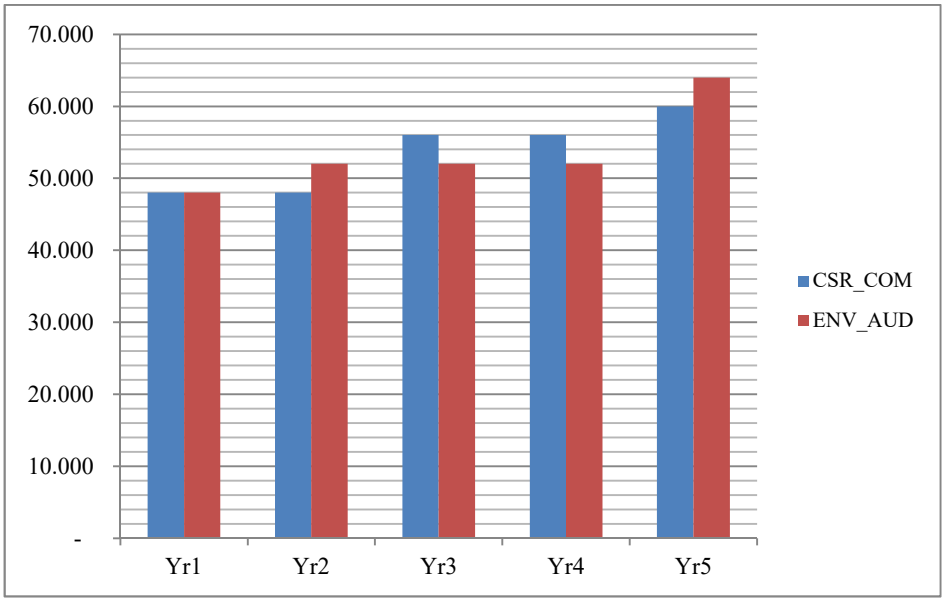


**Figure 5.4** Graph of proportion of firms with Environmental/CSR Committees & Environmental Assurance Yr1 to Yr5




### *5.2.3 Control variables*

Descriptive statistics in Table 5.1 show that firm size, measured by the natural log of total assets, was relatively stable over the period (mean SIZE around 23% for all years). Return on Assets (ROA), observed fluctuating means over the period (ROA: 7.557% in Yr1, 8.692% in Yr2, 7.618% in Yr3, 8.153% in Yr4 and 6.565% in Yr5). Mean Market to Book ratio increased between Yr1 to Yr3 (SQRT_MKT at 1.441% in Yr1, 1.666% in Yr2 and 2.166% in Yr3) and decreased in Yr4 (1.610%) and rose in Yr5 (1.648%). Mean Leverage measured by total liabilities divided by total equity observed overall increases over the period (SQRT_LEV at 6.940% in Yr1 to 8.958% in Yr4). Frequency distributions[45] for each of the control variables are in shown in Appendix D.

[45] Transformation of raw data was needed for firm size, market to book ratio and leverage (firm size was measured as the natural log of total assets, market to book ratio was measured as the square root of market to book ratio and leverage the square root of total liabilities to divide by total equity). Transformed values assumed a more normal distribution with skewness below or closer to the value of one. Frequency distributions for each is presented in Appendix D

## 5.3 Correlation Coefficients

Correlation between total disclosures as measured by ECC_Total and each of the independent and control variables are computed using Pearson's product-moment correlations over the five year research period. The results are presented in Table 5.5. There is a positive and statistically significant ($p<0.01$) correlation between total ECC disclosures (ECC_Total) and Board independence (BOD_IND), Boards with environmental (BOD_ENVIR_AFFIL), social (BOD_SOC_AFFIL) and community (BOD_COMM_AFFIL) affiliations. ECC is strongly and positively correlated with environmental audit (ENV_AUDIT) (0.848). Results show that ECC_Total is not statistically significantly correlated with firms that have CSR Committees at Board level (CSR_COM).

Size (SIZE) and foreign listing (FOR_LIST) are positively and statistically significantly ($p<0.01$) correlated with total ECC disclosures. Correlations between return on assets (ROA), market to book ratio (SQRT_MKTBK), leverage (SQRT_LEV) and ECC disclosures are not statistically significant.

Correlation coefficients suggest that multi-collinearity between independent and control variables are not a concern as are at levels less than 0.70 (Hair et al. 2014). Most are either not statistically significant or significant but at low levels (with positive coefficients between 0.187 to 0.364 and negative coefficients between -0.339 to -0.204). The highest observed is correlation coefficient between Size and ENV_AUDIT (at 0.616) where although positively statistically significant (at $p<0.01$) is also at a level which does not pose a concern.

**Table 5.5** Pearson Correlation Matrix

| | ECC_ TOTAL | BOD_IND | BOD_ ENVIR_ AFFIL | BOD_ SOC_ AFFIL | BOD_ COMM_ AFFIL | CSR_ COMM | ENV_ AUDIT | SIZE | ROA | SQRT _MKT BK | SQRT_ LEV | FOR_ LIST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ECC_TOTAL | 1.000 | | | | | | | | | | | |
| BOD_IND | 0.474*** | 1.000 | | | | | | | | | | |
| BOD_ENVIR_AFFIL | 0.283*** | 0.204** | 1.000 | | | | | | | | | |
| BOD_SOC_AFFIL | 0.253*** | 0.261*** | 0.223** | 1.000 | | | | | | | | |
| BOD_COMM_AFFIL | 0.359*** | 0.033 | 0.261*** | 0.259*** | 1.000 | | | | | | | |
| CSR_COMM | 0.121 | 0.042 | 0.353*** | -0.017 | -0.145 | 1.000 | | | | | | |
| ENV_AUDIT | 0.848*** | 0.390*** | 0.244*** | 0.167 | 0.401*** | 0.035 | 1.000 | | | | | |
| SIZE | 0.708*** | 0.274*** | 0.362*** | 0.339*** | 0.268*** | 0.331*** | 0.616*** | 1.000 | | | | |
| ROA | 0.052 | 0.046 | -0.339*** | 0.095 | -0.063 | -0.240*** | -0.069 | -0.025 | 1.000 | | | |
| SQRT_MKTBK | -0.119 | 0.085 | -0.240*** | -0.070 | -0.086 | -0.262*** | -0.100 | -0.220** | 0.208** | 1.000 | | |
| SQRT_LEV | 0.004 | -0.031 | -0.001 | 0.002 | 0.103 | -0.063 | 0.047 | 0.068 | -0.111 | -0.001 | 1.000 | |
| FOR_LIST | 0.309*** | 0.343*** | -0.173 | -0.204** | 0.187** | -0.037 | 0.364*** | 0.230*** | 0.126 | 0.099 | -0.245** | 1.000 |

Legend: Table 5.5 provides the Pearson correlation matrix for all sample firms for all years. Associations ***. ** and * are statistically significant at the 1%, 5% and 10% respectively.
ECC_Total = Proportion of total environmental and climate change disclosure (ECC disclosure) score divided by total maximum score for all categories; BOD_ENVIR_AFFIL = Proportion of Board members who are presently or were formerly affiliated with environmental, climate related or conservation organizations (including government sponsored institutions and not for profit) to total board members; BOD_SOC_AFFIL = Proportion of Board members who are presently or were formerly affiliated with social and humanitarian organisations (i.e. social /humanitarian organisations include organisations focused on alleviation of poverty, food aid, disability support, medical or health related support and research organisations) to total board members; BOD_COMM_AFFIL = Proportion of Board members who are presently or have former community affiliation, (both locally and internationally) to total board members; these include: (a)Board member(s) who also sit on Boards of sporting clubs or art organizations or are members or trustees of funds or foundations run for these purposes (e.g. museums, art institutions, sporting leagues) ; (b)Board member(s) with significant affiliation with government bodies or organizations locally and internationally, through their former appointments or engagements as Ministers (or equivalent) or prominent industry alliance representatives; (c) Board member(s) who are also represented on Boards of Academic institutions or have significant affiliations as advisors or contributors to these institutions.; BOD_IND = Proportion of Independent Board members to total board members; SIZE = The natural logarithm of total assets at the beginning of year t; ROA = Return on assets (Profit before tax / Total assets); SQRT_MKTBK = Square root of market to book ratio (price / book value); SQRT_LEV = Square root of Leverage (Total debt/total equity).

## 5.4 Paired sample t-tests

Paired sample t-tests are used to examine differences between means for consecutive periods over the research period. The purpose of these t-tests are to compare means of the same group at two different times (in this case, for each consecutive year) to determine if there is statistical evidence that the mean differences between paired groups are significantly different from zero. In other words, if not zero, the null hypothesis is rejected. Results show only one-tailed significance, as the research proposition is directional (i.e. that there is an increase in extent of disclosures over the study period).

### *5.4.1 T-tests on Dependent variables*

Table 5.6 reports differences in disclosure means for ECC_Total and each ECC category and results for four sets of paired sample t-tests: (a) pair 1, tests differences in means between Yr1 and Yr2, being periods before the impending introduction of regulatory provisions (both years pre-REG); (b) pair 2, tests differences in means between Yr3 and Yr2, which involves the intervening periods of change (Yr3 being post-REG as it is the first operative year of the CPM and Yr2 being pre-REG); (c) pair 3, tests differences in means between Yr4 and Yr3, which are the two operative years of the CPM and periods which saw the introduction of ASIC provisions (both years post-REG) and; (d) pair 4, tests differences in means between Yr5 and Yr4, with Yr5 being impacted by the repeal of CPM but saw the introduction of ASX's CG requirements (both periods classified as post-REG).

For ECC_Total: (a) pair 1 results show Yr1 (m = 25.313, SD = 20.433) and Yr2 (m = 28.703, SD = 21.250) mean distribution of differences are not equal to zero and statistically significant at 1% level ($t(24) = 3.453$, $p<0.01$). This significance level suggests the high likelihood (99%) that Yr2 mean disclosure is statistically significantly higher than Yr1 mean disclosure, during the two consecutive pre-REG periods, when firms faced impending environmental regulations. This period observed the greatest mean change (13.393% increase); (b) pair 2 results also show mean distribution of differences between pre-REG (Yr2) and post-REG (Yr3) is statistically significant at the 1% level ($t(24) = 3.741$, $p<0.01$). However, the increase

in means was at a marginally lower percentage change than earlier (9.041% increase) ; (c) pair 3 results show that the distribution of difference in means for Yr3 and Yr4, is statistically significant, at the 10% level ($t(24) = 1.705$, $p<0.10$). Results show a 10.023% increase in mean disclosure from Yr3 to Yr4, during these two consecutive periods post-REG. Although firms made greater disclosures post-REG but the rate of change pre-REG was greater than during the post-REG periods; (d) Pair 4 results report that the mean difference between Yr4 and Yr5 is not statistically significantly different, thus the null hypothesis is accepted. There is therefore no statistical evidence to support the probability that the observed modest increase of 4.469% change in mean disclosures between Yr4 and Yr5 is statistically different. Therefore, collectively, results (a), (b), (c) and (d) provide evidence of increasing levels of ECC disclosures, year on year, commencing as early as two years prior to regulatory changes concerning environmental reporting up until at least two years post introduction of two regulatory provisions (CPM and ASIC RG247).

Generally, similar results are shown when t-tests are performed for each ECC category. Particularly, for disclosure categories which capture the quantitative (ECC1), qualitative (ECC2) and data assurance (ECC4) aspects of environmental data reported. Results also show mean differences are statistically significant, for pre-REG periods and post-REG up to Yr4, but are all at varying levels of significance. (For ECC1: (i) pair 1, $t(24) = 2.187$, $p<0.05$; (ii) pair2, $t(24) = 1.778$, $p<0.05$; (iii) pair3, $t(24) = 1.872$, $p<0.05$. For ECC2: pair 1, $t(24) = 2.823$, $p<0.01$; (ii) pair2, $t(24) = 2.498$, $p<0.01$; (iii) pair3, $t(24) = 1.496$, $p<0.10$. For ECC4: pair 1, $t(24) = 2.244$, $p<0.05$; (ii) pair2, $t(24) = 1.878$, $p<0.05$). For categories which cover general disclosure information pertaining to information on scope and methodologies (ECC3) and disclosure format (ECC5), changes in means are statistically significant for periods pre-REG only (ECC3, pair1: $t(24) = 1.445$, $p<0.10$ and ECC5, pair1: $t(24) = 1.365$, $p<0.10$).

**Table 5.6** Paired sample t-tests on Dependent Variables

| **ECC_TOTAL** | **Yr1** | **Yr2** | **Yr3** | **Yr4** | **Yr5** |
|---|---|---|---|---|---|
| Mean | 25.312 | 28.702 | 31.297 | 34.434 | 35.973 |
| Standard deviation | 20.433 | 21.251 | 21.733 | 18.480 | 18.723 |
| Variance | 417.499 | 451.591 | 472.320 | 341.516 | 350.536 |
| Observations | 25 | 25 | 25 | 25 | 25 |
| | | pair1 (Yr2-Yr1) | pair2 (Yr3-Yr2) | pair3 (Yr4-Yr3) | pair4 (Yr5-Yr4) |
| Hypothesized Mean Difference | | 0 | 0 | 0 | 0 |
| Δ in means $Yr_t$ - $Yr_{t-1}$ | | 3.390 | 2.595 | 3.137 | 1.539 |
| % Δ in means | | 13.393 | 9.041 | 10.023 | 4.469 |
| df | | 24 | 24 | 24 | 24 |
| t Stat | | 3.453 | 3.741 | 1.705 | 1.109 |
| P(T<=t) one-tail | | 0.001 | 0.001 | 0.051 | 0.139 |
| t Critical one-tail | | 1.711 | 1.711 | 1.711 | 1.711 |

| **ECC1** | **Yr1** | **Yr2** | **Yr3** | **Yr4** | **Yr5** |
|---|---|---|---|---|---|
| Mean | 21.333 | 24.333 | 25.667 | 29.333 | 30.833 |
| Standard deviation | 18.215 | 17.459 | 17.250 | 13.474 | 14.232 |
| Variance | 331.771 | 304.803 | 297.569 | 181.539 | 202.546 |
| Observations | 25 | 25 | 25 | 25 | 25 |
| | | pair1 (Yr2-Yr1) | pair2 (Yr3-Yr2) | pair3 (Yr4-Yr3) | pair4 (Yr5-Yr4) |
| Hypothesized Mean Difference | | 0 | 0 | 0 | 0 |
| Δ in means $Yr_t$ - $Yr_{t-1}$ | | 3.000 | 1.334 | 3.666 | 1.500 |
| % Δ in means | | 14.063 | 5.482 | 14.283 | 5.114 |
| df | | 24 | 24 | 24 | 24 |
| t Stat | | 2.187 | 1.778 | 1.872 | 1.141 |
| P(T<=t) one-tail | | 0.019 | 0.044 | 0.037 | 0.133 |
| t Critical one-tail | | 1.711 | 1.711 | 1.711 | 1.711 |

| **ECC2** | **Yr1** | **Yr2** | **Yr3** | **Yr4** | **Yr5** |
|---|---|---|---|---|---|
| Mean | 26.571 | 29.143 | 33.143 | 37.714 | 38.000 |
| Standard deviation | 23.101 | 23.593 | 25.909 | 22.917 | 21.500 |
| Variance | 533.673 | 556.633 | 671.259 | 525.170 | 462.245 |
| Observations | 25 | 25 | 25 | 25 | 25 |
| | | pair1 (Yr2-Yr1) | pair2 (Yr3-Yr2) | pair3 (Yr4-Yr3) | pair4 (Yr5-Yr4) |
| Hypothesized Mean Difference | | 0 | 0 | 0 | 0 |
| Δ in means $Yr_t$ - $Yr_{t-1}$ | | 2.572 | 4.000 | 4.571 | 0.286 |
| % Δ in means | | 9.680 | 13.725 | 13.792 | 0.758 |
| df | | 24 | 24 | 24 | 24 |
| t Stat | | 2.823 | 2.498 | 1.496 | 0.140 |
| P(T<=t) one-tail | | 0.005 | 0.010 | 0.074 | 0.445 |
| t Critical one-tail | | 1.711 | 1.711 | 1.711 | 1.711 |

**Table 5.6** Paired sample t-tests on Dependent Variables (continued)

| **ECC3** | **Yr1** | **Yr2** | **Yr3** | **Yr4** | **Yr5** |
|---|---|---|---|---|---|
| Mean | 53.000 | 55.000 | 58.000 | 62.000 | 58.000 |
| Standard deviation | 36.315 | 36.799 | 35.148 | 29.861 | 31.225 |
| Variance | 1,318.750 | 1,354.167 | 1,235.417 | 891.667 | 975.000 |
| Observations | 25 | 25 | 25 | 25 | 25 |
| | | pair1 (Yr2-Yr1) | pair2 (Yr3-Yr2) | pair3 (Yr4-Yr3) | pair4 (Yr5-Yr4) |
| Hypothesized Mean Difference | | 0 | 0 | 0 | 0 |
| Δ in means $Yr_t$ - $Yr_{t-1}$ | | 2.000 | 3.000 | 4.000 | -4.000 |
| % Δ in means | | 3.774 | 5.455 | 6.897 | -6.452 |
| df | | 24 | 24 | 24 | 24 |
| t Stat | | 1.445 | 1.000 | 1.072 | -1.281 |
| P(T<=t) one-tail | | 0.081 | 0.164 | 0.147 | 0.106 |
| t Critical one-tail | | 1.711 | 1.711 | 1.711 | 1.711 |

| **ECC4** | **Yr1** | **Yr2** | **Yr3** | **Yr4** | **Yr5** |
|---|---|---|---|---|---|
| Mean | 20.735 | 25.441 | 28.691 | 28.868 | 32.603 |
| Standard deviation | 23.046 | 27.255 | 28.424 | 27.876 | 27.872 |
| Variance | 531.106 | 742.850 | 807.897 | 777.076 | 776.875 |
| Observations | 25 | 25 | 25 | 25 | 25 |
| | | pair1 (Yr2-Yr1) | pair2 (Yr3-Yr2) | pair3 (Yr4-Yr3) | pair4 (Yr5-Yr4) |
| Hypothesized Mean Difference | | 0 | 0 | 0 | 0 |
| Δ in means $Yr_t$ - $Yr_{t-1}$ | | 4.706 | 3.250 | 0.177 | 3.735 |
| % Δ in means | | 22.696 | 12.775 | 0.617 | 12.938 |
| df | | 24 | 24 | 24 | 24 |
| t Stat | | 2.244 | 1.878 | 0.062 | 1.157 |
| P(T<=t) one-tail | | 0.017 | 0.036 | 0.475 | 0.129 |
| t Critical one-tail | | 1.711 | 1.711 | 1.711 | 1.711 |

| **ECC5** | **Yr1** | **Yr2** | **Yr3** | **Yr4** | **Yr5** |
|---|---|---|---|---|---|
| Mean | 46.000 | 52.000 | 54.000 | 62.000 | 66.000 |
| Standard deviation | 40.620 | 42.032 | 40.620 | 36.171 | 37.417 |
| Variance | 1,650.000 | 1,766.667 | 1,650.000 | 1,308.333 | 1,400.000 |
| Observations | 25 | 25 | 25 | 25 | 25 |
| | | pair1 (Yr2-Yr1) | pair2 (Yr3-Yr2) | pair3 (Yr4-Yr3) | pair4 (Yr5-Yr4) |
| Hypothesized Mean Difference | | 0 | 0 | 0 | 0 |
| Δ in means $Yr_t$ - $Yr_{t-1}$ | | 6.000 | 2.000 | 8.000 | 4.000 |
| % Δ in means | | 13.043 | 3.846 | 14.815 | 6.452 |
| df | | 24 | 24 | 24 | 24 |
| t Stat | | 1.365 | 1.000 | 2.138 | 1.445 |
| P(T<=t) one-tail | | 0.093 | 0.164 | 0.021 | 0.081 |
| t Critical one-tail | | 1.711 | 1.711 | 1.711 | 1.711 |

Legend: Paired sample t-test for ECC disclosures (total and by categories) for all sample firms was performed by comparing Yr1 with Yr2, Yr2 with Yr3, Yr3 with Yr4 and Yr4 with Yr5. (ECC1= quantitative disclosure aspects ; ECC2 = qualitative disclosure aspects; ECC3 = disclosure on reporting scope and policies; ECC4 = disclosure on assurance over environmental data; ECC5 = disclosure format of environmental data; ECC_Total = total ECC disclosure for all categories)

### *5.4.2 T-tests on Independent variables*

Results of paired sample t-tests for independent variables are tabulated in Table 5.7. The difference in mean BOD_IND is significant at the 5% level between Yr2 and Yr3 ($t(24) = 1.802$, $p<0.10$). Although only a modest increase, there was a 1.887% increase from Yr2 (pre-RG) to Yr3 (post-REG). Stronger governance through greater representation of independent board members may reflect firms' response to regulatory changes which commenced in Yr3 (i.e. CPM from 1 July 2012 and requirements for greater disclosure transparency as a result of ASIC RG247 from March 2013). A greater change in mean BOD_IND observed between Yr4 and Yr5, (3.408% increase) that is statistically significant at the 10% level ($t(24) = 1.663$, $p<0.10$) could reflect a further adjustment to sample firm's governance practices following the release of ASX CG (3rd edition) which was effective from 1 July 2014 (Yr5).

Means distribution of differences for three aspects of Board member affiliations show the following: (i) BOD_ENV_AFFIL is statistically significant at the 5% level during the post-REG periods between Yr3 and Yr4 ($t(24) = 2.148$, $p<0.05$) with a 17.70% increase. It is likely that boards of sample firms see the increasing importance of greater affiliation with environmental related organisations following the commencement of the CPM in Yr3. This flow on effect into Yr4 is likely as boards would have had to become more proactive in considering the business implications of the intended transition from a fixed price to flexible price system initially planned to commence the following year. The increase in board member affiliation in this area however, did not continue into the next consecutive year, Yr5. These results also seem to indicate Board response to the subsequent repeal of CPM in Yr5 which may have taken the pressure off firms' environmental agendas; (ii) BOD_SOC_AFFIL showed a modest change (5.941% increase) from Yr2 to Yr3 which are the periods immediately before (Yr2) and during the first year (Yr3) of regulatory changes and is statistically significant at the 10% level ($t(24) = 1.392$, $p<0.10$). The greatest increase (15.380%) is observed during the post-REG periods between Yr4 and Yr5. Results report that this increase is statistically significant at the 5% level ($t(24) = 2.177$, $p<0.05$). In line with results of paired sample t-tests for BOD_ENV_AFFIL, there appears to be a shift of emphasis by board members to

greater social/humanitarian affiliations in the period when there was less of a need to focus on environmental implications on businesses (Yr4 to Yr5); (iii) For BOD_COM_AFFIL, results from the first three sets of t-tests show statistical significance at 5% to 10% level. Mean BOD_COM_AFFIL between Yr1 and Yr2 observed a 5.931% increase ($t(24) = 1.706$, $p<0.05$), Yr2 and Yr3 a 6.082% increase ($t(24) = 1.418$, $p<0.10$), and from Yr3 to Yr4 a 6.790% increase ($t(24) = 1.543$, $p<0.10$). Thus, board members with community affiliation have reported statistically significant increases which commenced pre-REG and continued into post-REG periods except in the last consecutive period (Yr4 and Yr5). The increasing upward trend over the four year period appears to reflect the current norms for leaders in businesses to be increasingly involved with organisations which impact community groups. This could stem from business' legitimacy agenda (Cho and Patten 2007) or indicative of the increasing demands expected of directors of Boards today to bring in valuable or relevant 'multiple identities' which may benefit the organisation (Hillman 2008).

Mean differences for paired sample t-tests for CSR_COM show an 8% increase in the proportion of sample firms which have environmental/sustainability committees at Board level during Yr2 to Yr3. Results are statistically significant at 10% level ($t(24) = 1.445$, $p<0.10$). This change from Yr2 (pre-RG) to Yr3 (post-REG) is indicative of firm response for stronger governance on climate change, during a period of regulatory change which require businesses to consider the implications of CPM and demands for greater disclosure transparency following ASIC RG247.

The proportion of sample firms which engage in environmental audits increased during Yr4 to Yr5 by 23%. The increase is statistically significant at 10% level ($t(24) = 1.365$, $p<0.10$). As our sample firms are among the top 25 ASX listed firms, the mean ENV_AUDIT increase during this period maybe indicative of listed firms heighten response to meet ASX's expectations to report on environmental risks according ASX CG (3rd edition) requirements in Recommendation7.4.

**Table 5.7** Paired sample t-tests on Independent Variables

| **BOD_IND** | **Yr1** | **Yr2** | **Yr3** | **Yr4** | **Yr5** |
|---|---|---|---|---|---|
| Mean | 76.522 | 77.568 | 79.032 | 79.377 | 82.082 |
| Standard deviation | 12.995 | 12.781 | 12.822 | 13.829 | 10.312 |
| Variance | 1.689 | 1.633 | 1.644 | 1.912 | 1.063 |
| Observations | 25 | 25 | 25 | 25 | 25 |
| | | pair1 (Yr2-Yr1) | pair2 (Yr3-Yr2) | pair3 (Yr4-Yr3) | pair4 (Yr5-Yr4) |
| Hypothesized Mean Difference | | 0 | 0 | 0 | 0 |
| Δ in means $Yr_t$ - $Yr_{t-1}$ | | 1.046 | 1.464 | 0.345 | 2.704 |
| % Δ in means | | 1.368 | 1.887 | 0.437 | 3.408 |
| df | | 24 | 24 | 24 | 24 |
| t Stat | | 1.074 | 1.802 | 0.358 | 1.663 |
| P(T<=t) one-tail | | 0.147 | 0.042 | 0.362 | 0.055 |
| t Critical one-tail | | 1.711 | 1.711 | 1.711 | 1.711 |

| **BOD_ENVIR_AFFIL** | **Yr1** | **Yr2** | **Yr3** | **Yr4** | **Yr5** |
|---|---|---|---|---|---|
| Mean | 8.616 | 8.924 | 9.710 | 11.429 | 12.271 |
| Standard deviation | 10.610 | 10.057 | 9.247 | 9.371 | 9.733 |
| Variance | 1.126 | 1.011 | 0.855 | 0.878 | 0.947 |
| Observations | 25 | 25 | 25 | 25 | 25 |
| | | pair1 (Yr2-Yr1) | pair2 (Yr3-Yr2) | pair3 (Yr4-Yr3) | pair4 (Yr5-Yr4) |
| Hypothesized Mean Difference | | 0 | 0 | 0 | 0 |
| Δ in means $Yr_t$ - $Yr_{t-1}$ | | 0.308 | 0.786 | 1.719 | 0.842 |
| % Δ in means | | 3.576 | 8.808 | 17.702 | 7.367 |
| df | | 24 | 24 | 24 | 24 |
| t Stat | | 0.426 | 1.208 | 2.148 | 0.726 |
| P(T<=t) one-tail | | 0.337 | 0.119 | 0.021 | 0.238 |
| t Critical one-tail | | 1.711 | 1.711 | 1.711 | 1.711 |

| **BOD_SOC_AFFIL** | **Yr1** | **Yr2** | **Yr3** | **Yr4** | **Yr5** |
|---|---|---|---|---|---|
| Mean | 17.270 | 18.231 | 19.314 | 20.506 | 23.660 |
| Standard deviation | 13.527 | 15.878 | 15.593 | 16.684 | 15.941 |
| Variance | 1.830 | 2.521 | 2.431 | 2.783 | 2.541 |
| Observations | 25 | 25 | 25 | 25 | 25 |
| | | pair1 (Yr2-Yr1) | pair2 (Yr3-Yr2) | pair3 (Yr4-Yr3) | pair4 (Yr5-Yr4) |
| Hypothesized Mean Difference | | 0 | 0 | 0 | 0 |
| Δ in means $Yr_t$ - $Yr_{t-1}$ | | 0.961 | 1.083 | 1.192 | 3.154 |
| % Δ in means | | 5.568 | 5.941 | 6.172 | 15.380 |
| df | | 24 | 24 | 24 | 24 |
| t Stat | | 0.735 | 1.392 | 0.868 | 2.177 |
| P(T<=t) one-tail | | 0.235 | 0.088 | 0.197 | 0.020 |
| t Critical one-tail | | 1.711 | 1.711 | 1.711 | 1.711 |

**Table 5.7** Paired sample t-tests on Independent Variables (continued)

| **BOD_COMM_AFFL** | **Yr1** | **Yr2** | **Yr3** | **Yr4** | **Yr5** |
|---|---|---|---|---|---|
| Mean | 39.247 | 41.575 | 44.104 | 47.099 | 49.701 |
| Standard deviation | 27.507 | 27.292 | 24.067 | 25.091 | 24.531 |
| Variance | 7.566 | 7.448 | 5.792 | 6.295 | 6.018 |
| Observations | 25 | 25 | 25 | 25 | 25 |
| | | pair1 (Yr2-Yr1) | pair2 (Yr3-Yr2) | pair3 (Yr4-Yr3) | pair4 (Yr5-Yr4) |
| Hypothesized Mean Difference | | 0 | 0 | 0 | 0 |
| Δ in means $Yr_t$ - $Yr_{t-1}$ | | 2.328 | 2.529 | 2.995 | 2.602 |
| % Δ in means | | 5.931 | 6.082 | 6.790 | 5.525 |
| df | | 24 | 24 | 24 | 24 |
| t Stat | | 1.706 | 1.418 | 1.543 | 1.177 |
| P(T<=t) one-tail | | 0.050 | 0.085 | 0.068 | 0.125 |
| t Critical one-tail | | 1.711 | 1.711 | 1.711 | 1.711 |

| **CSR_COMM** | **Yr1** | **Yr2** | **Yr3** | **Yr4** | **Yr5** |
|---|---|---|---|---|---|
| Mean | 48.000 | 48.000 | 56.000 | 56.000 | 60.000 |
| Standard deviation | 50.990 | 50.990 | 50.662 | 50.662 | 50.000 |
| Variance | 26.000 | 26.000 | 25.667 | 25.667 | 25.000 |
| Observations | 25 | 25 | 25 | 25 | 25 |
| | | pair1 (Yr2-Yr1) | pair2 (Yr3-Yr2) | pair3 (Yr4-Yr3) | pair4 (Yr5-Yr4) |
| Hypothesized Mean Difference | | 0 | 0 | 0 | 0 |
| Δ in means $Yr_t$ - $Yr_{t-1}$ | | 0.000 | 8.000 | 0.000 | 4.000 |
| % Δ in means | | 0.000 | 16.667 | 0.000 | 7.143 |
| df | | 24 | 24 | 24 | 24 |
| t Stat | | 0 | 1.445 | 0 | 1.000 |
| P(T<=t) one-tail | | 0 | 0.081 | 0 | 0.164 |
| t Critical one-tail | | 0 | 1.711 | 0 | 1.711 |

| **ENV_AUDIT** | **Yr1** | **Yr2** | **Yr3** | **Yr4** | **Yr5** |
|---|---|---|---|---|---|
| Mean | 48.000 | 52.000 | 52.000 | 52.000 | 64.000 |
| Standard deviation | 50.990 | 50.990 | 50.990 | 50.990 | 48.990 |
| Variance | 26.000 | 26.000 | 26.000 | 26.000 | 24.000 |
| Observations | 25 | 25 | 25 | 25 | 25 |
| | | pair1 (Yr2-Yr1) | pair2 (Yr3-Yr2) | pair3 (Yr4-Yr3) | pair4 (Yr5-Yr4) |
| Hypothesized Mean Difference | | 0 | 0 | 0 | 0 |
| Δ in means $Yr_t$ - $Yr_{t-1}$ | | 4.000 | 0.000 | 0.000 | 12.000 |
| % Δ in means | | 8.333 | 0.000 | 0.000 | 23.077 |
| df | | 24 | 24 | 24 | 24 |
| t Stat | | 1.000 | 0 | 0 | 1.365 |
| P(T<=t) one-tail | | 0.164 | 0 | 0.500 | 0.093 |
| t Critical one-tail | | 1.711 | 0 | 1.711 | 1.711 |

Legend: Paired sample t-test for means of independent variables for all sample firms was performed by comparing Yr1 with Yr2, Yr2 with Yr3, Yr3 with Yr4 and Yr4 with Yr5. Refer Appendix A for variable definitions.

## 5.5 Frequency Analyses

*5.4.1 Frequency Analysis of components of the dependent variable: ECC Index*

A total of 59 items make up the ECC disclosure index and each item in the five categories are described in Appendix E. The change in frequency of each of the 59 items of the ECC disclosure index is computed to determine which items have changed significantly over the research period. They are as follows:

(a) ECC1, measures the extent of firm's quantitative disclosures. Items in this category exhibit increases from at least 25% to greater than 100%. This upward disclosure broadly observed (i) *significant increases* (more than 100 per cent change); (ii) *large increases* (by more than 50% but less than 100%) and; (iii) *moderate increases* (by at least 30% but less than 50% increase) in Yr5 compared to Yr1. Most items with *significant increases* are disclosed by less than 10 per cent of sample firms. These include disclosure on water usage intensity measures (Item 9, 250%), water for other use (Item 8, 200%), usage of forest commodities (Item 6, 100%), energy usage intensity measures (Item 17, 100%) and disclosure of flare gas (Item 14, 100%). Item 17 however, was disclosed by 24 per cent of firms initially in Yr1 and increased to 48 per cent by Yr5. Items which exhibit *large increases* are disclosed by at least 40 per cent or more of sample firms, with the exception of item 20. These include disclosure of total waste (Item 19, 73%), waste intensity measures (Item 20, 50%), categorisation of GHG scope 1 and 2 data (Item 3, 54%), gross GHG emissions (Item 1, 44%) and GHG emissions intensity measures (Item 2, 33%). Items with *moderate increases* like disclosures on water usage (Item 7, 38%) and energy use (Item 16, 31%) are disclosed by more than 50 per cent of samples firms and disclosure on energy production (Item 18, 33% ) and paper usage (Item 22, 33%) are disclosed by a lower proportion of sample firms. In short, the overall increase of 44.532% (see Table 5.1) in mean disclosure for category ECC1 in Yr5 compared to Yr1 can reasonably be attributed to items listed in (ii) and (iii) above. These results are further illustrated in line graph plots in Figure 5.5 and Figure 5.6. These changes are gradual year on year increases for some and more distinct changes over shorter consecutive periods for others.

**Figure 5.5** ECC1 items with *large increases* of at least 50% change in Yr5 compared to Yr1

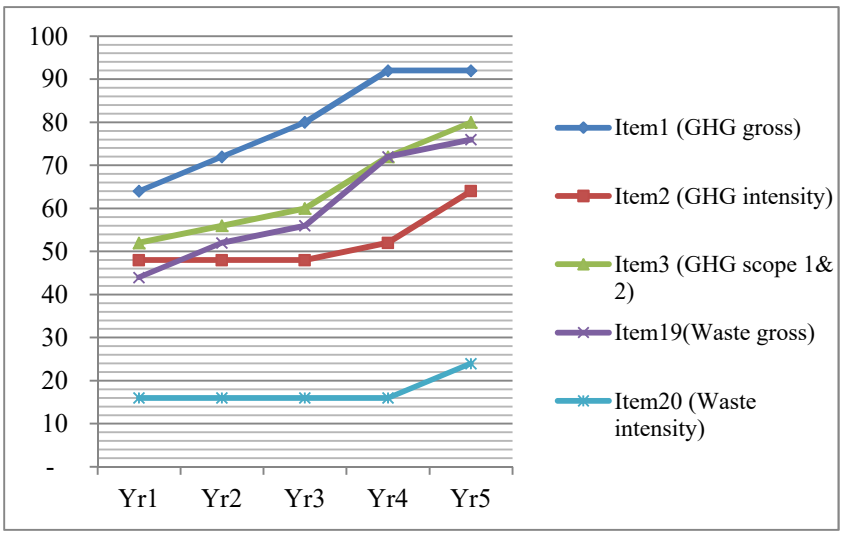
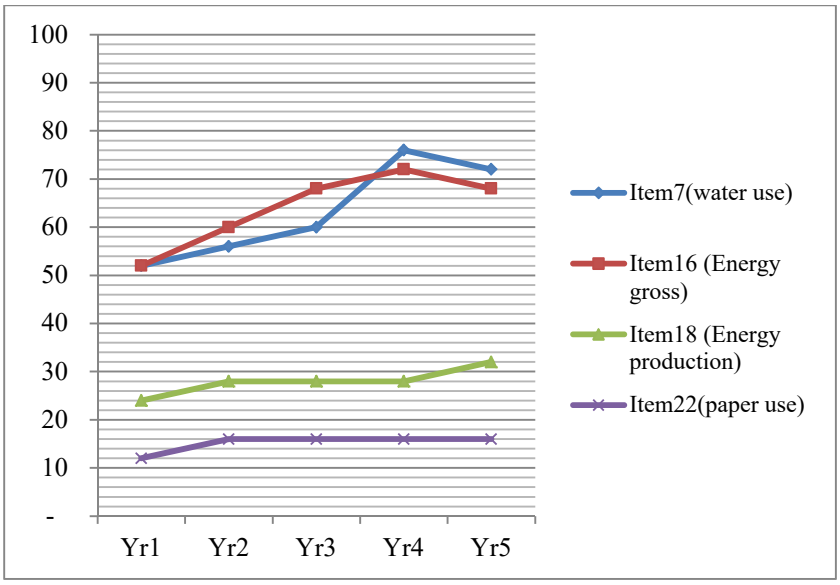



**Figure 5.6** ECC1 items with *moderate increases* of at least 30% change in Yr5 compared to Yr1




(b) ECC2 scores firms for their qualitative disclosure characteristics. They are generally disclosures which provide meaningful categorisation or disaggregation of environmental results, either geographically, operationally, by source and/or other method. Overall, qualitative characteristics improved for all items. The increase in ECC2 mean in Yr5 compared to Yr1 of 43.013% (Table 5.1) is largely from improvements in qualitative disclosure of waste data (Item 28, 70% and Item 29, 67%), water data (Item 27, 56%), other pollutants (Item 34, 67%) and GHG data (Item 25, 50%). A majority of these items were disclosed by more

than 30 per cent of firms in Yr1 and by at least by 50 per cent of firms by Yr5. This is illustrated in Figure 5.7 below. Although disclosures on paper use (Item 32, 100%) and raw material (Item 33, 100%) observed 100 per cent increases but these disclosure items represent less than 10 per cent of sample firms. There has been improvements in firms providing disclosure pertaining to GHG methodology applied (Item 35, 46%), as did disclosures which make appropriate comparison of data against prior results or baselines (Item 37, 36%) and targets (Item 38, 38%) as shown in Figure 5.8 below.

**Figure 5.7** ECC2 items with at least 50% change in Yr5 compared to Yr1

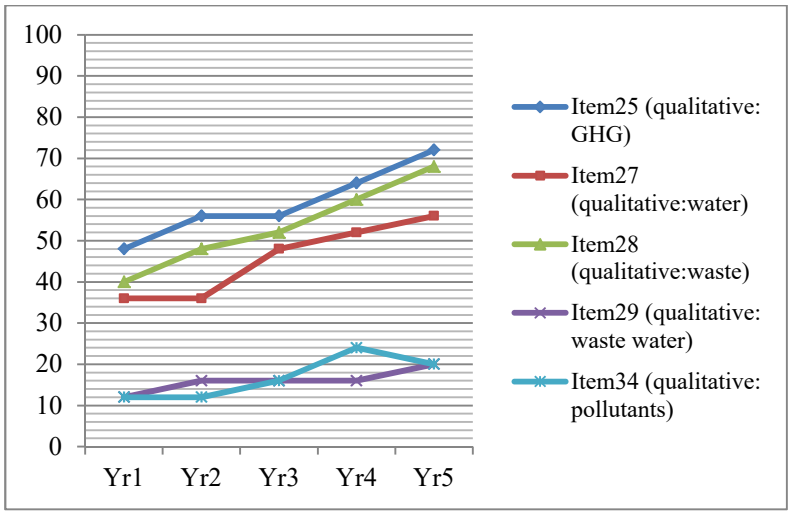
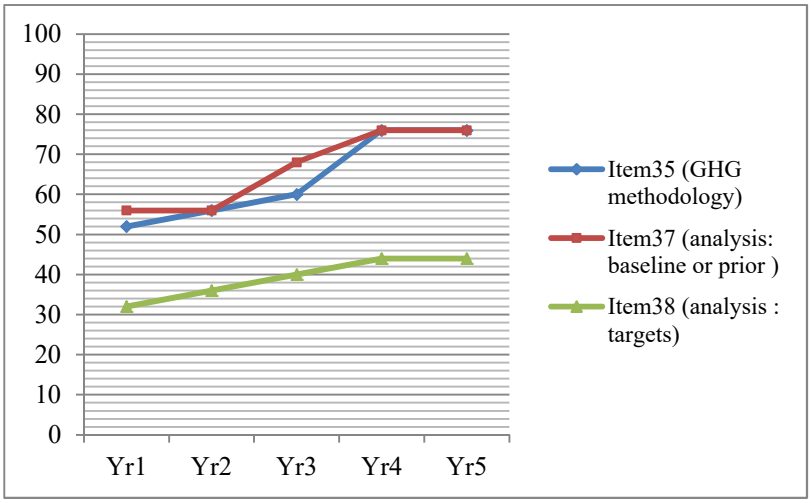


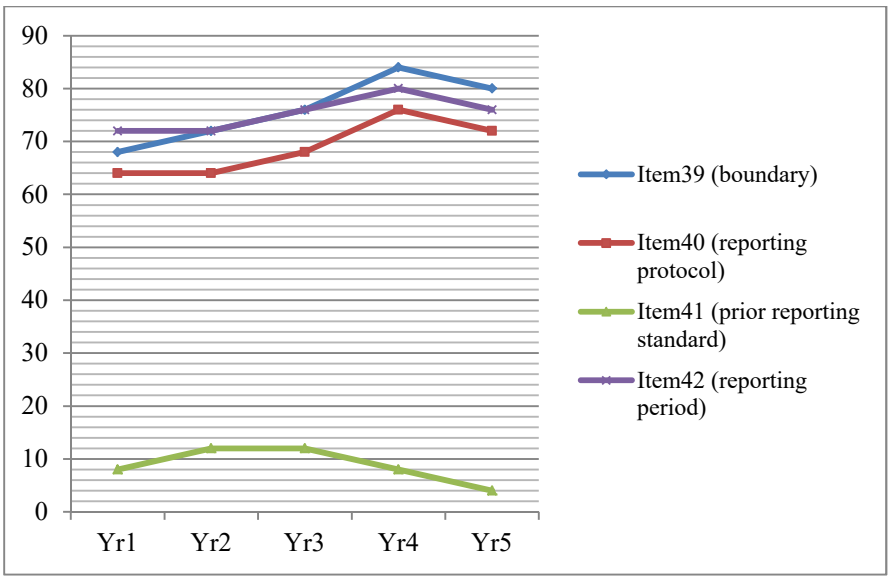

**Figure 5.8** ECC2 items with at least 30% change in Yr5 compared to Yr1




(c) ECC3 measures if sample firms were disclosing specifics on boundaries of data being reported (Item 39), the reporting protocol applied (Item 40) as well as reporting periods (Item 42). Results show all items except disclosure relating to

prior standards being applied improved over the five years (i.e. Item 39, 18% increase; Item 40, 13% increase; Item 41, 6% increase and Item 41, 50% decrease). These modest increases exhibited by items 39, 40 and 42 coupled with the downward effect of item 41 may have resulted in an overall mean ECC3 improvement of only 9.343% (see Table 5.1). However, as these aspects are all recommended under common reporting protocols like the GRI, it is not surprising that the practice of disclosing these would have been applied since Yr1 and significant changes are not expected to prevail. With regard to Item 41, it is also likely that within a voluntary reporting environment, it is not advantageous for firms to present disclosures regarding prior standards being used if they currently apply different ones. Figure 5.9 presents the change for each item in ECC3.

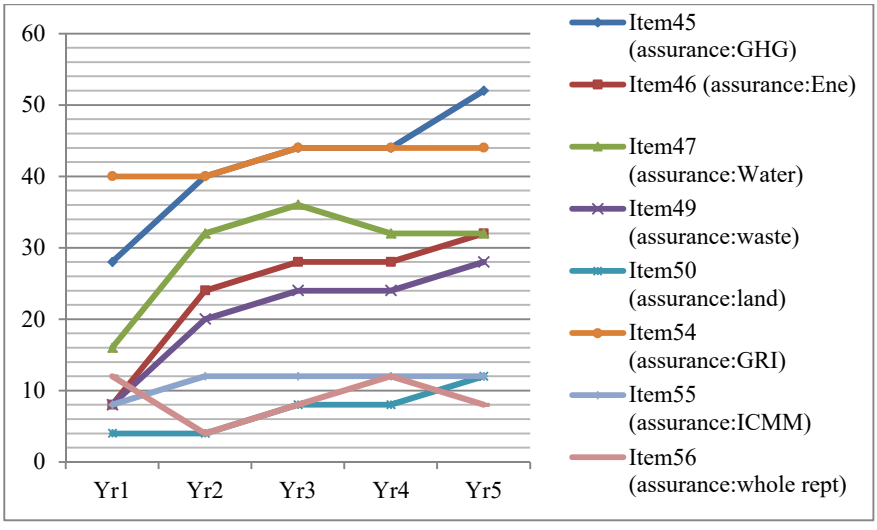
**Figure 5.9** Change in ECC3 items from Yr1 to Yr5




(d) ECC4 measures aspects of third party assurance over environmental data. Results show that over the five year period, more firms now engage third party assurers to conduct assurance over environmental (Item 44) and other sustainability data (Item 43). Both item 44 and 43 exhibit 67% and 42% increase respectively. Greater improvements are observed for assurance over environmental data.

Assurance providers have also improved in the manner of disclosure relating to specifics regarding scope of assurance over data being examined. Specific disclosure pertaining to assurance over GHG data (Item 45, 86%), energy data (Item46, 300%), water data (Item 47, 100%) waste data (Item 49, 250%) and land data (Item 50, 200%) have improved significantly. Over 40 per cent of sample firms disclosed assurance against GRI criteria and application level assessments (GRI 4 and prior) in Yr1 and that rose by 10% over five years (Item 54). Among the mining and metal firms there was also a rise in disclosure relating to assurance over firm policies which align with the requirements of ICMM's Sustainable Development Framework (Item 55, 50%). Thus, it is also not surprising that more generic disclosures which refer to assurance over the whole report (Item 56) declined in Yr2 compared to Yr1, when all other items increased. An upward trend observed between Yr2 to Yr4 however did not continue into Yr5 and the resulting overall decline in Yr5 compared to Yr1 was a 33% decrease. In all, these observations suggest a greater shift to more specific assurance disclosures regarding scope in environmental assurance reporting. Figure 5.10 illustrate these significant changes over the period.

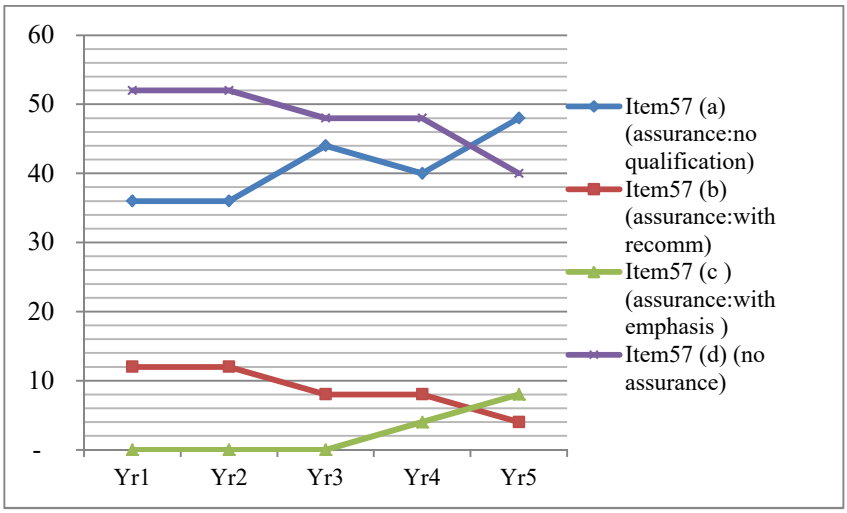
**Figure 5.10** ECC4 items on scope of assurance engagements, from Yr1 to Yr5




Assurance conclusions reached over the research period reports a rise in the proportion of assurance conclusions with no qualifications (Item 57(a), 33%), a decline in the percentage of conclusions with one or more recommendations (Item 57(b), -67%), and decline in percentage of firms with no assurance over their environmental data (Item 57(c), -23%). There was however a two-fold increase in

assurance conclusions with an emphasis of matter (Item 57(c)), but these represents only 4% in Yr4 and 8% in Yr5 sample firms. The proportion of firms obtaining each of these assurance conclusions over the five year period are shown in Figure 5.11. Collectively, results in ECC4 show improvements with greater number of firms engaging third party assurers to conduct assurance over environmental and other sustainability data. The engagements not only suggest that there are improvements in the way assurance may be conducted, (on the assumption that greater disclosure pertaining to specific scope of assurance engagement translates to actual conduct of work) but also improvements in the ultimate findings arising from these assurance engagements.

**Figure 5.11** ECC4 items on assurance engagement conclusions, from Yr1 to Yr5




(e) ECC5 reflects year on year improvement by sample firms showing increasing practice to report environmental information via sustainability reports (Item 58, 31%). There is also a significant rise in the way environmental data is reported, by way of concise tabular data performance reports (Item 59, 71%). These indicate positive improvements toward more user-friendly formats for data comparison across firms.

## 5.6 Summary of Chapter 5

Results show that the level of ECC disclosures have increased over the research period but are still at fairly low levels (25.313% in Yr1 to 35.974% in Yr5). There is a marginally greater improvement in quantitative disclosures (ECC1 44.532%) compared to qualitative disclosures (ECC2 at 43.013%) and improvement in the way disclosure is presented with greater number of firms providing performance results on a summary page and stand-alone reports (ECC5 at 43.478% rise). The greatest increase is from assurance disclosures (ECC4 at 57.237%), suggesting there is more specificity on types of environmental data being assured and reported on in the later periods.

By industry, food and staples retailing and telecommunication sectors were champion disclosures (47.500% in Yr1 to 55.333% in Yr5 for the former and 36.667% in Yr1 to 53.333% in Yr5 for latter) while least proactive were from Consumer services (0% in Yr1 to 25.000% in Yr5) and Health services (0% in Yr1 to 13.33 % in Yr5). Firms in environmentally sensitive industries (ESI) observed varied levels of disclosure trends in Yr1 (ENE: 27.000%, MAT: 38.525%, TRANSP: 11.111% and UTIL: 23.333%), compared to a closely similar levels by Yr5 (ENE: 36.667%, MAT: 39.891%, TRANSP: 36.667% and UTIL: 31.667%). This may suggest an upward trend toward meeting minimum disclosure levels perceived as acceptable by of firms in ESI sectors.

Paired t-test results show that mean total ECC disclosures observed the greatest rate of change during the two periods preceding the introduction of regulation (i.e. CPM) with mean ECC disclosure change by 13.393% between Yr1 and Y2, at 1% significance level. Statistically significantly higher mean ECC disclosure change was also observed between the first regulatory year and the year preceding the change (i.e. Yr2 and Yr3 at 9.041% change, 1% significance level) and during the two years post regulation (i.e. Yr3 and Yr4 10.023% change, 10% significance level). A modest change in mean ECC disclosures from the second and third year post introduction of CPM (i.e. Yr4 and Yr5) observed only a 4.469% change and was not statistically significant. It is likely, that the uncertainty of CPM lead to most firms making the decision to remain at status quo.

# CHAPTER SIX
# MULTIVARIATE STATISTICS

## 6.1 Introduction

In this Chapter the association between the extent of ECC disclosure and independent and control variables are examined. Based on statistical evidence reported in Chapter 5, there is a positive correlation between total ECC disclosures (ECC_Total) and BOD_IND, ENV_AUD, BOD_ENV_AFFIL, BOD_SOC_AFFIL BOD_COM_AFFIL, SIZE and FOR_LIST at 10% significance level. Using ordinary least square regression (OLS) for the five year observation period, analysis will test the association between ECC_Total and independent variables: BOD_IND, CSR_COM, ENV_AUD, BOD_ENV_AFFIL, BOD_SOC_AFFIL, BOD_COMM_AFFIL, and the control variables: SIZE, ROA, SQRT_MKTBK, SQRT_LEV, FOR_LIST. Analysis also includes tests of association between each component of ECC_Total (quantitative, qualitative, scope and boundary, assurance and disclosure format), negative and positive environmental performance (NEG_ECC_Total and POS_ECC_Total) and firm specific governance variables.

## 6.2 Multiple Regression Models

### *6.2.1 Base regression models*

The multivariate model used to test the aforementioned associations is estimated in equation [1.0] below. A pooled OLS '*base regression model'* (model 1) for the five year data set was performed with each year included as a dummy variable in the regression equation:

$$ECC\_Total_{it} = \alpha_{it} + \beta_1 BOD\_IND_{it} + \beta_2 CSR\_COM_{it} + \beta_3 ENV\_AUDIT_{it} + \beta_4 BOD\_ENV\_AFFIL_{it} + \beta_5 BOD\_SOC\_AFFIL_{it} + \beta_6 BOD\_COM\_AFFIL_{it} + \beta_7 SIZE_{it} + \beta_8 ROA_{it} + \beta_9 SQRT\_MKTBK_{it} + \beta_{10} SQRT\_LEV_{it} + \beta_{11} FOR\_LIST_{it} + \beta_{12\text{-}22} INDSEC_{it} + \beta_{23\text{-}27} YEAR_i + \varepsilon_{it} \quad [1.0]$$

Where:
$ECC\_Total_{it}$ = Environment and climate change disclosure score (as measured according to ECC disclosure index) for firm i in year t;
$BOD\_IND_{it}$ = Proportion of Independent Board members to total board members for firm i in year t;
$CSR\_COM_{it}$ = presence of Environment/CSR Committee for firm i in year t (1=yes; 0=no);
$ENV\_AUDIT_{it}$ = firm i engages with environmental audit in year t (1=yes; 0=no);

$BOD\_ENV\_AFFIL_{it}$ = Proportion of Board members who are presently or were formerly affiliated with environmental, climate related or conservation organizations (including government sponsored institutions and not for profit) to total board members for firm i in year t;
$BOD\_SOC\_AFFIL_{it}$ = Proportion of Board members who are presently or were formerly affiliated with social and humanitarian organisations (i.e. social/humanitarian organisations include organisations focused on alleviation of poverty, food aid, disability support, medical or health related support and research organisations) to total board members for firm i in year t;
$BOD\_COMM\_AFFIL_{it}$ = Proportion of Board members who are presently or have former community affiliation, (both locally and internationally) to total board members; these include: (a)Board member(s) who also sit on Boards of sporting clubs or art organizations or are members or trustees of funds or foundations run for these purposes (e.g. museums, art institutions, sporting leagues) ; (b)Board member(s) with significant affiliation with government bodies or organizations locally and internationally, through their former appointments or engagements as Ministers (or equivalent) or prominent industry alliance representatives;(c)Board member(s) who are also represented on Boards of Academic institutions or have significant affiliations as advisors or contributors to these institutions;
$SIZE_{it}$= the natural logarithm of total assets for firm i in year t;
$ROA_{it}$ = Return on assets (profit before tax / total assets) for firm i in year t;
$SQRT\_MKTB_{it}$= square root of market value of equity to book value ratio (price/book value) for firm i in year t;
$SQRT\_LEV_{it}$= square root of leverage (total debt/total equity) for firm i in year t;
$FOR\_LIST_{it}$ = firm i is listed on one or more foreign exchanges other than in Australia in year t (1=yes, 0=no);
$INDSEC_{it}$ = a dummy variable, coded as 1 if the firm is represented in a specific GICS category, 0 otherwise for firm i in year t;
*YEAR* = dummy variable scored as 1 for each year;
$\alpha_{it}$ = intercept;
$\beta$ = estimated coefficient for each item or category.
$\varepsilon_{it}$ = the error term;
$i$ = firms 1–125;
$t$ = the financial years 2011–2015 (Yr1-Yr5);

Additionally, the association between each disclosure category (ECC1, ECC2, ECC3, ECC4 and ECC5) that makes up the total disclosure (ECC_Total) and the aforementioned variables are also examined using equation [1.0] in models 1A, 1B, 1C and 1D. This is used to test hypotheses H1a, H2a, H3a, H4a, H5a and H6a stated in Chapter 3. Results of *base regression models* are presented in Table 6.1 and discussed in section 6.3.1

### *6.2.2 Regulatory interaction analysis (ECC disclosures)*

In the prior section, base regression model 1 using equation [1.0] considers only the additive effects of independent and control variables on our dependent variable. Prior studies (Frost, 2007; Knox and Levy, 2011; Choi, Lee and Psaros, 2013) indicate that changes due to regulation are significant predictors of voluntary ECC disclosures. In this section, our regression models incorporate a new variable to account for regulatory change (PD) during our observation period and the possible multiplicative effects of variables in our model with PD. PD is a dummy variable which scores 0 for pre-REG data and 1 for post-REG data. Average values for all dependent, independent and control variables for Yr1 and Yr2 data are calculated

and classified as pre-REG data and Yr3 and Y4 as post-REG[46] data. The equation is estimated in equation [2.0] as follows:

$$AVE\_ECC\_Total_i = \alpha_i + \beta_1 AVE\_BOD\_IND_i + \beta_2 AVE\_CSR\_COM_i + \beta_3 AVE\_ENV\_AUDIT_i + \beta_4 AVE\_BOD\_ENV\_AFFIL_i + \beta_5 AVE\_BOD\_SOC\_AFFIL_i + \beta_6 AVE\_BOD\_COM\_AFFIL_i + \beta_7 AVE\_SIZE_i + \beta_8 AVE\_ROA_i + \beta_9 AVE\_SQRT\_MKTBK_i + \beta_{10} AVE\_SQRT\_LEV_i + \beta_{11} AVE\_FOR\_LIST_i + \beta_{12} PD_i + \beta_{13\text{-}23} INDSEC_i + \varepsilon_i \quad [2.0]$$

Where:
*AVE_ECC_Total* = average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) environmental and climate change disclosure score(measured according to ECC disclosure index);
*AVE_BOD_IND* = the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for independent variable BOD_IND;
*AVE_CSR_COM* = the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for independent variable CSR_COM;
*AVE_ENV_AUDIT* = the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for independent variable ENV_AUDIT;
*AVE_BOD_ENV_AFFIL* = the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for independent variable BOD_ENV_AFFIL;
*AVE_BOD_SOC_AFFIL* = the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for independent variable BOD_SOC_AFFIL;
*AVE_BOD_COM_AFFIL* = the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for independent variable BOD_COM_AFFIL;
*AVE_SIZE* = the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for control variable SIZE;
*AVE_ROA* = the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for control variable ROA;
*AVE_SQRT_MKTBK* = the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for control variable SQRT_MKTBK;
*AVE_SQRT_LEV* = the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for control variable SQRT_LEV;
*AVE_FOR_LIST* = the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for control variable FOR_LIST;
*PD* = dummy variable scored as 0 for pre-REG years (Yr1 and Y2) and 1 for post-REG years (Yr3 and Y4);
$\alpha_{it}$ = intercept;
$\beta$ = estimated coefficient for each item or category.
$\varepsilon_{it}$ = the error term;
$i$ = firms 1–125;

Applying equation [2.0], if results provide evidence of statistical significance for variable PD as an important determinant in the regression model, there may be reason to believe that the rate of change of the dependent variable with respect to changes in any of the independent variables could be different due to PD. Therefore, we test if this is so by introducing an interaction term for each independent variable and apply them in separate regression models. Model 2A incorporates PD* BOD_IND, model 2B incorporates PD*CSR_COM, model 2C incorporates PD*ENV_AUDIT, model 2D incorporates PD*BOD_ENV_AFFIL, model 2E

[46] Average values for post-REG data utilises Y3 and Y4 only. This is done to (i) ensure both pre-REG and post-REG data are represented by two year averages respectively; and (ii) as the repeal of CPM and the introduction of ASX CGPR 3rd edition in Y5 presents two opposite regulatory situations, it was best to be excluded from average calculations.

incorporates PD*BOD_SOC_AFFIL and model 2F incorporates PD*BOD_COM_AFFIL. These *average regression models with an interaction term* is estimated using equation [2.1] below. These are used to test hypotheses H1c, H2c, H3c, H4c, H5c, H6c stated in Chapter 3. Results are presented in Table 6.2 and discussed in section 6.3.2.

$$AVE\_ECC\_Total_i = \alpha_i + \beta_1 AVE\_BOD\_IND_i + \beta_2 AVE\_CSR\_COM_i + \beta_3 AVE\_ENV\_AUDIT_i + \beta_4 AVE\_BOD\_ENV\_AFFIL_i + \beta_5 AVE\_BOD\_SOC\_AFFIL_i + \beta_6 AVE\_BOD\_COM\_AFFIL_i + \beta_7 AVE\_SIZE_i + \beta_8 AVE\_ROA_i + \beta_9 AVE\_SQRT\_MKTBK_i + \beta_{10} AVE\_SQRT\_LEV_i + \beta_{11} AVE\_FOR\_LIST_i + \beta_{12} PD_i + \beta_{13} PD*(D)AVE\_(variable)_i + \beta_{14\text{-}24} INDSEC_i + \varepsilon_i \quad [2.1]$$

*Where:*
*PD*(D)AVE_(variable)* = an interaction term comprising PD multiplied by *(D)AVE_(variable)*;
*(D)AVE_(variable)* = dichotomous independent variables in the model, computed by assigning 1 for average values above its median and 0 for average values below its median;
All other variable definitions are the same as listed for equation [2.0].

### *6.2.3 Performance regression models*

The following OLS regression models are used to examine the association between negative and positive ECC performance and each of the predictor variables. Firms' ECC performance index is a proxy measure of the positive (POS_ECC_Total) or negative (NEG_ECC_Total) environmental activities engaged by firms. The equations for these *performance models* are estimated using equations [3.0] and equation [3.1]. These tests hypotheses H1b, H2b, H3b, H4b, H5b, H6b detailed in Chapter 3. Results of these tests are presented in Table 6.3 and discussed in section 6.3.3.

$$NEG\_ECC\_Total_{it} = \alpha_{it} + \beta_1 BOD\_IND_{it} + \beta_2 CSR\_COM_{it} + \beta_3 ENV\_AUDIT_{it} + \beta_4 BOD\_ENV\_AFFIL_{it} + \beta_5 BOD\_SOC\_AFFIL_{it} + \beta_6 BOD\_COM\_AFFIL_{it} + \beta_7 SIZE_{it} + \beta_8 ROA_{it} + \beta_9 SQRT\_MKTBK_{it} + \beta_{10} SQRT\_LEV_{it} + \beta_{11} FOR\_LIST_{it} + \beta_{12\text{-}22} INDSEC_{it} + \beta_{23\text{-}27} YEAR_i + \varepsilon_{it} \quad [3.0]$$

Where:
*NEG_ECC_Total*$_{it}$ = proportion of negative ECC indicator items disclosed as a proportion of total negative ECC performance indicators for firm i in year t;
All other variable definitions are the same as listed for equation [1.0].

$$POS\_ECC\_Total_{it} = \alpha_{it} + \beta_1 BOD\_IND_{it} + \beta_2 CSR\_COM_{it} + \beta_3 ENV\_AUDIT_{it} + \beta_4 BOD\_ENV\_AFFIL_{it} + \beta_5 BOD\_SOC\_AFFIL_{it} + \beta_6 BOD\_COM\_AFFIL_{it} + \beta_7 SIZE_{it} + \beta_8 ROA_{it} + \beta_9 SQRT\_MKTBK_{it} + \beta_{10} SQRT\_LEV_{it} + \beta_{11} FOR\_LIST_{it} + \beta_{12\text{-}22} INDSEC_{it} + \beta_{23\text{-}27} YEAR_i + \varepsilon_{it} \quad [3.1]$$

Where:
*POS_ECC_Total*$_{it}$ = proportion of positive ECC indicator items disclosed as a proportion of total positive ECC performance indicators for firm i in year t;;
All other variable definitions are the same as listed for equation [1.0].

### *6.2.4 Regulatory interaction analysis (ECC performance indicators)*

Similarly, as was the case for ECC disclosures, the effect of regulatory change on the association between predictor variables and positive and negative firm environmental performance is also examined. The *average performance models* are estimated using equation [4.0] and equation [4.1]. These equations incorporate PD, a dummy variable which scores 0 for pre-REG period and 1 for post-REG period. Corresponding results are presented in Table 6.4 and discussed in Section 6.3.4.

$$AVE\_NEG\_ECC\_Total_i = \alpha_i + \beta_1 AVE\_BOD\_IND_i + \beta_2 AVE\_CSR\_COM_i + \beta_3 AVE\_ENV\_AUDIT_i + \beta_4 AVE\_BOD\_ENV\_AFFIL_i + \beta_5 AVE\_BOD\_SOC\_AFFIL_i + \beta_6 AVE\_BOD\_COM\_AFFIL_i + \beta_7 AVE\_SIZE_i + \beta_8 AVE\_ROA_i + \beta_9 AVE\_SQRT\_MKTBK_i + \beta_{10} AVE\_SQRT\_LEV_i + \beta_{11} AVE\_FOR\_LIST_i + \beta_{12} PD_i + \beta_{13\text{-}23} INDSEC_i + \varepsilon_i \quad [4.0]$$

Where:
*AVE_NEG_ECC_Total* = average of NEG_ECC_Total for two years pre-REG (Yr1 and Yr2) and average of two years post-REG data (Yr3 and Yr4);
All other variable definitions are the same as listed for equation [2.0].

$$AVE\_POS\_ECC\_Total_i = \alpha_i + \beta_1 AVE\_BOD\_IND_i + \beta_2 AVE\_CSR\_COM_i + \beta_3 AVE\_ENV\_AUDIT_i + \beta_4 AVE\_BOD\_ENV\_AFFIL_i + \beta_5 AVE\_BOD\_SOC\_AFFIL_i + \beta_6 AVE\_BOD\_COM\_AFFIL_i + \beta_7 AVE\_SIZE_i + \beta_8 AVE\_ROA_i + \beta_9 AVE\_SQRT\_MKTBK_i + \beta_{10} AVE\_SQRT\_LEV_i + \beta_{11} AVE\_FOR\_LIST_i + \beta_{12} PD_i + \beta_{13\text{-}23} INDSEC_i + \varepsilon_i \quad [4.1]$$

Where:
*AVE_POS_ECC_Total* = average of POS_ECC_Total for two years pre-REG (Yr1 and Yr2) and average of two years post-REG data (Yr3 and Yr4);
All other variable definitions are the same as listed for equation [2.0].

For each positive and negative performance indicator model, where PD proves to be statistically significant, further analysis was performed to incorporate an *interaction term* in the models. The interaction term(s) are applied separately in each model, estimated using equation [4.2] or [4.3]. These serve to tests hypotheses H1d, H2d, H3d, H4d, H5d, H6d stated in Chapter 3. Results of these tests are presented in Table 6.5 and also discussed in section 6.3.4.

$$AVE\_NEG\_ECC\_Total_i = \alpha_i + \beta_1 AVE\_BOD\_IND_i + \beta_2 AVE\_CSR\_COM_i + \beta_3 AVE\_ENV\_AUDIT_i + \beta_4 AVE\_BOD\_ENV\_AFFIL_i + \beta_5 AVE\_BOD\_SOC\_AFFIL_i + \beta_6 AVE\_BOD\_COM\_AFFIL_i + \beta_7 AVE\_SIZE_i + \beta_8 AVE\_ROA_i + \beta_9 AVE\_SQRT\_MKTBK_i + \beta_{10} AVE\_SQRT\_LEV_i + \beta_{11} AVE\_FOR\_LIST_i + \beta_{12} PD_i + \beta_{13} PD*(D)AVE\_(variable)_i + \beta_{14\text{-}24} INDSEC_i + \varepsilon_i \quad [4.2]$$

Where:
*AVE_NEG_ECC_Total* = average of NEG_ECC_Total for two years pre-REG (Yr1 and Yr2) and two years post-REG data (Yr3 and Yr4);
*PD*(D)AVE_(variable)* = an interaction term comprising PD multiplied by *(D)AVE_(variable)*;
*(D)AVE_(variable)* = dichotomous independent variables , computed by assigning 1 for average values above its median and 0 for average values below its median (i.e. for BOD_IND, CSR_COM, ENV_AUDIT, BOD_ENV_AFFIL, BOD_SOC_AFFIL and BOD_COM_AFFIL).
All other variable definitions are the same as listed for equation [2.0].

$$AVE\_POS\_ECC\_Total_i = \alpha_i + \beta_1 AVE\_BOD\_IND_i + \beta_2 AVE\_CSR\_COM_i + \beta_3 AVE\_ENV\_AUDIT_i + \beta_4 AVE\_BOD\_ENV\_AFFIL_i + \beta_5 AVE\_BOD\_SOC\_AFFIL_i + \beta_6 AVE\_BOD\_COM\_AFFIL_i + \beta_7 AVE\_SIZE_i + \beta_8 AVE\_ROA_i + \beta_9 AVE\_SQRT\_MKTBK_i + \beta_{10} AVE\_SQRT\_LEV_i + \beta_{11} AVE\_FOR\_LIST_i + \beta_{12} PD_i + \beta_{13} PD*(D)AVE\_(variable)_i + \beta_{14\text{-}24} INDSEC_i + \varepsilon_i \quad [4.3]$$

Where:
*AVE_POS_ECC_Total* = average of POS_ECC_Total for two years pre-REG (Yr1 and Yr2) and two years post-REG data (Yr3 and Yr4);
*PD*(D)AVE_(variable)* = an interaction term comprising PD multiplied by *(D)AVE_(variable)*;
*(D)AVE_(variable)* = dichotomous independent variables, computed by assigning 1 for average values above its median and 0 for average values below its median (i.e. for BOD_IND, CSR_COM, ENV_AUDIT, BOD_ENV_AFFIL, BOD_SOC_AFFIL and BOD_COM_AFFIL).;
All other variable definitions are the same as listed for equation [2.0].

## 6.3 Multivariate Results

### *6.3.1 Results for Base regression models*

Multiple regression results for base regression model 1 (with dependent variable ECC_Total) and five regression models for each ECC disclosure category (model 1A, 1B, 1C, 1D and 1E respectively) are presented as Table 6.1. Model 1 aims to determine the explanatory factors for environment and climate change disclosure practices measured according to the ECC Index during the observation period. The results show the model is a good fit with high explanatory power of 87.8% and a confidence level of 95%. All other models that examine each of the ECC disclosure categories report a good fit as well, models 1A, 1B and 1C which examine determinants of qualitative, quantitative and methodological aspects of ECC disclosures report adjusted $R^2$ of 70.4%, 77.7% and 71.2% respectively. Model 1D examining explanatory factors of assurance aspects of disclosures reports the highest adjusted $R^2$ of 89.9% whilst model 1E reports an adjusted $R^2$ of 61.0%.

H1a states that there is a positive association between board independence (BOD_IND) and the extent of ECC disclosures (ECC_Total). Results in Table 6.1 shows model 1 support H1a. There is a positive and statistically significant association between BOD_IND and sample firms' ECC_Total at a 1% significance level. BOD_IND is also positively associated with all disclosure categories, except environmental assurance disclosures (ECC4). Model 1A, 1B, 1C and 1E at 1% significance level and model 1D reports no statistical association.

H2a proposes a positive association between firms which have environmental/CSR committees (CSR_COM) and extent of ECC disclosure (ECC_Total). Table 6.1 reports results of model 1 which support H2a as there is a positive and statistically significant association between CSR_COM and ECC_Total at 5% significance level. According to models 1A, 1B, 1C, 1D and 1E, CSR_COM is positively and significantly associated with all categories of disclosure except environmental assurance disclosures (ECC4).

H3a states a positive association between firms which obtain third party assurance over their environmental data / conduct environmental audits (ENV_AUDIT) and the extent of ECC disclosure (ECC_Total). Results in Table 6.1 show H3a is supported

in model 1 at 1% significance level. This is true for all categories of disclosure (in models 1A, 1B, 1C, 1D and 1E) and they are significant at levels of either 1% or 5%. The positive association confirms the expectation that environmental audits reflect firms' pro-activeness toward increasing the reliability and quality of reported environmental data (Moroney, Windsor and Aw, 2012).

H4a proposes a positive association between the presence of board members with environmental affiliation[47] (BOD_ENVIR_AFFIL) and the extent of ECC disclosures (ECC_Total). Contrary to predictions, results in Table 6.1 model 1 do not support H4a as there is no statistically significant association. Similar results are observed for models 1A, 1B, 1C, 1D and 1E, for each category of ECC disclosure during the observation period.

H5a states that there is a positive association between the presence of board members with social or humanitarian affiliation[48] (BOD_SOC_AFFIL) and the extent of ECC disclosures (ECC_Total). Results in Table 6.1 model 1 support H5a as there is a positive and statistically significant association between BOD_SOC_AFFIL and ECC_Total at 5% significance level. The association is positively and statistically significant only for ECC disclosure pertaining to scope and method (ECC3), assurance data (ECC4) and disclosure format (ECC5) at 1%, 5% and 1% significant levels respectively. Disclosure categories ECC3 and ECC 5 refer to disclosure categories which are generally promulgated by voluntary reporting regimes. This finding provides evidence that directors with social affiliations appear to ensure adequacy of disclosures is maintained as part of legitimacy of operations. Also, the positive association between BOD_SOC_AFFIL and disclosure of assurance data (ECC4) may indicate aspects of firm risks associated with assurance engagements which are important considerations for directors with social affiliations because ECC4 disclosures tend to reflect credibility of reported environmental data.

H6a proposes a positive association between the presence of board members with community affiliation[49] and the extent of ECC disclosures. Results support this prediction. A positive and statistically significant association at 1% significance

[47] For examples of directors with environmental affiliations refer to Appendix H
[48] For examples of directors with social affiliations refer to Appendix H
[49] For examples of directors with community affiliations refer to Appendix H

level is reported between BOD_COM_AFFIL and ECC_Total. The test of association with BOD_COM_AFFIL for each category of ECC results in statistically significant positive associations for quantitative disclosures (ECC1) and qualitative disclosures (ECC2) (both at $p<0.01$) and scope and method (ECC3) and disclosure format (ECC5) (both at $p<0.05$) (Table 6.1).

As expected, SIZE, SQRT_LEV and FOR_LIST are control variables that are statistically significantly associated with ECC_Total ($p<0.05$), with positive associations for SIZE and SQRT_LEV and negative associations for FOR_LIST. SIZE is also positively and significantly associated with all categories of disclosure, except disclosure format (ECC5). SQRT_LEV is positively and significantly associated with quantitative (ECC1) and scope and methodology disclosures (ECC3) and disclosure format (ECC5). FOR_LIST is negatively and significantly associated with only with quantitative (ECC1) disclosures.

In summary, although results do not establish a causal link between the dependent and independent variables, results in Table 6.1 provide evidence which support hypotheses H1a, H2a, H3a, H5a, H6a. In other words, increased total disclosures (ECC_Total) are evident for firms with proportionately more independent boards (BOD_IND), have a stand-alone environmental/CSR committee (CSR_COM), engage in environmental audits (ENV_AUDIT), and have board members with social/humanitarian (BOD_SOC_AFFIL) and community (BOD_COM_AFFIL) affiliations.

Governance variables (BOD_IND, CSR_COM and ENV_AUDIT) are significantly associated with quantitative environmental disclosures (ECC1), qualitative environmental disclosures (ECC2), scope and methodology disclosures (ECC3) and presentation aspects of environmental disclosures (ECC5). Only ENV_AUDIT is positively associated with disclosures relating to assurance data (ECC4). These governance attributes collectively constitute a set of monitoring mechanisms which provide support for policies, procedures and systems that facilitate increased disclosures. Resource dependence variables relating to directors with social and community affiliations (BOD_SOC_AFFIL and BOD_COM_AFFIL) report positive associations with general disclosure requirements (ECC3 and ECC5) and

BOD_SOC_AFFIL is also positively associated with disclosures on assured environmental data (ECC4).

**Table 6.1** Results for Base regression models

| | ECC_Total | ECC1 | ECC2 | ECC3 | ECC4 | ECC5 |
|---|---|---|---|---|---|---|
| | Model 1 | Model 1A | Model 1B | Model 1C | Model 1D | Model 1E |
| BOD_IND | 0.413*** | 0.483*** | 0.544*** | 0.227*** | 0.168 | 1.117*** |
| | (4.534) | (-4.214) | (3.799) | (0.978) | (1.531) | (3.516) |
| CSR_COMM | 0.057** | 0.062* | 0.068** | 0.188*** | -0.007 | 0.176** |
| | (2.213) | (5.066) | (1.691) | (2.878) | (-0.218) | (1.968) |
| ENV_AUDIT | 0.256*** | 0.133*** | 0.269** | 0.367*** | 0.399*** | 0.268*** |
| | (12.292) | (1.920) | (8.200) | (6.906) | 15.890 | (3.692) |
| BOD_ENVIR_AFFIL | -0.400 | -0.197 | -0.054 | 0.258 | 0.130 | -0.123 |
| | (-0.375) | (-1.476) | (-0.326) | (0.956) | (1.013) | (-0.333) |
| BOD_SOC_AFFIL | 0.160** | 0.010 | 0.019 | 0.967*** | 0.230** | 0.709*** |
| | (2.156) | (0.106) | (0.163) | (5.112) | (2.572) | (2.740) |
| BOD_COMM_AFFIL | 0.120*** | 0.162*** | 0.154*** | 0.210** | -0.002 | 0.263** |
| | (3.148) | (3.380) | (2.571) | (2.158) | (-0.049) | (1.973) |
| SIZE | 0.026** | 0.033** | 0.046** | -0.108*** | 0.032** | 0.024 |
| | (2.105) | (2.11) | (2.329) | (-3.400) | (2.128) | (0.545) |
| ROA | 0.000 | 0.002 | 0.000 | 0.003 | -0.002 | 0.001 |
| | (0.340) | (1.014) | (0.126) | (0.971) | (-1.19) | (0.155) |
| SQRT_MKTBK | -0.005 | -0.003 | -0.006 | -0.021* | -0.002 | -0.012 |
| | (-0.959) | (-0.467) | (-0.797) | (-1.667) | (-0.254) | (-0.679) |
| SQRT_LEV | 0.006** | 0.006* | 0.002 | 0.023*** | 0.004 | 0.023*** |
| | (2.581) | (1.962) | (0.542) | (3.823) | (1.304) | (2.756) |
| FOR_LIST | -0.095*** | -0.102*** | -0.199 | -0.031 | -0.050 | 0.120 |
| | (-3.182) | (-2.693) | (-4.211) | (-0.401) | (-1.368) | (1.148) |
| Constant | -0.781*** | -1.015*** | -1.189** | 2.388*** | -0.755** | -1.554 |
| | (-2.652) | (-2.737) | (-2.567) | (3.176) | (-2.123) | (-1.512) |
| IND FE | YES | YES | YES | YES | YES | YES |
| YEAR FE | YES | YES | YES | YES | YES | YES |
| N | 125 | 125 | 125 | 125 | 125 | 125 |
| adj. R-sq | 0.878 | 0.704 | 0.777 | 0.712 | 0.899 | 0.610 |

***, **, and * denote significance at 1%, 5% and 10% respectively (Two-tail).
The variable definitions are in Appendix A. Robust t-statistic in brackets.
VIF for each: BOD_IND (3.242); CSR_COMM (4.096), ENV_AUDIT (2.701); BOD_ENVR_AFFIL (2.654); BOD_SOC_AFFIL (3.267); BOD_COMM_AFFIL (2.369) ; SIZE (4.096); ROA ( 1.694); SQRT_MKTBK (1.262); SQRT_LEV (2.063); FOR_LIST (5.190)

From these results, (Table 6.1), if ENV_AUDIT increases by 1, ECC_Total increases by 0.256. With an increase in CSR_COMM by 1, ECC_Total increases by 0.057. In the case of BOD_IND, a continuous variable, if BOD_IND increases by 1 standard deviation, ECC_Total increases by approximately 5.3670 (12.995x0.413). Where, 12.995 is the standard deviation of BOD_IND and 0.413 is coefficient of BOD_IND on ECC Total. Thus, with each unit increase in governance variables, (which are statistically significantly associated with ECC disclosures), the results suggest strong positive correlation with improved ECC disclosure levels.

### *6.3.2 Results for regulatory interaction analysis (ECC disclosures)*

Table 6.2 presents results for model 2, 2A, 2B, 2C, 2D, 2E and 2F which apply average values of pre-REG and post-REG data for dependent, independent and control variables with regulatory effects. Model 2 reports that board independence

(AVE_BOD_IND $p<0.01$), environmental audits (AVE_ENV_AUDIT $p<0.01$) and boards with community affiliated members (AVE_BOD_COM_AFFIL $p<0.05$) are positively and statistically associated with mean average disclosures at varying significance levels, of 1% and 5%. Control variables AVE_SQRT_MKTBK and AVE_FOR_LIST are negatively and statistically associated with AVE_ECC_Total at 10% and 5% levels respectively. The dummy variable 'PD' (1 for post-REG years and 0 for pre-REG years) incorporated into the model is also positively and statistically significant at 5% level. This indicates that regulatory change introduced during the research period is a significant determinant of the extent of firm environmental disclosures.

An interaction term is incorporated into each regression model: 2A, 2B, 2C, 2D, 2E and 2F to consider the effect of regulation (PD) on the association between independent and dependent variable. Results show: (i) main effects of variables AVE_BOD_IND and AVE_ENV_AUDIT remain positively and statistically significant in all models ($p<0.01$) and their interaction terms not statistically significant. Adjusted $R^2$ in models 2A, 2B, 2C, 2D and 2E which incorporate interaction terms do not report an improvement in model fit compared to model 2. This suggests that regulatory effects do not affect the variability in AVE_ECC_TOTAL associated with changes in AVE_BOD_IND or AVE_ENV_AUDIT; (ii) variable AVE_BOD_COM_AFFIL is positively and statistically significant for all models except 2F (at $p<0.05$). In model 2F, although AVE_BOD_COM_AFFIL is not statistically significant, the main effect is not zero. The interaction term PD*(D)_AVE_BOD_COM_AFFIL is positively and statistically significant at 10% level. The inclusion of this interaction term has improved the overall explanatory power of the model to an adjusted $R^2$ of 90.4% compared to 89.6% reported in model 2. Based on coefficient estimates reported in Table 6.2, the expected rate of change to the dependent variable, AVE_ECC_Total in relation to AVE_BOD_COM_AFFIL is different for different values of PD. According to coefficient estimates, if all else equal, the predicted AVE_ECC_Total in model 2F suggests that the presence of regulation positively affects average ECC disclosures when there is greater board community affiliation[50]. This shows that

[50] The basis of this statement is explained via an example: We apply coefficient estimates in model 2F for different values of PD, when BOD_COM_AFFIL is above its median (i.e (D)AVE_BOD_COM_AFFIL = 1) to derive predicted change in AVE_ECC_Total. If PD=1, the predicted change in AVE_ECC_total is - 0.286 (i.e.-

there is a statistically significant multiplicative effect over and above the additive effect for AVE_BOD_COM_AFFIL on the dependent variable; (iii) Control variables AVE_SQRT_MKTBK remain significant for models 2A and 2D ($p<0.10$) and AVE_FOR_LIST significant for all models ($p<0.05$).

In summary, by using average values, board independence, environmental audit and boards with community affiliation (BOD_IND, ENV_AUDIT and BOD_COM_AFFIL) remain significant explanatory factors that explain the variability in mean ECC disclosures when the effects of regulation during the research period is considered. Therefore, hypotheses H1c, H3c and H6c are supported. Furthermore, model 2F which includes the interaction effects associated with PD*(D)_AVE_BOD_COM_AFFIL suggests that the association between boards with community affiliation and environmental disclosures are of greater importance with increased environmental regulation. It is likely that given the regulatory uncertainties relating to climate regulation, their ties and network connections which include affiliations with government bodies and organisations become of greater importance (Hillman, Cannella and Paetzold 2000) to the firm's environmental disclosure strategies.

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0.435+0.089+(0.06*1*1)) compared to when PD = 0 the predicted change in AVE_ECC_total is -0.346 (i.e.-0.435+0.089+0.06*0*1)) . This shows that the predicted change in AVE_ECC_Total results in a smaller decline in AVE_ ECC_Total when PD = 1, compared to when PD=0. Thus, there is a smaller negative decline in ECC disclosure in the presence of regulation for every change in BOD_COM_AFFIL above its median values. In contrast, if PD is not considered, i.e model 2 (which does not incorporate an interaction term), the estimated predicted AVE_ECC_Total is -0.430 (i.e.-0.567+0.137), which is a larger decline in disclosure compared to model 2F when PD=0. This shows that the association between ECC disclosure and BOD_COM_AFFIL is different when consideration is given to include the multiplicative effect of the interaction between BOD_COM_AFFIL and regulation (PD) in the regression model.

**Table 6.2** Results for Average Regression models with interaction terms

| | Model 2 | Model 2A | Model 2B | Model 2C | Model 2D | Model 2E | Model 2F |
|---|---|---|---|---|---|---|---|
| AVE_BOD_IND | 0.448*** | 0.463*** | 0.444*** | 0.447*** | 0.447*** | 0.438*** | 0.417*** |
| | (3.017) | (2.976) | (2.925) | (2.954) | (2.939) | (2.937) | (2.903) |
| AVE_CSR_COMM | -0.005 | -0.007 | -0.010 | -0.004 | -0.006 | -0.001 | -0.003 |
| | (-0.117) | (-0.156) | (-0.194) | (-0.081) | (-0.126) | (-0.021) | (-0.064) |
| AVE_ENV_AUDIT | 0.253*** | 0.256*** | 0.254*** | 0.251*** | 0.252*** | 0.265*** | 0.255*** |
| | (6.992) | (6.850) | (6.846) | (6.461) | (6.582) | (6.957) | (7.33) |
| AVE_BOD_ENVIR_AFFIL | -0.155 | -0.149 | -0.150 | -0.151 | -0.147 | -0.170 | -0.106 |
| | (-0.767) | (-0.726) | (-0.726) | (-0.729) | (-0.654) | (-0.839) | (-0.539) |
| AVE_BOD_SOC_AFFIL | 0.194 | 0.204 | 0.200 | 0.191 | 0.196 | 0.169 | 0.194 |
| | (1.418) | (1.443) | (1.416) | (1.358) | (1.389) | (1.21) | (1.47) |
| AVE_BOD_COMM_AFFIL | 0.137** | 0.132** | 0.137** | 0.136** | 0.137** | 0.136** | 0.089 |
| | (2.359) | (2.173) | (2.309) | (2.289) | (2.315) | (2.341) | (1.447) |
| AVE_SIZE | 0.018 | 0.017 | 0.018 | 0.018 | 0.018 | 0.014 | 0.014 |
| | (0.875) | (0.793) | (0.837) | (0.854) | (0.853) | (0.637) | (0.699) |
| AVE_ROA | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.005 | 0.005 |
| | (1.339) | (1.345) | (1.337) | (1.328) | (1.31) | (1.196) | (1.355) |
| AVE_SQRT_MKTBK | -0.026* | -0.026* | -0.025 | -0.025 | -0.027* | -0.025 | -0.024 |
| | (-1.781) | (-1.702) | (-1.620) | (-1.646) | (-1.708) | (-1.682) | (-1.681) |
| AVE_SQRT_LEV | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 |
| | (0.936) | (0.944) | (0.912) | (0.926) | (0.923) | (0.958) | (1.100) |
| AVE_FOR_LIST | -0.123** | -0.124** | -0.125** | -0.123** | -0.123** | -0.129** | -0.120** |
| | (-2.656) | (-2.621) | (-2.623) | (-2.609) | (-2.59) | (-2.759) | (-2.675) |
| PD | 0.046** | 0.053* | 0.040 | 0.041 | 0.048 | 0.028 | 0.016 |
| | (2.126) | (1.858) | (1.244) | (1.359) | (1.463) | (1.004) | (0.617) |
| PD*(D)_AVE_BOD_IND | - | -0.014 | - | - | - | - | - |
| | - | (-0.391) | - | - | - | - | - |
| PD*((D)_AVE_CSR_COM | - | - | 0.010 | - | - | - | - |
| | - | - | (0.248) | - | - | - | - |
| PD*(D)_AVE_ENV_AUDIT | - | - | - | 0.008 | - | - | - |
| | - | - | - | (0.206) | - | - | - |
| PD*(D)_AVE_BOD_ENVIR_ AFFIL | - | - | - | - | -0.004 | - | - |
| | - | - | - | - | (-0.088) | - | - |
| PD*(D)_AVE_ BOD_SOC_ AFFIL | - | - | - | - | - | 0.035 | - |
| | - | - | - | - | - | (0.987) | - |
| PD*(D)_AVE_BOD_COM_ AFFIL | - | - | - | - | - | - | 0.060* |
| | - | - | - | - | - | - | (1.819) |
| Constant | -0.567 | -0.552 | -0.556 | -0.565 | -0.564 | -0.446 | -0.435 |
| | (-1.177) | (-1.125) | (-1.131) | (-1.153) | (-1.145) | (-0.896) | (-0.929) |
| IND FE | YES | YES | YES | YES | YES | YES | YES |
| YEAR FE | YES | YES | YES | YES | YES | YES | YES |
| N | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| adj. R-sq | 0.896 | 0.893 | 0.892 | 0.892 | 0.892 | 0.896 | 0.904 |

***, **, and * denote significance at 1%, 5% and 10% respectively (Two-tail).
The variable definitions are in Appendix A. Robust t-statistic in brackets.

### *6.3.3 Results for performance regression models*

Results in Table 6.3 show negative firm environmental performance indicators (model 3 NEG) are positively and significantly associated with BOD_IND, CSR_COM, ENV_AUDIT and BOD_COM_AFFIL (at $p<0.05$ for CSR_COM and $p<0.01$ for others) Therefore, results support a positive association for hypotheses H1b, H2b, H3b and H6b for negative environmental performance. Model 3 NEG also report that directors with environmental affiliation (BOD_ENV_AFFIL) is negatively associated with negative environmental performance at 5% significance level. Thus, results support a negative association for hypothesis H4b for negative

environmental performance. Closely mirroring Rodrigue, Magnan and Cho (2013)'s study, results indicate that the greater the environmental affiliation of its directors, the more likely corporate leaders will tend to suppress negative environmental information.

Positive environmental performance indicators (Model 3 POS) are also significantly and positively associated with BOD_IND ($p<0.01$), CSR_COM ($p<0.05$), ENV_AUDIT ($p<0.01$), and BOD_COM_AFFIL ($p<0.05$) (Table 6.3). Results support hypotheses H1b, H2b, H3b and H6b for positive environmental performance with positive associations. Additionally, BOD_SOC_AFFIL reports a positive and significant association with positive environmental performance ($p<0.01$) and hypothesis H5b is supported for positive environmental performance.

Control variables like SIZE, SQRT_LEV and FOR_LIST continue to be statistically significant in both models which report adjusted $R^2$ of 72.8% and 88.8% respectively.

In summary, BOD_IND, CSR_COM, ENV_AUDIT and BOD_COM_AFFIL are important explanatory factors for firm negative and positive environmental performance. Collectively results support hypothesis H1b, H2b, H3b and H6b for negative and positive environmental performance indicators and all report positive associations. Boards with environmental affiliation (BOD_ENV_AFFIL) are negatively associated with negative environmental performance, while boards with social affiliation (BOD_SOC_AFFIL) are positively associated with positive environmental performance. Thus, results support hypotheses H4b with a negative association in relation to negative performance indicators and H5b is supported with a positive association for positive environmental performance indicators.

**Table 6.3** Results for Performance models (negative and positive)

| | NEG_ECC_TOTAL | POS_ECC_TOTAL |
|---|---|---|
| | Model 3 NEG | Model 3 POS |
| BOD_IND | 0.475*** | 0.391*** |
| | (4.228) | (4.114) |
| CSR_COMM | 0.078** | 0.058** |
| | (2.456) | (2.180) |
| ENV_AUDIT | 0.135*** | 0.283*** |
| | (5.255) | (13.020) |
| BOD_ENVIR_AFFIL | -0.226* | 0.067 |
| | (-1.727) | (0.605) |
| BOD_SOC_AFFIL | 0.066 | 0.236*** |
| | (0.717) | (3.047) |
| BOD_COMM_AFFIL | 0.139*** | 0.101** |
| | (2.951) | (2.536) |
| SIZE | 0.023* | 0.026* |
| | (1.484) | (1.963) |
| ROA | 0.002 | -0.001 |
| | (1.294) | (-0.761) |
| SQRT_MKTBK | -0.003 | -0.006 |
| | (-0.525) | (-1.223) |
| SQRT_LEV | 0.008*** | 0.005** |
| | (2.759) | (2.192) |
| FOR_LIST | -0.072* | -0.119*** |
| | (-1.960) | (-3.803) |
| Constant | -0.812** | -0.696** |
| | (-2.235) | (-2.262) |
| IND FE | YES | YES |
| YEAR FE | YES | YES |
| N | 125 | 125 |
| adj. R-sq | 0.728 | 0.888 |

***, **, and * denote significance at 1%, 5% and 10% respectively (Two-tail). The variable definitions are in Appendix A. Robust t-statistic in brackets.

### *6.3.4 Results for regulatory interaction analysis (ECC performance indicators)*

Results of further analysis to incorporate the effect of regulatory change on the association between independent and control variables on both negative and positive environmental performance are reported in Table 6.4 and Table 6.5.

Table 6.4 report results of model 4 (NEG) which show that the effect of regulation is not associated with negative performance indicators. Instead, board independence, environmental audit and boards with community affiliation (AVE_BOD_IND, $p<0.01$; AVE_ENV_AUDIT, $p<0.01$; AVE_BOD_COM_AFFIL $p<0.10$) are significant determinants of negative environmental performance indicators. Hypotheses H1d, H3d and H6d are supported for negative environmental performance indicators, accordingly with positive associations. Accordingly, model 4 (POS) provides evidence that regulatory changes associated with recent carbon price, ASIC's guidance and ASX recommendations are positively associated with positive environmental performance indicators (PD at $p<0.10$). Positive

environmental performance indicators are also associated with AVE_BOD_IND, ($p<0.01$) and AVE_ENV_AUDIT ($p<0.01$). Thus, incorporating the effect of regulation, hypotheses H1d and H3d are also supported for positive environmental performance indicators.

**Table 6.4** Results for Average negative and positive performance models

| | AVE_NEG_ECC | AVE_POS_ECC |
|---|---|---|
| | Model 4 NEG | Model 4 POS |
| AVE_BOD_IND | 0.490*** | 0.417*** |
| | (3.340) | (2.76) |
| AVE_CSR_COMM | 0.060 | 0.039 |
| | (1.265) | (0.795) |
| AVE_ENV_AUDIT | 0.171*** | 0.289*** |
| | (4.657) | (7.663) |
| AVE_BOD_ENVIR_AFFIL | -0.223 | -0.002 |
| | (-1.116) | (-0.009) |
| AVE_BOD_SOC_AFFIL | -0.122 | 0.096 |
| | (-0.896) | (0.684) |
| AVE_BOD_COMM_AFFIL | 0.124** | 0.084 |
| | (2.124) | (1.387) |
| AVE_SIZE | 0.002 | 0.019 |
| | (0.098) | (0.899) |
| AVE_ROA | 0.013*** | 0.003 |
| | (3.163) | (0.617) |
| AVE_SQRT_MKTBK | -0.021 | -0.027* |
| | (-1.447) | (-1.789) |
| AVE_SQRT_LEV | 0.005 | 0.004 |
| | (0.976) | (0.839) |
| AVE_FOR_LIST | -0.089* | -0.123** |
| | (-1.968) | (-2.651) |
| PD | 0.033 | 0.040* |
| | (1.528) | (1.831) |
| Constant | -0.334 | -0.531 |
| | (-0.704) | (-1.09) |
| IND FE | YES | YES |
| YEAR FE | YES | YES |
| N | 50 | 50 |
| adj. R-sq | 0.850 | 0.908 |

***, **, and * denote significance at 1%, 5% and 10% respectively (Two-tail). The variable definitions are in Appendix A. Robust t-statistic in brackets.

Given the statistical significance of PD in model 4 POS, models 4A POS, 4B POS, 4C POS, 4D POS, 4E POS and 4F POS which incorporates an interaction term comprising the multiple of PD and each independent variable was performed. Results reported in Table 6.5 show interaction terms PD*(D)_AVE_CSR_COM and PD*(D)_AVE_ BOD_SOC_AFFIL are statistically significant at 1% and 10% level (models 4B POS and 4E POS). Positive and significant coefficient estimates in models 4B POS and 4E POS suggests that with regulatory changes associated with climate regulation, firm engagement with activities which reflect positive environmental performance activities, are associated with boards with CSR committees and directors with social affiliations. (The effect of respective coefficients in models 4B POS and 4E POS are not zero, although not statistically

significant at prescribed levels. Additionally, their respective interaction terms report statistically significant coefficients and models reflect higher adjusted $R^2$ at 91.6% and 91.4% respectively compared to 90.8% reported in model 4 POS ).

Table 6.5 Results for positive average performance models with interaction terms

| | AVE_POS_ECC_Total | | | | | |
|---|---|---|---|---|---|---|
| | Model 4A POS | Model 4B POS | Model 4C POS | Model 4D POS | Model 4E POS | Model 4F POS |
| AVE_BOD_IND | 0.421** | 0.384** | 0.417** | 0.414** | 0.399** | 0.394** |
| | (2.661) | (2.646) | (2.715) | (2.680) | (2.721) | (2.645) |
| AVE_CSR_COMM | 0.039 | 0.010 | 0.038 | 0.038 | 0.050 | 0.040 |
| | (0.771) | (0.201) | (0.764) | (0.748) | (1.034) | (0.822) |
| AVE_ENV_AUDIT | 0.290*** | 0.305*** | 0.292*** | 0.288*** | 0.309*** | 0.287*** |
| | (7.369) | (8.256) | (6.949) | (7.309) | (8.059) | (7.733) |
| AVE_BOD_ENVIR_AFFIL | 0.000 | 0.039 | -0.005 | 0.012 | -0.022 | 0.039 |
| | (0.001) | (0.199) | (-0.023) | (0.053) | (-0.109) | (0.19) |
| AVE_BOD_SOC_AFFIL | 0.098 | 0.131 | 0.097 | 0.101 | 0.037 | 0.097 |
| | (0.681) | (0.97) | (0.678) | (0.690) | (0.267) | (0.701) |
| AVE_BOD_COMM_AFFIL | 0.082 | 0.075 | 0.084 | 0.083 | 0.080 | 0.046 |
| | (1.289) | (1.308) | (1.368) | (1.360) | (1.368) | (0.717) |
| AVE_SIZE | 0.019 | 0.015 | 0.019 | 0.019 | 0.011 | 0.017 |
| | (0.851) | (0.711) | (0.881) | (0.869) | (0.536) | (0.797) |
| AVE_ROA | 0.003 | 0.005 | 0.003 | 0.003 | 0.002 | 0.002 |
| | (0.615) | (1.129) | (0.597) | (0.624) | (0.431) | (0.581) |
| AVE_SQRT_MKTBK | -0.027** | -0.018 | -0.027* | -0.028* | -0.024 | -0.025* |
| | (-1.729) | (-1.225) | (-1.747) | (-1.738) | (-1.676) | (-1.716) |
| AVE_SQRT_LEV | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.005 |
| | (0.830) | (0.824) | (0.817) | (0.837) | (0.891) | (0.951) |
| FOR_LIST | -0.123** | -0.133*** | -0.123** | -0.123** | -0.132*** | -0.119** |
| | (-2.605) | (-2.981) | (-2.604) | (-2.589) | (-2.907) | (-2.603) |
| PD | 0.042 | -0.004 | 0.044 | 0.044 | 0.010 | 0.016 |
| | (1.459) | (-0.139) | (1.397) | (1.322) | (0.343) | (0.573) |
| PD*(D)_AVE_BOD_IND | -0.004 | - | - | - | - | - |
| | (-0.119) | - | - | - | - | - |
| PD*(D)_AVE_CSR_COM | | 0.079*** | - | - | - | - |
| | | (1.930) | - | - | - | - |
| PD*(D)_AVE_ENV_AUDIT | | - | -0.006 | - | - | - |
| | | - | (-0.16) | - | - | - |
| PD*(D)_AVE_BOD_ENVIR_AFFIL | | - | - | -0.006 | - | - |
| | | - | - | (-0.157) | - | - |
| PD*(D)_AVE_ BOD_SOC_AFFIL | | - | - | - | 0.060* | - |
| | | - | - | - | (1.700) | - |
| PD*(D)_AVE_BOD_COM_AFFIL | | - | - | - | - | 0.050 |
| | | - | - | - | - | (1.455) |
| Constant | -0.526 | -0.421 | -0.530 | -0.523 | -0.328 | -0.444 |
| | (-1.054) | (-0.897) | (-1.068) | (-1.049) | (-0.673) | (-0.921) |
| IND FE | YES | YES | YES | YES | YES | YES |
| YEAR FE | YES | YES | YES | YES | YES | YES |
| N | 50 | 50 | 50 | 50 | 50 | 50 |
| adj. R-sq | 0.905 | 0.916 | 0.905 | 0.905 | 0.914 | 0.912 |

***, **, and * denote significance at 1%, 5% and 10% respectively (Two-tail).
The variable definitions are in Appendix A. Robust t-statistic in brackets.

In short, average performance models with regulatory effects show that monitoring governance explanatory variables BOD_IND, ENV_AUDIT continue to remain significant determinants of negative and positive environmental performance indicators. Resource dependence explanatory variable, BOD_COM_AFFIL is associated with negative environmental performance indicators. The regulatory effects do not diminish the significant associations between these predictor and dependent variables.

Given that evidence suggest regulatory changes are associated with positive environmental performance indicators, results show that firms with socially affiliated directors (BOD_SOC_AFFIL) and have environmental/CSR committees (CSR_COM) are associated with positive environmental performance indicators. This suggests that the effect of regulation is positively associated with greater firm engagement with positive environmental performance activities or disclosure of these activities compared to periods without regulatory intervention for firms with CSR Committees and directors with social affiliations.

## 6.4 OLS regression assumptions

OLS regression assumes a linear association between dependent and predictor variables. The following have also been performed to assess if underlying OLS regression analysis of equal variances, independence and normality of residual assumptions are met. Additionally, statistical analyses to consider issues of multi-collinearity are also considered. Outlier detection is performed and reported in Chapter 7 section 7.5 of this thesis.

Linearity relationship refers to the degree to which changes in the dependent variable is associated with independent variables in the model. Through analysis of residual plots, the correlation concept of a constant change in dependent variable across a range of values for the independent variable can be assessed. A common residual plot involves the plot of regression *studentised residual against the predicted dependent values* (Appendix G, Plot1). Plot 1 shows that there is relatively equal dispersion about zero and no particular pattern of distribution that is greater or lesser than zero. Further assessments using partial regression plots (Appendix G, Plots 2) show the relationship with the dependent variable for each independent variable. These plots show the relationship for BOD_IND, ENV_AUDIT and CSR_COM are relatively well defined, as scatter points are closely distributed around the linear line. BOD_ENV_AFFIL, BOD_SOC_AFFIL and BOD_COM_AFFIL are less well defined but do not show any nonlinear pattern.

Equal variance assumes that residuals/error terms (the difference between observed and predicted values) are equal across levels of the predicted values. Assessment of this assumption using a scatterplot of standardized residuals (on y-axis) and standardized predicted residuals (on x-axis) is shown in Appendix G, Plot 3. Plot 3

shows that the scattered points assume reasonably similar distances from zero for every predicted value. This is also referred to as homoscedasticity and this assumption of equal variance is therefore not violated.

The scatterplot graph of standardized residuals with standardized predicted residuals (Appendix G, Plot 3) also shows randomly scattered points are around zero which suggests errors are reasonably independent. Assessment of independence of residuals using Dubin-Watson test statistics shows a value of 1.614. This falls within the boundaries of 1.5 and 2.5 which suggests that there is no serial correlation in sample data and that these dependent and independent variables are independent (Hair et al, 2014).

Normality of residuals assumption has also been met as evidence by the normal probability plot (P-P Plot) of standardized residual and histogram in Appendix G, Plot 4. The P-P Plot shows that values are distributed along the diagonal line with no substantial departures, thus, residuals are normally distributed.

Assessing the degree of multi-collinearity is important in multiple regression because if independent variables are highly correlated with each other, the effect of each independent variable to predict the dependent variable decreases (i.e. variability in dependent variable is explained largely by shared variance (high multi-collinearity) rather than the unique effects of the independent variables (low multi-collinearity)) (Hair et al 2014). From a simple initial assessment using a correlation matrix in Section 5, results do not indicate the presence of high correlations among independent and control variables. However, collinearity could result from the combined effect of two or more independent variables. Using variable inflation factors (VIF), a common measure to assess the degree of multi-collinearity, results as reported in footnotes to Table 6.1, show all VIF values of less than 10, indicating that multi-collinearity is not a concern in our regression analysis (Hair et al, 2014).

## 6.5 Summary of Chapter 6

*Governance-disclosure relation*

Results provide evidence that monitoring governance roles of boards (BOD_IND, CSR_COM, ENV_AUDIT) are positively associated with ECC disclosures. Additionally, results by disclosure categories show BOD_IND and CSR_COM are associated with both quantitative and qualitative disclosures (ECC1 and ECC2) and disclosures relating to scope, methodology and presentation (ECC3 and ECC5). Firms' with ENV_AUDIT are positively associated with assured environmental disclosures (ECC4). These results agree generally with international and Australian studies (Rupley, Brown and Marshall, 2012; Liao, Luo and Tang 2015; De Villiers, Naiker and Van Staden 2011; Peters and Romi 2014; Rao, Tilt and Lester 2012) that enhanced monitoring governance mechanisms are effective means for providing enhanced environmental disclosure. Resource dependence roles of boards through directors' social/ humanitarian and community affiliations, either currently or formerly (BOD_SOC_AFFIL and BOD_COM_AFFIL) are positively associated with disclosures. Contrary to predictions however, results do not provide evidence of a statistically significant association between directors with environmental affiliations (BOD_ENV_AFFIL) and the extent of ECC disclosures (Table 6.1).

*Regulatory effects and the governance-disclosure relation*

To consider the effects of regulatory changes during the research period on environmental disclosures, a dummy variable PD (with 1 = periods post regulation and 0 = pre regulation) was incorporated into the regression models using average values for dependent, independent and control variables for both pre- and post-regulatory periods. Consistent with prior studies, (Choi, Lee and Psaros 2013, Frost 2007; Ghomi and Leung 2013) results report that regulatory change is statistically associated with extent of ECC disclosures. Results show predictor variables BOD_IND and ENV_AUDIT and BOD_COM_AFFIL remain significant determinants of environmental disclosures despite the effects of regulation. However, the statistical association between CSR_COM, BOD_SOC_AFFIL and ECC disclosures are not significant with the presence of regulatory effects in the model (model 2, Table 6.2).

Furthermore, by incorporating interaction terms (each governance variable x PD) in average regression models (models 2A, 2B, 2C, 2D, 2E and 2F, Table 6.2), results support the multiplicative effect of regulatory change on the association between BOD_COM_AFFIL and ECC disclosures. It is likely that inherent uncertainties from recent regulatory changes render the role of directors with current or former community affiliations with community groups, ministerial, government bodies or industry alliances to be of greater importance to the firm.

*Governance-performance relation*

BOD_IND, CSR_COM, ENV_AUDIT and BOD_COM_AFFIL report statistically significant associations with both positive and negative environmental performance indicators. Results report positive directional coefficient estimates for each of these variables. BOD_SOC_AFFIL are associated with only positive environmental performance indicators while BOD_ENV_AFFIL with negative environmental performance indicators (model 3 NEG and model 3 POS, Table 6.3).

*Regulatory effects and the governance-performance relation*

Results report that regulatory effect (PD) is not associated with negative environmental performance indicators. BOD_IND, ENV_AUDIT and BOD_COM_AFFIL remain significant determinants of negative environmental performance indicators despite regulatory change (model 4 NEG, Table 6.4).

However, regulatory effect (PD) is associated with positive environmental performance indicators. This suggests that regulatory changes due to carbon pricing and recommendations associated with risk disclosures are associated with firm responses aimed at providing indicators which reflect positively on firms' environmental performance. Furthermore, due to regulatory effects, results show that variability in positive environmental indicators are associated with firms who have CSR committees and directors with social affiliations. Nevertheless, firms with independent boards and firms which engage in environmental audits remain significant governance determinants of positive environmental performance indicators (models 4A, 4B, 4C, 4D, 4E and 4F, Table 6.5).

# CHAPTER SEVEN
# SENSITIVITY ANALYSIS

## 7.1 Introduction

Chapters 5 and 6 discussed the statistical approach and results from analyses which provide details of the trend of environmental and climate change disclosures (ECC) of our sample firms and the association between the extent of environmental disclosures and performance with firm specific governance variables. In this Chapter, details of robustness checks performed to test the general research proposition and hypotheses are discussed. The following analyses were performed:

(a) The association between individual ECC disclosure items and each independent variable in this study, for the five year observation period is examined using logistic regression models. The test and results are presented in section 7.2;

(b) Tests are performed to address potential endogeneity and self-selection issues:

  (i) A lagged regression model is used to consider the time delay of response due to any change in predictor variables in the test of association between environmental disclosures and governance variables. The model specification and results are presented and discussed in section 7.3.1.

  (ii) Propensity matching score analysis is used to further examine the stated associations. These tests are performed to address potential mis-specification which may result in bias coefficient estimates due to self-selection bias. Tests and results are discussed in section 7.3.2.

(c) Prior research (Patten 1992; Deegan and Gordon 1996; Stanny and Ely 2008) frequently finds firm size as an important determinant of voluntary disclosures. Association between environmental and climate related disclosures and independent and control variables is also tested to account for firm size differences. Model estimate and results are discussed in section 7.4.

(d) Although data distributions for control variables all assume normal distribution, outliers are still evident from frequency distributions in Appendix D. Section 7.5 presents the analyses and results for delineation of outliers (Hair et al 2014).

## 7.2 Logistic regression

The following logistics regression model is used to examine the effects of the governance variables on the likelihood for firms to disclose specific types of ECC disclosures.

$$\Pr(DIS_{it}=1) = F(\beta_1 BOD\_IND_{it} + \beta_2 CSR\_COM_{it} + \beta_3 ENV\_AUDIT_{it} + \beta_4 BOD\_ENV\_AFFIL_{it} + \beta_5 BOD\_SOC\_AFFIL_{it} + \beta_6 BOD\_COM\_AFFIL_{it} + \beta_7 SIZE_{it} + \beta_8 ROA_{it} + \beta_9 SQRT\_MKTBK_{it} + \beta_{10} SQRT\_LEV_{it} + \beta_{11} FOR\_LIST_{it} + \beta_{12\text{-}22} INDSEC_{it} + \beta_{23\text{-}27} YEAR_i + \varepsilon_i) \quad [6.0]$$

Where:
$DIS_{it}$ = *DIS* is an indicator variable which is equal to 1 if the company disclosed the ECC item and 0 if otherwise for firm i in year t;
$BOD\_IND_{it}$ = Proportion of Independent Board members to total board members for firm i in year t;
$CSR\_COM_{it}$ = presence of Environment/Sustainability Committee for firm i in year t (1=yes; 0=no);
$ENV\_AUDIT_{it}$ = firm i engages third party assurance over environmental data in year t (1=yes; 0=no);
$BOD\_ENV\_AFFIL_{it}$ = Proportion of Board members who are presently or were formerly affiliated with environmental, climate related or conservation organizations (including government sponsored institutions and not for profit) to total board members for firm i in year t;
$BOD\_SOC\_AFFIL_{it}$ = Proportion of Board members who are presently or were formerly affiliated with social and humanitarian organisations (i.e. social/humanitarian organisations include organisations focused on alleviation of poverty, food aid, disability support, medical or health related support and research organisations) to total board members for firm i in year t;
$BOD\_COMM\_AFFIL_{it}$ = Proportion of Board members who are presently or have former community affiliation, (both locally and internationally) to total board members; these include: (a)Board member(s) who also sit on Boards of sporting clubs or art organizations or are members or trustees of funds or foundations run for these purposes (e.g. museums, art institutions, sporting leagues) ; (b)Board member(s) with significant affiliation with government bodies or organizations locally and internationally, through their former appointments or engagements as Ministers (or equivalent) or prominent industry alliance representatives;(c)Board member(s) who are also represented on Boards of Academic institutions or have significant affiliations as advisors or contributors to these institutions;
$SIZE_{it}$= the natural logarithm of total assets for firm i in year t;
$ROA_{it}$ = Return on assets (profit before tax / total assets) for firm i in year t;
$SQRT\_MKTB_{it}$= square root of market value of equity to book value ratio (price/book value) for firm i in year t;
$SQRT\_LEV_{it}$= square root of leverage (total debt/total equity) for firm i in year t;
$FOR\_LIST_{it}$ = firm i is listed on one or more foreign exchanges other than in Australia in year t (1=yes, 0=no);
$INDSEC_{it}$ = a dummy variable, coded as 1 if the firm is represented in a specific GICS category, 0 otherwise for firm i in year t;
*YEAR* = dummy variable scored as 1 for each year;
$\beta$ = estimated coefficient for each item or category.
$\varepsilon_{it}$ = the error term;
$i$ = firms 1–125;
$t$ = the financial years 2011–2015 (Yr1-Yr5);

Tests of the full model against a constant/null model[51] was statistically significant[52] for all chosen dependent variables in models examined, indicating that predictors as a group reliably distinguishes disclosures and non-disclosures in each case. Logistic

[51] A constant model represents the model without any predictors in the equation. A comparison between the model with predictors and the constant model informs the researcher if inclusion of predictors adds to the predictive power of the model (Burns 2008). Note: results of the constant model is not reported in table 7.1 but by way of narrative in section 7.2

[52] Model QualTGT reports model chi-square of 92.494(df=24, p<0.000); Model QualBase chi-square of 95.658 (df=24, p<0.000); Model QualMthod chi-square of 131.533 (df=24, p<0.000); Model QuanGHG chi-square of 95.27(df=24, p<0.000); Model QuanENE chi-square of 91.743 (df=24, p<0.000). These reflect high likelihood of observing actual data on the assumption that the model has been fitted is accurate.

regression is performed to examine the likelihood that firms will disclose specific ECC information given the same predictors as the base regression model.

To test our models, the choice of dependent variables used was selected from the disclosure items in the ECC index. For qualitative disclosure items (ECC2 category), models examine the likelihood for firms to provide analyses of ECC results against targets, baseline or prior results and disclosure of GHG methodologies (items 38, 37 and 35 respectively). These items not only observed increased adoption overtime but are qualitative measures that add to meaningful ECC disclosure. (KPMG's latest survey finds that ECC reporting trends suggest that stakeholders want firms to address and report on carbon reduction targets[53] as this "demonstrates their commitment to transition to a low-carbon economy" (KPMG, 2017, 50)). For quantitative disclosure items (ECC1 category), the researcher choose items 1 and item 16 as they are disclosed by at least 40 per cent and more than 50 per cent of sample firms respectively. The following describes models' dependent variable specifications and corresponding results of each:

(a) Model QualTGT predicts if firms would disclose qualitative analyses of results against targets (item 38 on ECC Index). Model results show that *board independence* and firms with *socially affiliated board members* make a significant contribution to the likelihood of firms disclosing ECC targets in corporate reports ($p = 0.086$ and $p = 0.092$). When the proportion of BOD_IND is raised by one unit, the odds ratio is 12.126 and with one unit increase in BOD_SOC_AFFIL, the odds ratio is 7.818. This suggests that firms are 12 times and 7 times more likely to disclose ECC targets given these board attributes. This model reports an overall prediction success of 84% compared to 60.8% for a constant model. The Nagelkerke's $R^2$ of 70.9% is the adjusted version of the Cox & Snell $R^2$ and indicates a moderately strong relationship between predictors and prediction (Cox and Snell, 1989).

(b) Model QualBase predicts if firms would disclose qualitative analyses of results against baselines or prior year results (item 37 on ECC index). Results report that firms with *socially affiliated board members* make a significant

[53] In KPMG's 2016 survey, 67% of global firms are already disclosing targets, but of those that do only a few are disclosing targets which are linked to any other national, regional or global climate targets (KPMG, 2017).

contribution to the likelihood of said disclosure (p = 0.010). The odds of that increases by close to 12 times more likely with every one unit increase in the proportion of BOD_SOC_AFFIL. This model reflects an improvement from the constant model at an overall prediction of 88% compared to 66.4%. Similarly, a moderately strong Pseudo $R^2$ (Nagelkerke's $R^2$) is reported at 74.2%.

(c) Model QualMthod predicts if firms will disclose their GHG methodology (item 35) given the same predictors. Results report that boards with *community affiliation* also make a significant contribution to the likelihood of this disclosure (p=0.009). The odds of GHG methodology disclosure increases by 21 times with every increase in BOD_COM_AFFIL. This model reflects an improvement from the constant model at an overall prediction of 94% compared to 64% and pseudo $R^2$ of 89.2%.

(d) Models QuanGHG and QuanENE predict if firms will disclose quantitative GHG results (item1) or energy results (item 16). Results show *boards with social affiliation* (p = 0.082) and *community affiliation* (p = 0.026 and p = 0.008) as well as *environmental/CSR committees* (p = 0.031) make a significant contribution to the likelihood that firms will provide these disclosures. This model reflects an improvement from the constant model at an overall prediction of 96% compared to 80% for Model QuanGHG and 88% compared to 64% for Model QuanENE. Both models report strong pseudo $R^2$ (Nagelkerke's $R^2$ of 84.3% and 71.3% respectively).

In summary, although the researcher is limited to test only a few individual ECC items, collectively results reflect that *board independence, boards with social and community affiliation and environmental/CSR committees* (BOD_IND, BOD_SOC_AFFIL, CSR_COM) are significant contributors to firms' decision to disclose specific quantitative and qualitative ECC disclosures. Results of models also show that control variables like SIZE, ROA, FOR_LIST also contribute to firms' propensity to disclose. These evidence support similar results reported in base regression models discussed in section 6.3.1.

**Table 7.1** Results of Logistic Regression Models

| | | Model QualTGT | Model QualBase | Model QualMthod | Model QuanGHG | Model QuanENE |
|---|---|---|---|---|---|---|
| | | Item 38 (Targets) | Item 37 (baselines or prior) | Item 35 (Methodology) | Item 1 (Gross GHG) | Item 16 (Energy Use) |
| BOD_IND | β | 12.126** | 7.072 | -18.045 | 22.669 | 4.278 |
| | Wald | (2.949) | (2.340) | (2.336) | (1.65) | (0.453) |
| BOD_ENVIR_AFFIL | | 3.413 | 2.869 | 64.512 | -8.026 | 1.427 |
| | | (0.506) | (0.342) | (6.209) | (0.20) | (0.062) |
| BOD_SOC_AFFIL | | 7.818*** | 11.803** | -2.441 | 42.639* | 3.227 |
| | | (2.837) | (6.264) | (0.063) | (3.034) | (0.453) |
| BOD_COMM_INFL | | 2.676 | 2.821 | 21.541*** | 20.181** | 5.828*** |
| | | (1.497) | (1.887) | (6.781) | (4.974) | (7.144) |
| CSR_COMM | | -2.134 | -0.331 | 0.573 | 10.580 | 3.896** |
| | | (1.944) | (0.070) | (0.044) | (2.023) | (4.677) |
| ENV_AUDIT | | -0.852 | -3.244 | -5.001 | -26.344 | -1.582 |
| | | (0.641) | (5.321) | (4.136) | (3.395) | (2.600) |
| SIZE | | 3.116** | 0.005 | 1.755 | -1.903 | 3.169** |
| | | (4.968) | (0.000) | (1.509) | (0.662) | (4.336) |
| ROA | | 0.613** | 0.1792* | 0.369** | 0.354 | -0.033 |
| | | (6.131) | (3.612) | (5.175) | (1.769) | (0.091) |
| SQRT_MKTBK | | -0.999 | -0.171 | 0.997 | 0.569 | 0.305 |
| | | (1.145) | (0.120) | (2.210) | (0.853) | (0.381) |
| SQRT_LEV | | 0.114 | -0.043 | 0.306 | -0.468 | 0.104 |
| | | (0.489) | (0.135) | (1.987) | (1.008) | (0.666) |
| FOR_LIST | | -0.666 | 2.767** | 12.477** | 27.801* | 0.108 |
| | | (0.169) | (2.769) | (5.281) | (2.798) | (0.004) |
| Constant | | (91.327) | 8.812 | -37.775 | 18.76 | -64.825 |
| | | (5.580) | (0.000) | (0.000) | (0.000) | (0.000) |
| IND FE | | YES | YES | YES | YES | YES |
| YEAR FE | | YES | YES | YES | YES | YES |
| N | | 125 | 125 | 125 | 125 | 125 |
| Cox & Snell R sq | | 0.523 | 0.535 | 0.651 | 0.533 | 0.520 |
| Nagelkerke R-sq | | 0.709 | 0.742 | 0.892 | 0.843 | 0.713 |

In Logistic models above, dependent variable s refer to whether firms' disclose certain types of quantiative ECC disclosures (items 1, 2, 16) , qualitative ECC disclosures (items 35, 37, 38) All models include industry dummies, year dummies.

***, **, and * denote significance at 1%, 5% and 10% respectively (Two-tail).

The variable definitions are in Appendix A. Wald-statistic in brackets.

## 7.3 Endogeneity and self-selection bias

In this section, consideration is given to address potential bias to coefficient estimates if independent variables correlate with the error term. This situation occurs when there is another reason for correlation in our model which relates to our dependent variable and independent variables. This endogeneity problem can be due to different reasons. Most relevant for this study is the potential causal influence in our time series analysis, as it is common for changes in the dependent variable to relate to independent variables within a certain period. Although in a broad sense, endogeneity can be caused by other unknown variables not included in the model, inclusion of numerous other control variables does not necessarily address attributable effects (Hair et al. 2014). Also, for this study it is more important to consider if self- selection bias as may be an issue due to our selection of variables from only large ASX listed companies. There may be potential scepticism on whether firms' governance and board affiliation characteristic are truly random. Model estimates and results for both these assessments are detailed in respective sections below.

### *7.3.1 Lagged Regression model*

To avoid potential endogeneity bias in our models, a robustness test of our regression model with lagged independent variables is performed. As the regression models involve time series data, it is highly likely that lags of independent variables could have an effect on the dependent variable. Changes in firm governance practices and board affiliation by directors in their respective roles may not have an immediate impact on firm environmental disclosures or their environmental activities. A *'lagged regression model'*, with *t-1* lag for independent and control variables is used and estimated using equation [7.0].

$$ECC\_Total_{it} = \alpha_{it} + \beta_1 BOD\_IND_{it-1} + \beta_2 CSR\_COM_{it-1} + \beta_3 ENV\_AUDIT_{it-1} + \beta_4 BOD\_ENV\_AFFIL_{it-1} + \beta_5 BOD\_SOC\_AFFIL_{it-1} + \beta_6 BOD\_COM\_AFFIL_{it-1} + \beta_7 SIZE_{it-1} + \beta_8 ROA_{it-1} + \beta_9 SQRT\_MKTBK_{it-1} + \beta_{10} SQRT\_LEV_{it-1} + \beta_{11} FOR\_LIST_{it-1} + \beta_{12\text{-}22} INDSEC_{it} + \beta_{23\text{-}27} YEAR_i + \varepsilon_{it} \quad [7.0]$$

Where:
All other variable definitions are the same as listed for equation [1.0] in Chapter 6.
*t* = the financial years 2011–2015 (Yr1-Yr5) for *dependent variable*;
*t -1* = the financial years 2011–2014 (Yr1-Yr4) for *lagged independent variables*

The test is performed only for ECC disclosure: ECC_Total, being total disclosure ECC1, ECC2, ECC3, ECC4 and ECC5, which are the various categories of environmental disclosure. Results of lagged models with lagged independent variables and dependent variable ECC_Total is shown in model LG1 and models LG1A, LG1B, LG1C, LG1D and LG1E for each disclosure category respectively in Table 7.2.

Results reported by these *lagged models* are broadly similar to the results reported in *base* and *average regression models* (sections 6.3.1 and 6.3.2). BOD_IND, ENV_AUDIT, BOD_COM_AFFIL remain significant explanatory variables of total ECC disclosures, and a majority of ECC disclosure categories, at $p<0.05$ or better. BOD_SOC_AFFIL and BOD_ENV_AFFIL also report significant associations with some categories of ECC disclosures as previously reported in Chapter 6, at $p<0.01$ or better. Control variables SIZE, SQRT_LEV and FOR_LIST remain statistically significant in the lagged models at $p<0.05$ or better.

**Table 7.2** Results of Regression model with lagged independent variables

| | ECC Total | ECC1 | ECC2 | ECC3 | ECC4 | ECC5 |
|---|---|---|---|---|---|---|
| | Lagg 1 | Lagg 1A | Lagg 1B | Lagg 1C | Lagg 1D | Lagg 1E |
| BOD_IND $_{t-1}$ | 0.460*** | 0.502*** | 0.443** | 0.321 | 0.345** | 1.385*** |
| | (3.838) | (4.014) | (2.629) | (1.058) | (1.936) | (4.477) |
| CSR_COMM $_{t-1}$ | 0.072 | 0.056 | 0.097 | 0.191 | 0.021 | 0.265*** |
| | (1.903) | (1.419) | (1.843) | (2.010) | (0.376) | (2.734) |
| ENV_AUDIT $_{t-1}$ | 0.225*** | 0.130*** | 0.280*** | 0.231*** | 0.301*** | 0.355*** |
| | (7.517) | (4.144) | (6.655) | (3.048) | (6.768) | (4.597) |
| BOD_ENVIR_AFFIL $_{t-1}$ | -0.054 | -0.220 | -0.158 | 0.173 | 0.290 | -0.685 |
| | (-0.355) | (-1.382) | (-0.736) | (0.448) | (1.279) | (-1.739) |
| BOD_SOC_AFFIL $_{t-1}$ | 0.141 | -0.032 | 0.100 | 0.972*** | 0.138 | 0.832*** |
| | (1.355) | (-0.295) | (0.682) | (3.684) | (0.891) | (3.089) |
| BOD_COMM_AFFIL $_{t-1}$ | 0.158*** | 0.187*** | 0.170** | 0.261 | 0.065 | 0.364*** |
| | (3.146) | (3.562) | (2.407) | (2.051) | (0.874) | (2.810) |
| SIZE $_{t-1}$ | 0.029*** | 0.028 | 0.032 | -0.078** | 0.059** | -0.020 |
| | (1.660) | (1.559) | (1.320) | (-1.775) | (2.265) | (-0.436) |
| ROA $_{t-1}$ | 0.001 | 0.004** | 0.002 | -0.001 | -0.003 | 0.001 |
| | (0.622) | (1.778) | (0.797) | (-0.131) | (-0.934) | (0.224) |
| SQRT_MKTBK $_{t-1}$ | -0.005 | -0.006 | -0.007 | -0.026 | 0.004 | -0.011 |
| | (-0.800) | (-0.946) | (-0.795) | (-1.647) | (0.456) | (-0.658) |
| SQRT_LEV $_{t-1}$ | 0.008** | 0.005 | 0.004 | 0.025*** | 0.010** | 0.023** |
| | (2.153) | (1.282) | (0.678) | (2.626) | (1.848) | (2.393) |
| FOR_LIST $_{t-1}$ | -0.083** | -0.093** | -0.177*** | 0.007 | -0.033 | 0.029 |
| | (-2.087) | (-2.241) | (-3.155) | (0.074) | (-0.556) | (0.280) |
| Constant | -0.897** | -0.907** | -0.837 | 1.715** | -1.586*** | -0.755 |
| | (-2.220) | (-2.150) | (-1.474) | (1.680) | (-2.641) | (-0.724) |
| IND FE | YES | YES | YES | YES | YES | YES |
| YEAR FE | YES | YES | YES | YES | YES | YES |
| N | 125 | 125 | 125 | 125 | 125 | 125 |
| adj. R-sq | 0.827 | 0.694 | 0.753 | 0.594 | 0.799 | 0.768 |

***, **, and * denote significance at 1%, 5% and 10% respectively (Two-tail).
The variable definitions are in Appendix [A]. Robust t-statistic in brackets.

### *7.3.2 Propensity Matching Score Analysis*

Multivariate analyses in Chapter 6 may potentially suffer from self-selection bias, if boards select independent members on their boards, have members with environmental, social or community affiliations, engage with environmental audits or have environmental/CSR committees. This would represent a sample from a specific group which does not represent a random sample of observations. The violation of OLS regression in this way could result in bias coefficient estimates. For this reason, a robustness check of the main regression model using propensity matching analysis is performed (Heckman, Ichimura and Todd, 1998).

Based on multivariate test results reported in Chapter 6, BOD_IND and ENV_AUDIT have consistently shown to be significant determinants of both environmental disclosures and performance. Therefore, we apply propensity matching score analysis for these variables. The following steps have been applied in our analysis:

Firstly, separate models are run to obtain propensity scores (predicted values) for BOD_IND and ENV_AUDIT. A logit regression model is used for ENV_AUDIT and OLS regression analysis for BOD_IND. The explanatory variables used in each model include CSR_COM, BOD_ENV_AFFIL, BOD_SOC_AFFIL, BOD_COM_AFFIL and the control variables SIZE, ROA, SQRT_MKRTBK, SQRT_LEV and FOR_LIST. BOD_IND and ENV_AUDIT are also included in the respective models, depending on which specific variable is used as the dependent variable.

Secondly, for each variable (BOD_IND or ENV_AUDIT) propensity scores belonging to the same group[54] are segregated then sorted to ensure 'one for one match' between both groups based on similar levels of propensity scores. A majority of these scores are matched to two decimal places. Performing the 'one for one' match for BOD_IND data set results in 92 firm year observations. Firm year observations obtained after performing the 'one for one' match for ENV_AUDIT is 54 respectively.

[54] Data is divided into two groups, 'high' and 'low' disclosures using ECC_Total(D) (i.e. dichotomous variable of ECC_Total which scores values above its median with 1 and values below its median 0)

The results of regression based on these matched samples are reported in Table 7.3. Consistent with results reported in Chapter 6, results based on matched pairs show statistically significant regression coefficients. Subsample based on matched board director independence show BOD_IND, CSR_COM, ENV_AUDIT, BOD_SOC_AFFIL and BOD_COM_AFFIL are statistically significant at p<0.10 or better. Subsample based on matched environmental audit show ENV_AUDIT, BOD_ENV_AFFIL and BOD_COM_AFFIL are statistically significant at p<0.05 or better. Overall, the matching analysis show that our base regression results are due to systematic differences in BOD_IND, ENV_AUDIT, BOD_COM_AFFIL and not likely due to differences stemming from other characteristics.

**Table 7.3** Results of propensity score analysis

| | ECC_Total | ECC_Total |
|---|---|---|
| | PMS (BOD_IND ) | PMS (ENV_AUDIT) |
| BOD_IND | 0.389*** | 0.098 |
| | (3.404) | (0.725) |
| CSR_COMM | 0.067** | -0.019 |
| | (2.188) | (-0.607) |
| ENV_AUDIT | 0.252*** | 0.246*** |
| | (9.439) | (9.516) |
| BOD_ENVIR_AFFIL | -0.127 | 0.357** |
| | (-0.934) | (2.358) |
| BOD_SOC_AFFIL | 0.177* | 0.09 |
| | (1.93) | (1.017) |
| BOD_COMM_AFFIL | 0.13** | 0.205*** |
| | (2.542) | (3.757) |
| SIZE | 0.027* | 0.111*** |
| | (1.678) | (3.656) |
| ROA | 0.000 | 0.011** |
| | (0.125) | (2.608) |
| SQRT_MKTBK | -0.003 | 0.107*** |
| | (-0.617) | (3.041) |
| SQRT_LEV | 0.007** | -0.003 |
| | (2.318) | (-0.691) |
| FOR_LIST | -0.112*** | -0.111*** |
| | (-2.991) | (-2.933) |
| Constant | -0.868** | -2.526*** |
| | (-2.341) | (-3.601) |
| IND FE | YES | YES |
| YEAR FE | YES | YES |
| N | 92 | 54 |
| adj. R-sq | 0.856 | 0.914 |

***, **, and * denote significance at 1%, 5% and 10% respectively (Two-tail). The variable definitions are in Appendix A. Robust t-statistic in brackets.

## 7.4 ECC disclosures scaled by Firm Size

The base regression model is adjusted to account for the effect of size (measured as the natural logarithm of total assets) on total ECC disclosure, estimated using equation [8.0] below:

$$ECC\_Total/SIZE_{it} = \alpha_{it} + \beta_1 BOD\_IND_{it} + \beta_2 CSR\_COM_{it} + \beta_3 ENV\_AUDIT_{it} + \beta_4 BOD\_ENV\_AFFIL_{it} + \beta_5 BOD\_SOC\_AFFIL_{it} + \beta_6 BOD\_COM\_AFFIL_{it} + \beta_7 SIZE_{it} + \beta_8 ROA_{it} + \beta_9 SQRT\_MKTBK_{it} + \beta_{10} SQRT\_LEV_{it} + \beta_{11} FOR\_LIST_{it} + \beta_{12\text{-}22} INDSEC_{it} + \beta_{23\text{-}27} YEAR_i + \varepsilon_{it} \quad [8.0]$$

Where:
$ECC\_Total/SIZE_{it}$ = Environment and climate change disclosure (measured according to ECC disclosure index) divided by SIZE (as the natural logarithm of total assets) for firm i in year t;
$BOD\_IND_{it}$ = Proportion of Independent Board members to total board members for firm i in year t;
$CSR\_COM_{it}$ = presence of Environment/Sustainability Committee for firm i in year t (1=yes; 0=no);
$ENV\_AUDIT_{it}$ = firm i engages third party assurance over environmental data in year t (1=yes; 0=no);
$BOD\_ENV\_AFFIL_{it}$ = Proportion of Board members who are presently or were formerly affiliated with environmental, climate related or conservation organizations (including government sponsored institutions and not for profit) to total board members for firm i in year t;
$BOD\_SOC\_AFFIL_{it}$ = Proportion of Board members who are presently or were formerly affiliated with social and humanitarian organisations (i.e. social/humanitarian organisations include organisations focused on alleviation of poverty, food aid, disability support, medical or health related support and research organisations) to total board members for firm i in year t;
$BOD\_COMM\_AFFIL_{it}$ = Proportion of Board members who are presently or have former community affiliation, (both locally and internationally) to total board members; these include: (a)Board member(s) who also sit on Boards of sporting clubs or art organizations or are members or trustees of funds or foundations run for these purposes (e.g. museums, art institutions, sporting leagues) ; (b)Board member(s) with significant affiliation with government bodies or organizations locally and internationally, through their former appointments or engagements as Ministers (or equivalent) or prominent industry alliance representatives;(c)Board member(s) who are also represented on Boards of Academic institutions or have significant affiliations as advisors or contributors to these institutions;
$SIZE_{it}$= the natural logarithm of total assets for firm i in year t;
$ROA_{it}$ = Return on assets (profit before tax / total assets) for firm i in year t;
$SQRT\_MKTB_{it}$= square root of market value of equity to book value ratio (price/book value) for firm i in year t;
$SQRT\_LEV_{it}$= square root of leverage (total debt/total equity) for firm i in year t;
$FOR\_LIST_{it}$ = firm i is listed on one or more foreign exchanges other than in Australia in year t (1=yes, 0=no);
$INDSEC_{it}$ = a dummy variable, coded as 1 if the firm is represented in a specific GICS category, 0 otherwise for firm i in year t;
$YEAR$ = dummy variable scored as 1 for each year;
$\alpha_{it}$ = intercept;
$\beta$ = estimated coefficient for each item or category.
$\varepsilon_{it}$ = the error term;
$i$ = firms 1–125;
$t$ = the financial years 2011–2015 (Yr1-Yr5);

Results using equation [8.0] report similar results to base regression model 1, where there is a positive and statistically significant association with five of the six independent variables being examined in this study: BOD_IND ($p<0.01$), CSR_COM ($p<0.10$), ENV_AUD ($p<0.01$), BOD_SOC_AFFIL ($p<0.05$), BOD_COM_AFFIL ($p<0.01$). Control variables report statistically significant associations for two control variables: SQRT_LEV ($p<0.05$) and FOR_LIST ($P<0.01$)) as did base regression model 1 but also shows SQRT_MKTBK to be negatively associated at 5% significance level. This suggests that the important

determinants of ECC disclosures reported in Section 6.3.1 remain significant determinants of environmental disclosures, as measured by ECCI disclosure index.

**Table 7.4** Results of Regression model adjusted for SIZE difference

| | **ECC_Total/SIZE** |
|---|---|
| BOD_IND | 0.018*** |
| | (4.850) |
| CSR_COMM | 0.002* |
| | (1.696) |
| ENV_AUDIT | 0.011*** |
| | (12.976) |
| BOD_ENVIR_AFFIL | -0.002 |
| | (-0.513) |
| BOD_SOC_AFFIL | 0.006** |
| | (1.984) |
| BOD_COMM_AFFIL | 0.005*** |
| | (2.930) |
| ROA | 0.000 |
| | (0.689) |
| SQRT_MKTBK | -0.001** |
| | (-2.212) |
| SQRT_LEV | -0.000** |
| | (2.005) |
| FOR_LIST | -0.004*** |
| | (-3.331) |
| Constant | -0.007** |
| | (-2.353) |
| IND FE | YES |
| YEAR FE | YES |
| N | 125 |
| adj. R-sq | 0.889 |

***, **, and * denote significance at 1%, 5% and 10% respectively (Two-tail). The variable definitions are in Appendix [A]. Robust t-statistic in brackets.

## 7.5 Outliers

In this study, transformation of raw data was necessary for firm size, market to book ratio and leverage. Firm size is measured as the natural log of total assets, market to book value measured as the square root of market to book value (price/ book value) and leverage measured as square root of leverage (total debt/ total equity). Despite the transformations, the frequency distributions show the presence of outliers. An outlier refers to data points which are more than 1.5 times the inter-quartile range, which means data points smaller than the value at the $25^{th}$ percentile or larger than the value at the $75^{th}$ percentile. In order to minimise the effect of possibly spurious outliers, winsorization is performed (Hair et al 2014). This means that the extreme values are replaced by the maximum or minimum values at the threshold. The thresholds are values below the 5th and above the 95th percentiles respectively (90% winsorization). This strategy, being distinct from a simpler procedure called

trimming (which discards extreme values), does not result in a smaller sample size. The test of association between variables using the resulting data also show statistically significant results for predictor variables as reported in earlier multivariate results (BOD_IND ($p<0.01$), CSR_COM ($p<0.05$), ENV_AUDIT ($p<0.01$) and BOD_COM_AFFIL ($p<0.05$)). Thus, the presence of outliers is not likely to pose significant problems in the statistical analyses and have been retained in multivariate analyses performed in Chapter 6. This has been performed to ensure that when alterations to the original dataset are not warranted, the original dataset is maintained.

**Table 7.5** Summary statistics of variables where delineation of outliers are performed

| Statistic | ROA | SQRT_ MKTBK | SQRT_ LEV | BOD_IND | BOD_SOC_ AFFIL |
|---|---|---|---|---|---|
| 25th percentile | 4.2700 | 1.2417 | 6.0233 | 0.7500 | 0.1000 |
| 75th percentile | 10.8000 | 1.9105 | 9.6943 | 0.8750 | 0.3000 |
| Interquartile Range | 6.5300 | 0.6688 | 3.6710 | 0.1250 | 0.2000 |
| Outliers < | -5.5250 | 0.2386 | 0.5167 | 0.5625 | -0.2000 |
| Outliers > | 20.5950 | 2.9136 | 15.2009 | 1.0625 | 0.6000 |
| number of outliers | 7 | 9 | 8 | 14 | 4 |

## 7.6 Summary of Chapter 7

In this chapter, robustness checks were performed and results compared against multivariate analyses in Chapter 6. Potential endogeneity and self-selection issues were considered using a t-1 lagged independent variable model and propensity matching analyses. Results of logit regression models concur generally with base regression model results. Predictor variables hypothesized contribute to firm likelihood of providing specified ECC disclosures (which measure the quantitative and qualitative aspects of disclosures which form the dependent variable ECC_Total in our core regression model). Overall, results of sensitivity tests corroborate with results of analyses performed in Chapter 6. Further, any potential concerns associated with the use of these multivariate statistical analyses have been addressed.

# CHAPTER EIGHT
# DISCUSSION AND CONCLUSION

## 8.1 Objectives recap

The objective of this study is to examine if specific governance mechanisms (presence of an independent board, environmental committees and environmental assurance engagements) and board resource capabilities (presence of directors with affiliations in the environmental, social/humanitarian and community) are associated with the extent of environmental and climate (ECC) disclosures and environmental performance indicators.

In this study, the researcher examines (i) ECC disclosure trends over a five year research period to report on disclosure trends using a disclosure index which incorporates six out of twelve prescribed disclosure requirements of the Climate Change Reporting Framework (CCRF). (ii) Through multivariate analyses, the researcher examined if the extent of ECC disclosures are associated with the above mentioned monitoring governance mechanisms and resource dependence capabilities ('governance-disclosure' tests) (iii) Thereafter, the researcher also examined if these six governance variables are associated with ECC performance indicators which reflect both positive and negative environmental performance of firms ('governance-performance' tests). (iv)Inclusion of 'regulatory effects' related to environmental and climate policy changes observed during the research period is then included in 'governance-disclosure' and 'governance-performance' analyses to determine how regulatory effects impact these associations.

## 8.2 ECC disclosure patterns

Results show statistically significant year on year increases in mean ECC disclosures, from two years prior to introduction of CPM till up to two years after[55] (Yr1 to Yr2 at 13.393% change, $p<0.01$; Yr2 to Yr3 at 9.041% change, $p<0.01$; Yr3

[55] Yr1 (2011) and Yr2(2012) are pre-REG periods, while Yr3(2013), Yr4(2014) and Yr5 (2015) post-REG periods. CPM and ASIC RG 247 commenced from Yr3, CPM was repealed effective from Yr5 and ASXCG Recommendation 7.4 effective from Yr5. See Section 4.2 for further details

to Yr4 at 10.023% change, $p<0.10$). Evidence shows that the greatest rate of change occurred in the two years preceding regulatory change, which suggests that impending introduction of CPM may have led to greater ECC disclosures. A modest change from Yr4 to Yr5 of 4.469% does not report a statistically significant difference may suggest that the repeal of CPM coupled with introduction of ASXCG's recommendations in Yr5 is likely to have led firms to remain at status quo, given the uncertainties surrounding the repeal and the lagged effect of ASX CGC recommendations on ECC disclosures.

Across sector disclosure trends over the five year period suggests preliminary evidence of some standardisation of ECC disclosures evident from firms grouped as ESI firms. Firms in ESI sectors report varied disclosure levels in Yr1 (ENE 27.000%, MAT 38.525%, TRANSP 11.111% and UTIL 23.333%) to closely similar disclosure levels by Yr5 (ENE 36.667%, MAT 39.891%, TRANSP 36.667% and UTIL 31.667%). This upward trend toward disclosure levels at fairly similar levels, may suggest that firms are disclosing at levels which they perceive is expected of them to be in line with their peers.

Quantitative ECC disclosure trends report improvement in reporting for GHG and waste data (at least 50% increases), water and energy data (at least 30% increase) over the five year period. Qualitative characteristics of data show improvements for all disclosure categories measured, with significant improvements from waste, water, other pollutants and GHG data (between 50% to 70% increase). A greater number of firms now engage third party assurance over environmental data (67% increase) and sustainability data (42% increases). Improvement is also observed in the nature of assurance conclusions reached, with 33% increase in assurance conclusions that report no qualifications or any emphasis of matter clauses. ECC disclosure through stand-alone reports have increased (31%) coupled with improvement in format of presentation at 71% increase (e.g. via concise tabular data performance reports) was also observed.

## 8.3 Governance association with ECC disclosure and performance indicators

### *8.3.1 Monitoring governance mechanisms & ECC disclosure and performance*

Findings of this study show that board monitoring mechanisms such as the presence of an *independent board, environmental committees* and third party *environmental assurance* are statistically and positively associated with environmental and climate related *(ECC) disclosures,* as well as both *positive and negative ECC performance.*. This provides evidence that such governance measures are substantive environmental governance mechanisms, with regard to the firms' environmental disclosure initiatives and environmental performance for top ASX firms from 2010 to 2015.

### *8.3.2 Resource dependence capabilities & ECC disclosure and performance*

The association between ECC disclosures and resource dependence variables which reflect the social network capital and advisory capability of directors through their affiliations produced mixed results.

The presence of directors with *environmental affiliations* is not associated with firm *ECC disclosures*. Nevertheless, their presence is statistically significantly associated with only *negative ECC performance* indicators, and evidence of association supports a negative correlation. These findings suggest that the presence of environmentally affiliated directors do not lead to enhanced ECC disclosures nor improved environmental performance. This evidence is similar to results in Rodgrigue, Magnan and Cho (2013)'s US study, who did not find the presence of 'environmentally aware directors' associated with environmental performance. They concluded that the presence of environmentally aware directors reflect a firm's legitimacy motives rather than substantial environmental management. In this study, results not only suggest that environmentally affiliated directors play a legitimacy role but are likely to also lead firms to suppress negative environmental performance indicators. It is likely, given their prior knowledge on environmental issues, environmentally affiliated directors are acutely more aware of potential negative

implications on the firm associated with poor environmental performance and have greater incentives to suppress disclosure of negative environmental performance.

Directors with *social/humanitarian affiliation* are positively associated with *ECC disclosures* and only with *positive ECC performance* indicators. These findings may suggest that their presence direct firms to engage in environmental activities which reflect positively on the firm and are incentivised to disclose these positive initiatives. The results do not report any statistically significant association with negative ECC indicators, may indicate that social/humanitarian affiliated directors emphasise disclosure of positive environmental performance indicators to ensure firm legitimacy is maintained. As their affiliations tend to be related to directors being current/former advisors, donors, or directors appointed on boards of organisations which reflect the firms' social contribution in relation to their corporate social performance (e.g. alleviation of poverty, humanitarian support), it is likely their advisory capabilities are skewed towards maintaining a positive image which reflect philanthropy and positive endeavours toward the environment. This argument reflects Hillman, Nicholson and Shropshire (2008)'s perspective, who suggest that directors with social affiliation tend to contribute to non-business decisions that would reflect positive aspects of the firm. Mallin, Michelon and Raggi (2013) also state that socially affiliated directors contribute to 'people and social' dimensions which are difficult to measure. Thus, the evidence does suggest that their value-added contributions call for decisions which tend to reflect positive environmental impacts of the firm rather than negative ones which can adversely impact philanthropy initiatives.

Directors with *community affiliation* are positively associated with *ECC disclosures* and both *positive and negative ECC performance* indicators. Directors with community affiliation include directors who have significant affiliation with community groups, ministerial or government affiliations or industry alliances and some of these affiliations are related to directors' personal values or interests. This evidence suggests that directors with community affiliation have far wider connection with potentially influential stakeholder groups or may have more proactive environmental attitudes or consciousness as a result of their personal attitudes (Cordano, Frieze and Ellis, 2004). Thus, they are better able to provide

advice and access to resources which may be relevant and beneficial to the firms' environmental performance (Hillman and Dalziel, 2003). They are also likely to have greater incentive to 'do the right thing' due to their position and influence in the community. These results support the presence of directors with community affiliation as a substantive governance measure, given that their presence are associated with greater environmental accountability and transparency relating to both positive and negative environmental performance indicators.

### *8.3.3 Regulatory effects on model associations: ECC disclosures*

Results report that *regulatory* changes (associated with the introduction and operation of carbon price, ASX disclosure recommendations and ASIC's prescriptive guidance) are statistically significantly associated with extent of *ECC disclosures* over the research period. As expected, these results reflect similar results as in prior studies, like Frost (2007)[56] and Cowan and Deegan (2011)[57] which report ECC disclosure reactions following legislative measures adopted in Australia.

With regulatory effects, *Board independence, environmental assurance and boards with community affiliation* remain significant *ECC disclosure* determinants. However, findings show *environmental committees* and *boards with social/humanitarian affiliations* no longer report statistically significant relations with *ECC disclosures.* Consistent with Liao, Luo and Tang (2014), this evidence suggests that environmental committees' role in firms' decision to provide environmental disclosures may be less effective measures when faced with increased regulatory pressure. Disclosures are likely to be driven more by these pressures than actual transparency measures instituted by environmental committees. Also, with regulatory effects, evidence suggests that the image enhancing and legitimacy

[56] Frost (2007) examined corporate environmental disclosures prior to and after the enactment of Australia's first mandatory environmental disclosure legislation, Section 299A of the Corporation Act. He reported significant increases in disclosures post legislation compared to prior to legislation but identified significant variation in approaches adopted by firms.

[57] Cowan and Deegan (2011) examined corporate disclosures during the National Pollutant Inventory (NPI) implementation period. NPI was the first emission measurement that required corporations to publically report actual emissions. Their findings report disclosure reaction to the implementation of NPI, including firms which were not affected by the regulation. Their findings suggest environmental regulation is a driver for change in environmental disclosure practices.

oriented role played by directors with social/humanitarian affiliation are less pronounced when firms are obligated to disclose according to prescribed guidelines. It is important to note, evidence also shows that the role of *directors with community affiliations* not only remain significant, but are exacerbated with regulation (this is evidenced by statistically significant interaction term, which reflects the multiplicative effect of this variable on ECC disclosure). This evidence corroborates with earlier arguments above, as new regulatory requirements would call on these directors to have a greater substantive role, in that their connections and network would assist firms to better manage and comply with implications of new regulations.

### *8.3.4 Regulatory effects on model associations: ECC performance*

Results report that *regulatory effect* is associated with only *positive ECC performance* indicators. This is not surprising, given that the requirements of recent regulatory changes likely exposes firms to scrutiny associated with disclosures relating to carbon emission liabilities and climate risks. Therefore, firms may respond by initiating greater positive environmental initiatives or disclose more positive environmental activities. Furthermore, given increased business uncertainty associated with recent climate policy changes (Pearse, 2016), firms may be incentivised to downplay potentially adverse impacts which these new guidance and legislative measures call for (e.g. increased disclosure pertaining to climate risks), by emphasizing more positive environmental initiatives and communicating these actions. Additionally, as *regulatory effect*, do not report statistical significance with *negative ECC performance* this suggests recent regulatory initiatives do little to initiate disclosure accountability regarding negative environmental performance activities.

Despite regulatory effects, *board independence* and *environmental assurance* remain substantive governance measures of firms' engagement and disclosure initiatives regarding both *positive and negative ECC performance* activities.

However, the significance of the *environmental committee's* governing role in relation to firm engagement with environmental activities reflective of *negative* ECC

performance *diminishes* with the presence of regulatory pressures. Conversely, the association is *exacerbated* for environmental activities which are indicative of *positive* performance. These findings suggest that the substantive role which environmental committees play to influence both positive and negative environmental performance outcomes may be impacted when faced with greater regulation. At these times, environmental committees may address risks associated with regulatory change by providing advice associated with new changes (Rodrigue, Magnan and Cho, 2013) and endeavour to engage in only activities which promote positive environmental performance outcomes. This is indicative of an approach which places greater emphasis on positive reputation outcomes (Rupley, Brown and Marshall, 2012). Therefore results suggest that with stringent regulatory conditions which call for potentially greater scrutiny or risk exposure to firms, environmental committees' may shift toward greater firm engagement in environmental activities which are reflective of positive performance outcomes to manage reputation, or engage in activities perceived to improve overall firm environmental performance outcomes.

Additionally, the association between directors with social affiliations and *positive ECC performance* is also *exacerbated* with regulatory effects. This likely suggests that firm responses to recent regulatory implications from carbon pricing further enhanced the role played by socially affiliated directors in their philanthropic efforts to augment the firms' environmental outcomes that reflect positive performance activities.

## 8.4 Limitations and assumptions

This study is subject to the following limitations. Firstly, the construction of the ECC disclosure index involves some level of judgement and is therefore exposed to some level of subjectivity. The construction of the ECC index was also limited to only a few 'objective' requirements of CCRF which are verifiable, so it does not purport to measure ECC disclosures of firms in the sample in conformity with all requirements of the CCRF framework. As this study could not benefit from the use of more than one researcher, scoring of the ECC indexes forming the dependent variables in this study could not be cross verified by another person. However, where reasonably

possible, consistent application of due process in light of criteria outlined in section 4.3.3 is performed. Secondly, as all independent and dependent data were hand-picked from Annual and Corporate sustainability reports, collation of a larger sample for each of the five year period was not feasible within the given time frame for this study. Thus, the use of pool regression models was performed. In using a pooled regression analysis, the same company data is generally repeated, in this case five times in one data set. To avoid the potential for bias estimates, further sensitivity tests have been performed and the results do not suggest any potential concerns. Thirdly, the researcher acknowledges that positive and negative ECC performance indicators measured is limited to disclosures made in published reports and this may not be fully indicative of environmental activities of sample firms examined. Finally, generalisation of results of this study beyond the Australian context may not be appropriate as other jurisdictions are subject to different requirements and performance regulations.

## 8.5 Implications and Future research

This study examines ECC disclosures across different sectors over a five year period. Results provide preliminary evidence which suggests that disclosures of firms in ESI sectors have progressed from varied levels of disclosure to closely similar levels by the end of the five year period. Future studies could consider a longitudinal examination of ECC disclosures for one specific sector to determine the extent that firms conform or adhere to standardised ECC disclosures which may be comparable across firms.

As empirical evidence show that the presence of independent directors, environmental committees and the conduct of environmental audits are associated with greater environmental and climate change disclosure transparency and performance, this ought to encourage corporate boards to effect these good governance measures. This is also in line with regulatory interests, as prescribing greater steps toward firm engagement in environmental audits bring positive implications on firm environmental performance. For investors, these would be privy to more information that is reliable to address their information needs to make more informed decisions.

As findings also show the importance that directors with 'community affiliation' play, both on firm disclosure transparency and environmental performance, corporate hiring strategies could consider these effects when making decisions on their corporate executive engagements. The potentially legitimising effect of 'environmentally affiliated directors' on firm environmental governance however does suggest the need for firms or stakeholder groups to address incentivising mechanisms which may motivate directors to act in the interest of the firm for substantive causes rather than reputational reasons. Perhaps, future research could examine the role of executive compensation in environmental governance, as a means of channelling director knowledge and expertise toward achieving positive outcomes rather than act as barriers to greater transparency. Although there is still little evidence of this practice among Australian firms today, literature can benefit from exploratory studies in this realm.

## 8.6 Contribution of this study

This study makes the following contributions. Firstly, results provide evidence of implications of recent policy and authoritative measures (i.e. Carbon price, ASIC RG 247 and ASX CG Recommendation 7.4) on ECC disclosure levels of top ASX firms. Although still at relatively low levels, Australian corporate ECC disclosure levels heighten particularly impending CPM periods up until the last operative period of CPM. Statistical evidence suggests that these increases were only modest and not significant in periods following the repeal of CPM. Secondly, being the first quantitative study to provide evidence of ECC disclosure trends using the latest CCRF, which is a standardised guidance framework which purports to measure ECC information that incorporates requirements of prominent voluntary standards and frameworks, these results will be of interest to standard settlers, international business groups and prominent not for profit groups who have called for greater standardisation of ECC disclosures in the interest of achieving disclosure comparability among firms (Cotter, Najah and Wang, 2011). Results provide preliminary evidence of converging disclosure practices for firms in ESI sectors, over the five year research period as measured according to this framework. Thirdly, given the importance of firm environmental governance today, this study provides evidence of whether governance mechanisms observed today (i.e. board

independence, environment/CSR committees, environmental assurance and director affiliations) are in essence substantive or symbolic environmental governance measures. More importantly, it provides evidence of whether regulatory or policy changes exacerbate or inhibit their effectiveness. Additionally, this study is the first to examine director resource capabilities relating to board affiliations with ECC disclosure and performance in the Australian context. The examination of directors' affiliation is also one of the most comprehensively performed. Distinction with regard to how directors may be affiliated can provide knowledge to the firm regarding how to use directors' social network capabilities to bring value-add dimensions to the firms' environmental governance and place safeguards in areas which could be potentially legitimising. These results have practical application to firms when making decisions regarding board composition or senior executive appointments, particularly when firm environmental priorities are of importance.

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## Appendix A
## Variable Definitions

| Variable | Definition |
|---|---|
| *Dependent variables* | |
| ECC1 | Proportion of Total quantitative disclosure of environmental performance results to Total maximum score in category ECC1 |
| ECC2 | Proportion of Total qualitative disclosure of environmental performance results to Total maximum score in category ECC2 |
| ECC3 | Proportion of Total disclosure on reporting scope and polices to Total maximum score in category ECC3 |
| ECC4 | Proportion of Total disclosure relating to assurance over environmental and sustainability data to Total maximum score in category ECC4 |
| ECC5 | Proportion of Total disclosure relating to environmental disclosure format to Total maximum score in category ECC5 |
| ECC_Total | Proportion of Total environment and climate change disclosure score (ECC1 to ECC5) to Total maximum score for all categories |
| *Independent variables* | |
| BOD_IND | Proportion of Independent Board members to total board members |
| CSR_COM | A dummy variable, coded as 1 if the firm has a Corporate Environmental or Sustainability Committee at Board level, and 0 otherwise |
| ENV_AUDIT | A dummy variable, coded as 1 if the firm engages third party assurance over environmental information reported, and 0 otherwise |
| BOD_ENV_AFFIL | Proportion of Board members who are presently or were formerly affiliated with environmental, climate related or conservation organizations (including government sponsored institutions and not for profit) to total board members |
| BOD_SOC_AFFIL | Proportion of Board members who are presently or were formerly affiliated with social and humanitarian organisations (i.e. social/humanitarian organisations include organisations focused on alleviation of poverty, food aid, disability support, medical or health related support and research organisations) to total board members |
| BOD_COM_AFFIL | Proportion of Board members who are presently or have former community affiliation, (both locally and internationally) to total board members; these include:<br>(a) Board member(s) who also sit on Boards of sporting clubs or art organizations or are members or trustees of funds or foundations run for these purposes (e.g. museums, art institutions, sporting leagues) ;<br>(b) Board member(s) with significant affiliation with government bodies or organizations locally and internationally, through their former appointments or engagements as Ministers (or equivalent) or prominent industry alliance representatives;<br>(c) Board member(s) who are also represented on Boards of Academic institutions or have significant affiliations as advisors or contributors to these institutions |

## Appendix A
## Variable Definitions (continued)

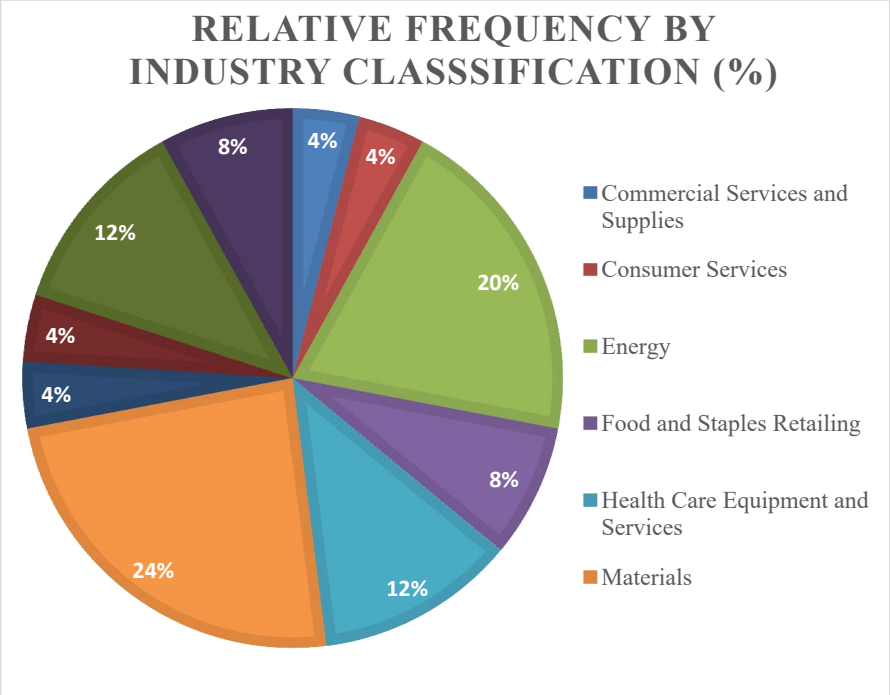
| Variable | Definition |
|---|---|
| *Control variables* | |
| SIZE | The natural logarithm of total assets at the beginning of year t |
| ROA | Return on assets (Profit before tax / Total assets) |
| SQRT_MKTBK | Square root of Market value of equity to Book Ratio (Price/Book value) |
| SQRT_LEV | Square root of Leverage (Total Debt / Total equity) |
| FOR_LIST | A dummy variable, coded as 1 if the firm is listed on one or more foreign exchanges other than Australia and 0 otherwise |
| IND | A dummy variable, coded as 1 if the firm is belongs to specific GSIC Industry, 0 otherwise, to control for industry effects. They include 10 categories: Commercial Services & Supplies, Consumer services, Energy, Food & Staples Retailing, Health Care Equipment & Services, Materials, Pharmaceuticals, Biotechnology & Life Sciences, Telecommunication Services, Transportation and Utilities. |
| YEAR | A dummy variable, coded as 1 if the year falls within the specific year category, and 0 otherwise |
| *Additional variables* | |
| PD | A dummy variable, coded as 0 for pre-REG years (Yr1 and Y2) and 1 for post-REG years (Yr3 and Y4) |
| AVG_ BOD_IND | the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for independent variable BOD_IND |
| AVE_CSR_COM | the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for independent variable CSR_COM |
| AVE_ENV_AUDIT | the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for independent variable ENV_AUDIT |
| AVG_ BOD_ENV_AFFIL | the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for independent variable BOD_ENV_AFFIL |
| AVG_ BOD_SOC_AFFIL | the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for independent variable BOD_SOC_AFFIL. |
| AVG_ BOD_COM_AFFIL | the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for independent variable BOD_COM_AFFIL |
| AVG_SIZE | the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for control variable SIZE |
| AVG_ROA | the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for control variable ROA (Yr1 and Yr2) |
| AVG_SQRT_MKTBK | the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for control variable SQRT_MKTBK |
| AVG_SQRT_LEV | the average of two years pre-REG (Yr1 and Yr2) and two years post-REG (Yr3 and Yr4) for control variable SQRT_LEV |
| AVE(D)_BOD_IND | dichotomous variable for BOD_IND, computed from AVE_BOD_IND, by assigning 1 for values above its median and 0 for values below its median |
| AVG(D)_ BOD_ENV_AFFIL | dichotomous variable for BOD_ENV_AFFIL, computed from AVE_BOD_ENV_AFFIL, by assigning 1 for values above its median and 0 for values below its median |
| AVG(D)_ BOD_SOC_AFFIL | dichotomous variable for BOD_SOC_AFFIL, computed from AVE_BOD_SOC_AFFIL, by assigning 1 for values above its median and 0 for values below its median |
| AVG(D)_ BOD_COM_AFFIL | dichotomous variable for BOD_COM_AFFIL, computed from AVE_BOD_COM_AFFIL, by assigning 1 for values above its median and 0 for values below its median |

## Appendix A
## Variable Definitions (continued)

| Variable | Definition |
|---|---|
| *Additional variables* | |
| ECC_Total/SIZE | ECC_Total scaled by the natural logarithm of total assets |
| NEG_ECC_TOTAL | proportion of negative ECC items disclosed as a proportion of total negative ECC disclosures |
| POS_ECC_TOTAL | proportion of positive ECC items disclosed as a proportion of total positive ECC disclosures |
| AVE_NEG_ECC_TOTAL | average of NEG_ECC_Total for two years pre-REG (Yr1 and Yr2) and average of two years post-REG data (Yr3 and Yr4) |
| AVE_POS_ECC_TOTAL | average of POS_ECC_Total for two years pre-REG (Yr1 and Yr2) and average of two years post-REG data (Yr3 and Yr4); |

## Appendix B
## Number of Observations by Industry Classification

| GISC Industry Group Description | No of firm years | Relative frequency (%) |
|---|---|---|
| Commercial Services and Supplies | 5 | 4.00 |
| Consumer Services | 5 | 4.00 |
| Energy | 25 | 20.00 |
| Food and Staples Retailing | 10 | 8.00 |
| Health Care Equipment and Services | 15 | 12.00 |
| Materials | 30 | 24.00 |
| Pharmaceuticals, Biotechnology & Life Sciences | 5 | 4.00 |
| Telecommunication Services | 5 | 4.00 |
| Transportation | 15 | 12.00 |
| Utilities | 10 | 8.00 |
| Total | 125 | 100.00 |



## Appendix C
## Environmental and Climate Change Disclosure Index (ECC Index)

| Item ref | Item description | Reference to CDSB Framework |
|---|---|---|
| | ***DISCLOSURE ENVIRONMENTAL PERFORMANCE RESULTS*** | |
| | *(Quantitative criteria : results)* | |
| 1 | Quantitative disclosure of GHG emissions (gross) | Items 1 to 24 from ***REQ-04***, which states "environmental results reflecting the degree to which material sources of environmental impact have arisen over the period should be reported in quantitative terms using absolute, normalised and intensity matrics" (CDSB 2015, 22) |
| 2 | Quantitative disclosure of GHG emissions (intensity) | |
| 3 | Quantitative disclosure of GHG emissions (categorisation : scope 1& 2) | |
| 4 | Quantitative disclosure of GHG emissions (categorisation : scope 3) | |
| 5 | Quantitative disclosure of Forest usage (palm oil) | |
| 6 | Quantitative disclosure of Forest commodities (timber) | |
| 7 | Quantitative disclosure of Water usage (savings, recycling, withdrawal) | |
| 8 | Quantitative disclosure of Water for other use (CSG and waste water) | |
| 9 | Quantitative disclosure of Water usage (intensity) | |
| 10 | Quantitative disclosure of Water withdrawal from water stressed areas | |
| 11 | Quantitative disclosure of Water withdrawal from water stressed areas (intensity) | |
| 12 | Quantitative disclosure of Water compliance violations (no. of cases) | |
| 13 | Quantitative disclosure of Chemical disposals | |
| 14 | Quantitative disclosure of Flare gas from facilities | |
| 15 | Quantitative disclosure of Flare gas (intensity) | |
| 16 | Quantitative disclosure of Energy usage (gross) | |
| 17 | Quantitative disclosure of Energy usage (intensity) | |
| 18 | Quantitative disclosure of Energy production / reduction in energy consumption (renewables or other) | |
| 19 | Quantitative disclosure of Waste collected (or recycled, disposed) | |
| 20 | Quantitative disclosure of Waste collected (intensity) | |
| 21 | Quantitative disclosure of Land disturbed (rehabilitated or conserved) | |
| 22 | Quantitative disclosure of Paper usage | |
| 23 | Quantitative disclosure of Raw material used in processes (e.g. packaging, mining, chemical processes) | |
| 24 | Quantitative disclosure of Other pollutants | |
| | *(Qualitative criteria : disaggregation or categorisation of results to aid understanding , such as by source, geographical, activity, by division, site or other)* | |
| 25 | Disaggregation or categorisation of GHG results | Items 25 to 34 from ***REQ-04*** which states: "results shall be disaggregated, categorised or broken down as appropriate where it is likely to aid understanding. For example, results may be categorised by geography, business activity or division , source type" (CDSB 2015, 23) AND Items 35 to 36 from ***REQ-04*** which states: "methodologies used to prepare environmental results shall be reported" (CDSB 2015, 23) |
| 26 | Disaggregation or categorisation of Energy results | |
| 27 | Disaggregation or categorisation of Water results | |
| 28 | Disaggregation or categorisation of Waste results | |
| 29 | Disaggregation or categorisation of Waste water results | |
| 30 | Disaggregation or categorisation of Land results | |
| 31 | Disaggregation or categorisation of Forest use results | |
| 32 | Disaggregation or categorisation of Paper use results | |
| 33 | Disaggregation or categorisation of Raw material results | |
| 34 | Disaggregation or categorisation of Other pollutant results | |
| | *(Qualitative criteria: methodologies applied to prepare environmental results)* | |
| 35 | Disclosure of methodology for GHG results | |
| 36 | Disclosure of methodology for Water results | |

## Appendix C
## Environmental and Climate Change Disclosure Index (ECC Index) (continued)

| Item ref | Item description | Reference to CDSB Framework |
|---|---|---|
| | ***DISCLOSURE OF COMPARATIVE PERFORMANCE ANALYSIS*** *(Qualitative criteria : disclosure of results with comparative analyses)* | |
| 37 | Quantitative analyses or comparison of results against prior periods or baselines | Items 37 to 38 from ***REQ-05*** [(1)] |
| 38 | Quantitative analyses or comparison of results against targets | |
| | DISCLOSURE OF SCOPE AND POLICIES | |
| 39 | Describes organisational boundary to which environmental and climate related reporting applies | Item 39 from ***REQ-07*** [(1)] |
| 40 | Disclosure cites reporting protocol applied to prepare environmental related information | Item 40 from ***REQ-08***[(1)] |
| 41 | Discloses if reporting standard has been consistently applied from one period to another and reports changes or restatements if applicable | Item 41 from ***REQ-10*** [(1)] |
| 42 | Disclosure relating to the reporting period covered by the environmental or climate related report | Item 42 from ***REQ-09*** [(1)] |
| | ***DISCLOSURE RELATING TO ASSURANCE OVER ENVIRONMENTAL DATA*** | |
| 43 | Discloses if non-financial / sustainability (environmental and social) information has been assured by a third party | Items 43 to 44 from ***REQ-12*** [(2)] |
| 44 | Discloses if environmental or climate related information is assured by a third party | |
| | *(Assurance statement specifies the specific "subject matter" covered within the scope of assurance activities)* | |
| 45 | Assurance over GHG information | Items 45 to 57 provide details on the extent and variability of assurance engagements |
| 46 | Assurance over Energy information | |
| 47 | Assurance over Water information | |
| 48 | Assurance over Forests information | |
| 49 | Assurance over Waste information | |
| 50 | Assurance over Land use information | |
| 51 | Assurance over Paper use information | |
| 52 | Assurance over Material usage information | |
| 53 | Assurance over Other pollutants information | |
| 54 | Assurance over specified content data against GRI criteria and or GRI application level assessment | |
| 55 | Assurance over firm policies which align with the requirements of International Council on Mining and Metals (ICMM) or any aspect of subject matters contained within ICMM Sustainable Development Framework [only for mining and metals ] | |
| 56 | Assurance over content of sustainability report (general reference to the whole of the report ) | |

## Appendix C
## Environmental and Climate Change Disclosure Index (ECC Index) (continued)

| Item ref | Item description | Reference to CDSB Framework |
|---|---|---|
| | ***DISCLOSURE RELATING TO ASSURANCE OVER ENVIRONMENTAL DATA (continued)*** | |
| 57 | Independent Assurance conclusions reached | |
| (a) | Limited or moderate assurance with no qualification (scores = 3) | |
| (b) | Limited or moderate assurance with no qualification but with recommendations (scores = 2) | |
| (c) | Qualified assurance with emphasis of matter (scores = 1) | |
| (d) | Not applicable as no independent assurance (scores = 0) | |
| | ***FORMAT & PRESENTATION*** | |
| 58 | Environmental information disclosure presented in a separate stand-alone sustainability report (or equivalent) | Item 60 and 61 provide easy reference to users of reports |
| 59 | Quantitative environmental results reported in a summary tabular report (or performance data section) | |

**KEYS**

where [(1)] are respectively:

REQ-05 states "disclosures shall include an analysis of information in REQ-04 compared with performance targets set and with results reported in previous periods" (CDSB 2015, 23)

REQ-07states "the basis on which organisational reporting boundary has been determined shall be described" (CDSB 2015, 24)

REQ-08 states "cite the reporting provisions used" (CDSB 2015, 25)

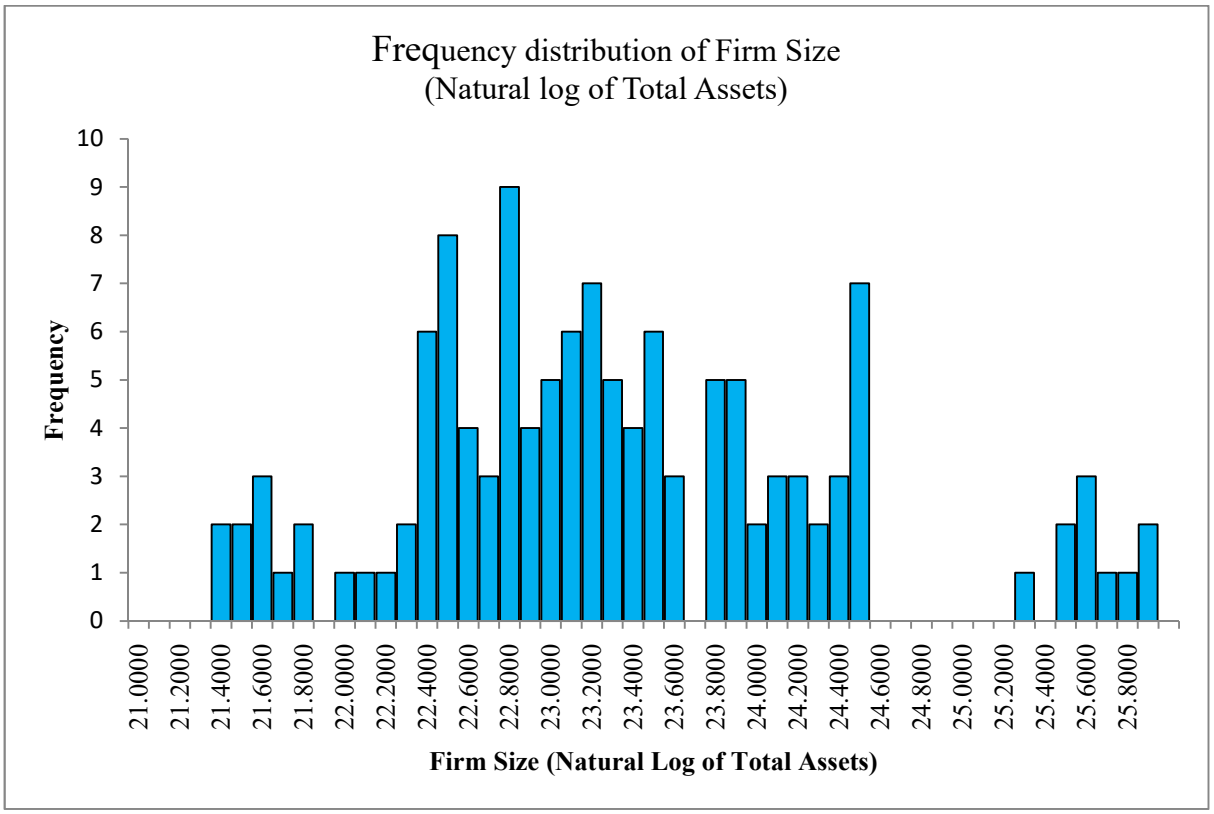
REQ-10 states "disclosures shall cite and explain prior period restatements" (CDSB 2015, 25)

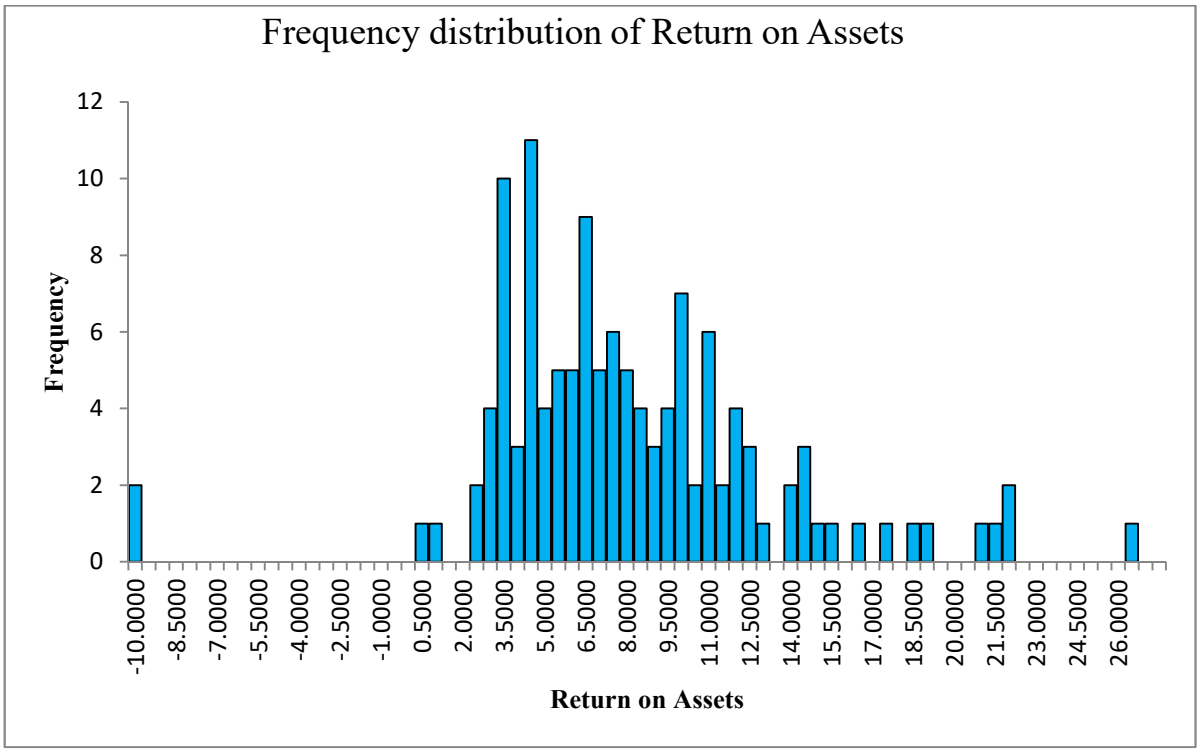
REQ-09 states "disclosures shall be provided on an annual basis" (CDSB 2015,25)

where [(2)]:

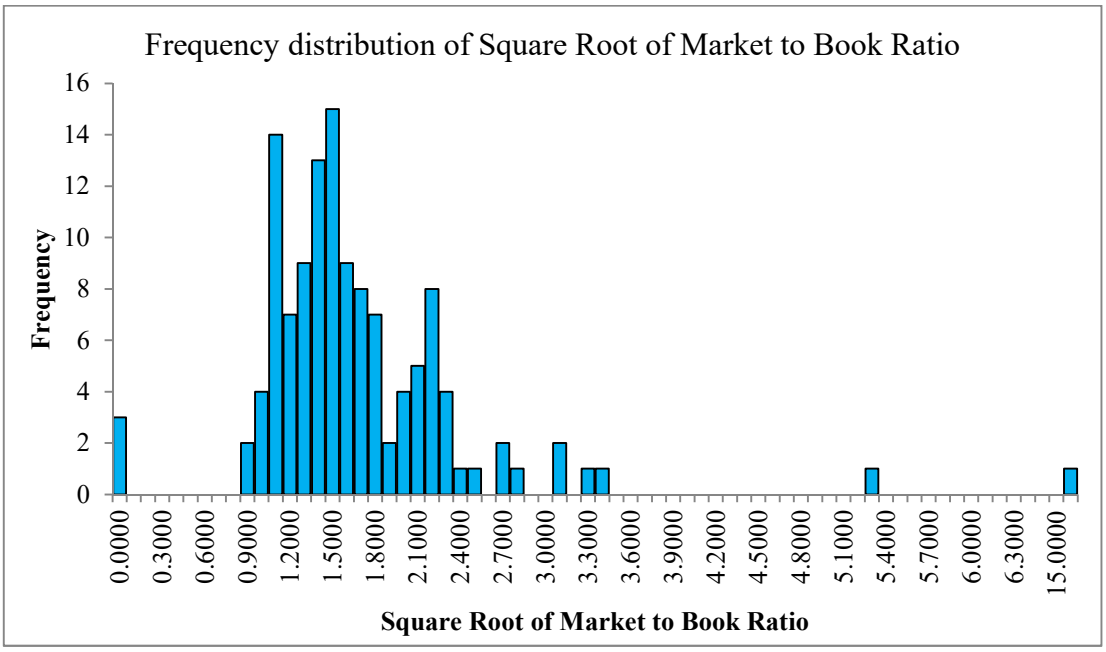
REQ-12 requires: "if assurance has been provided over reported environmental information (CCRF requires conformance with the principles and requirements of the CDSB Framework, if assurance provided according to CCRF)." (CDSB 2015, 26)

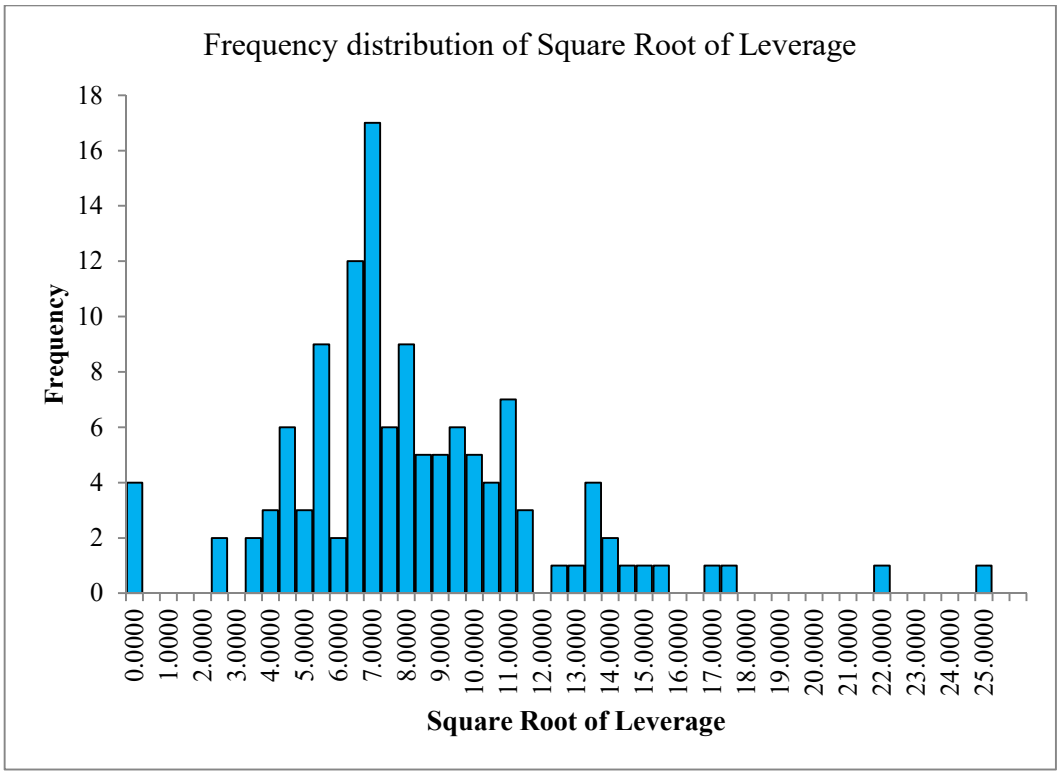
**Appendix D**
**Frequency Distribution of Control Variables**



**Appendix D**
**Frequency Distribution of Control Variables (continued)**




Transformation of raw data was necessary for firm size, market to book ratio and leverage. Data distribution for the natural log of firm size, square root of market to book ratio and square root of leverage all assume more normal distribution. Normalizing data allows the use of parametric statistical tests applied in this study. The presence of a few outliers observed is not a major concern in the statistical analyses and further adjustments are not warranted.

## Appendix E
## ECC disclosure index: Frequency Table

| | | ECC disclosure (%) | | | | | % change Yr5 - Yr1 |
|---|---|---|---|---|---|---|---|
| **Category** | **Items** | **Yr1** | **Yr2** | **Yr3** | **Yr4** | **Yr5** | |
| Quantitative Disclosure of Environmental Performance Results (ECC1) | *(Quantitative criteria)* | | | | | | |
| | Item 1 | 64 | 72 | 80 | 92 | 92 | 44 |
| | Item 2 | 48 | 48 | 48 | 52 | 64 | 33 |
| | Item 3. | 52 | 56 | 60 | 72 | 80 | 54 |
| | Item 4. | 40 | 44 | 40 | 36 | 40 | 0 |
| | Item 5. | 0 | 0 | 4 | 4 | 4 | # |
| | Item 6. | 4 | 4 | 4 | 8 | 8 | 100 |
| | Item 7. | 52 | 56 | 60 | 76 | 72 | 38 |
| | Item 8. | 8 | 20 | 20 | 20 | 24 | 200 |
| | Item 9. | 8 | 16 | 24 | 24 | 28 | 250 |
| | Item 10. | 4 | 4 | 4 | 0 | 0 | -100 |
| | Item 11. | 0 | 0 | 0 | 0 | 0 | 0 |
| | Item 12. | 0 | 0 | 0 | 0 | 0 | 0 |
| | Item 13. | 0 | 0 | 0 | 0 | 0 | 0 |
| | Item 14. | 4 | 4 | 4 | 8 | 8 | 100 |
| | Item 15. | 4 | 4 | 4 | 4 | 4 | 0 |
| | Item 16. | 52 | 60 | 68 | 72 | 68 | 31 |
| | Item 17. | 24 | 32 | 32 | 44 | 48 | 100 |
| | Item 18. | 24 | 28 | 28 | 28 | 32 | 33 |
| | Item 19. | 44 | 52 | 56 | 72 | 76 | 73 |
| | Item 20. | 16 | 16 | 16 | 16 | 24 | 50 |
| | Item 21 | 16 | 20 | 16 | 20 | 20 | 25 |
| | Item 22. | 12 | 16 | 16 | 16 | 16 | 33 |
| | Item 23. | 8 | 8 | 8 | 12 | 4 | -50 |
| | Item 24. | 28 | 24 | 24 | 28 | 28 | 0 |
| Qualitative Disclosure of Environmental Performance Results (ECC2) | *(Qualitative criteria : disaggregation or categorisation of results)* | | | | | | |
| | Item 25. | 48 | 56 | 56 | 64 | 72 | 50 |
| | Item 26. | 52 | 48 | 56 | 64 | 60 | 15 |
| | Item 27. | 36 | 36 | 48 | 52 | 56 | 56 |
| | Item 28. | 40 | 48 | 52 | 60 | 68 | 70 |
| | Item 29. | 12 | 16 | 16 | 16 | 20 | 67 |
| | Item 30. | 12 | 16 | 16 | 16 | 12 | 0 |
| | Item 31. | 4 | 4 | 4 | 4 | 4 | 0 |
| | Item 32. | 4 | 8 | 8 | 8 | 8 | 100 |
| | Item 33. | 4 | 8 | 12 | 16 | 8 | 100 |
| | Item 34. | 12 | 12 | 16 | 24 | 20 | 67 |
| | *(Qualitative criteria: methodologies applied to prepare environmental data)* | | | | | | |
| | Item 35. | 52 | 56 | 60 | 76 | 76 | 46 |
| | Item 36. | 8 | 8 | 12 | 8 | 8 | 0 |
| | *(Qualitative criteria : disclosure of results with comparative analyses)* | | | | | | |
| | Item 37. | 56 | 56 | 68 | 76 | 76 | 36 |
| | Item 38. | 32 | 36 | 40 | 44 | 44 | 38 |

## Appendix E
## ECC disclosure index: Frequency Table (continued)

| | | ECC disclosure (%) | | | | | % change Yr5 - Yr1 |
|---|---|---|---|---|---|---|---|
| **Category** | **Items** | **Yr1** | **Yr2** | **Yr3** | **Yr4** | **Yr5** | |
| Disclosure on reporting scope and polices (ECC3) | Item 39. | 68 | 72 | 76 | 84 | 80 | 18 |
| | Item 40. | 64 | 64 | 68 | 76 | 72 | 13 |
| | Item 41. | 8 | 12 | 12 | 8 | 4 | -50 |
| | Item 42. | 72 | 72 | 76 | 80 | 76 | 6 |
| Disclosure relating to assurance over environmental data (ECC4) | Item 43. | 48 | 52 | 52 | 56 | 68 | 42 |
| | Item 44. | 36 | 44 | 52 | 56 | 60 | 67 |
| | *Disclosure regarding "subject matter" assured within the scope of work* | | | | | | |
| | Item 45. | 28 | 40 | 44 | 44 | 52 | 86 |
| | Item 46. | 8 | 24 | 28 | 28 | 32 | 300 |
| | Item 47. | 16 | 32 | 36 | 32 | 32 | 100 |
| | Item 48. | 0 | 4 | 4 | 4 | 4 | # |
| | Item 49. | 8 | 20 | 24 | 24 | 28 | 250 |
| | Item 50. | 4 | 4 | 8 | 8 | 12 | 200 |
| | Item 51. | 0 | 4 | 4 | 4 | 4 | # |
| | Item 52. | 0 | 0 | 0 | 0 | 4 | # |
| | Item 53. | 0 | 4 | 4 | 8 | 12 | # |
| | Item 54. | 40 | 40 | 44 | 44 | 44 | 10 |
| | Item 55. | 8 | 12 | 12 | 12 | 12 | 50 |
| | Item 56. | 12 | 4 | 8 | 12 | 8 | -33 |
| | Item 57(a) % | 36 | 36 | 44 | 40 | 48 | 33 |
| | Item 57(b) % | 12 | 12 | 8 | 8 | 4 | -67 |
| | Item 57(c ) % | 0 | 0 | 0 | 4 | 8 | # |
| | Item 57(d) % | 52 | 52 | 48 | 48 | 40 | -23 |
| Environmental disclosure format (ECC5) | Item 58. | 64 | 68 | 72 | 84 | 84 | 31 |
| | Item 59. | 28 | 36 | 36 | 40 | 48 | 71 |

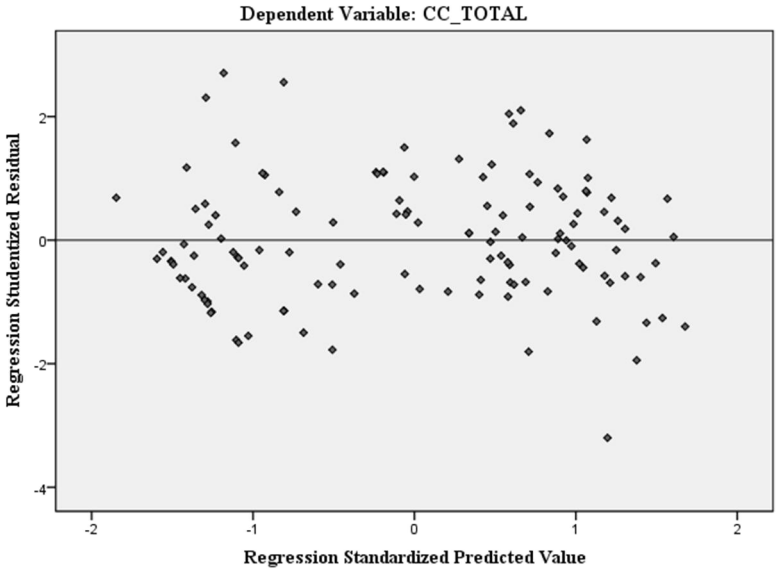
Legend: ECC disclosure % = the proportion of sample companies that disclose disclosure item listed; # = undefined

**Appendix F**
**ECC Performance Indicators (list of examples)**

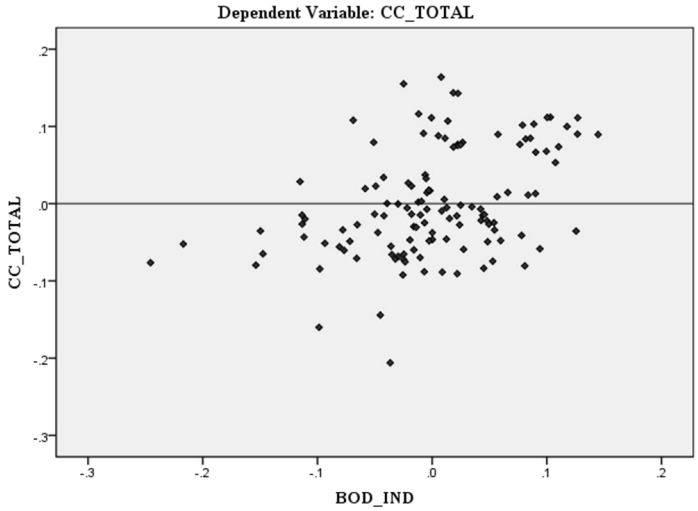
| Negative Performance Indicators [1] | Positive Performance Indicators [2] |
|---|---|
| Negative environmental impacts from:<br>• GHG emissions<br>• Timber/deforestation<br>• Land disturbed<br>• Paper use<br>• Waste disposed to landfill<br>• Other pollutants into the environment (e.g. NOx, SOx, CFC-11 equivalents) | Positive environmental impacts from:<br>• GHG / other pollutant abatement projects (e.g. CSR's N20 abatement project)<br>• Energy from renewable projects, including energy consumption sourced from renewables (either purchased or generated). These include new energy projects or efficiency from solar (e.g. BHP ) , hydro, wind (e.g. APA) or geothermal (e.g. Lihir Gold)<br>• Biodiversity projects (e.g. Newcrest)<br>• Water conservation projects (e.g. Orica Chemicals )<br>• Waste reduction projects (e.g. CSR)<br>• Energy efficiency projects (e.g. SANTOS)<br>• Involvement in early initiatives (e.g. TLS use of methanol based fuel cells) |
| Note: This is not an exhaustive list of indicators but some examples drawn from sample data<br>[1] These may include quantitative or/and qualitative disclosures relating to stated environmental impact measures<br>[2] These may include quantitative or/and qualitative disclosures (including any brief descriptive disclosure of abatement or renewable projects) | |

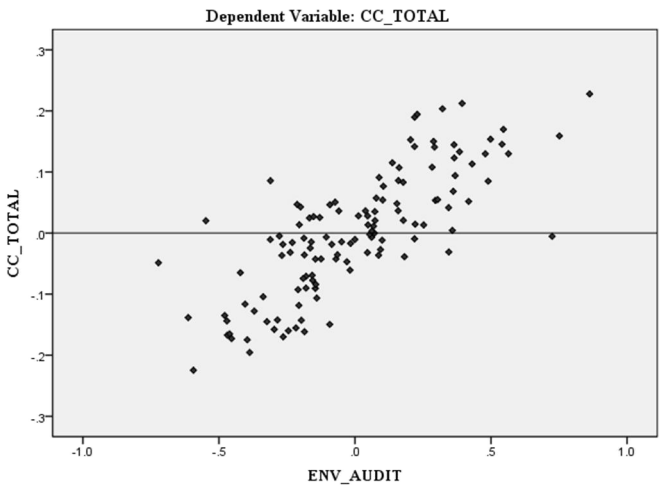
## Appendix G
## Multiple Regression (OLS assumptions)

Plot 1: Regression Studentized Residual against predicted value



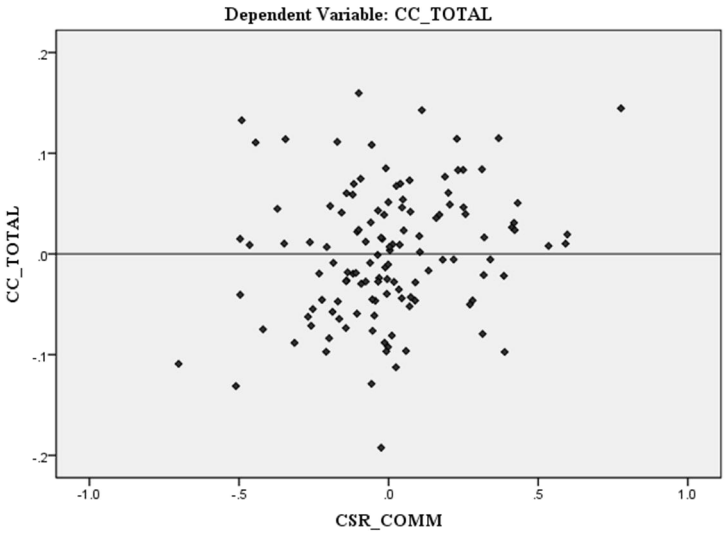

Plot 2: Partial Regression Plots

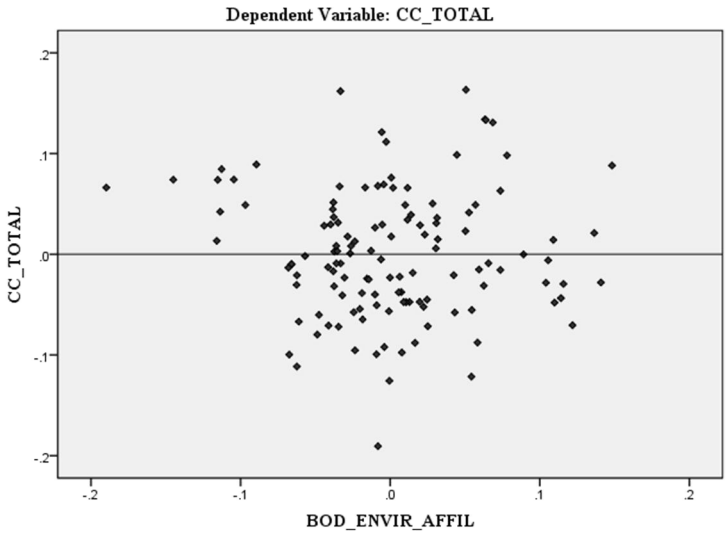


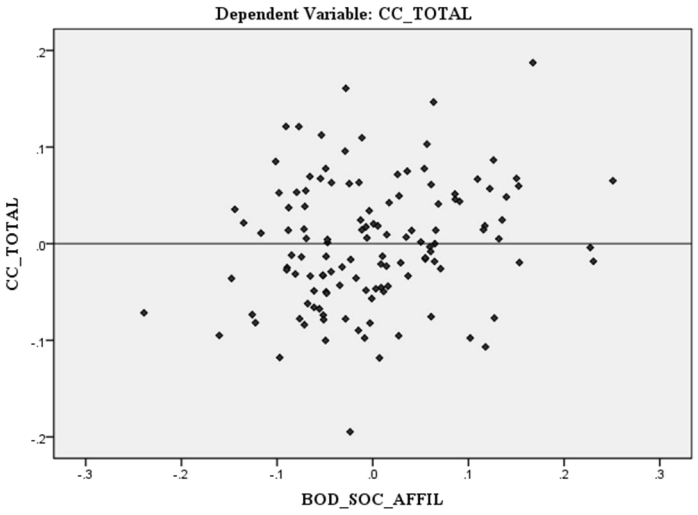



## Appendix G
## Multiple Regression (OLS assumptions)

Plot 2: Partial Regression Plots (continued )

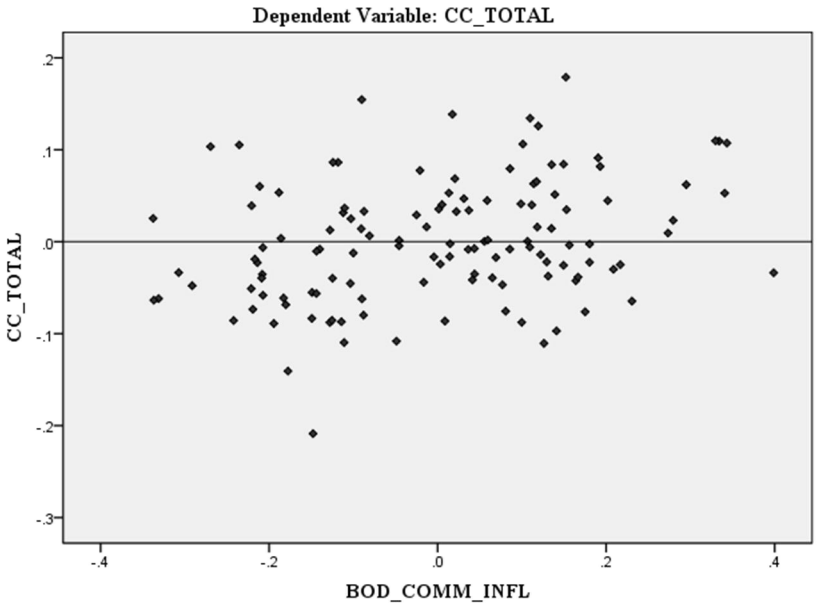


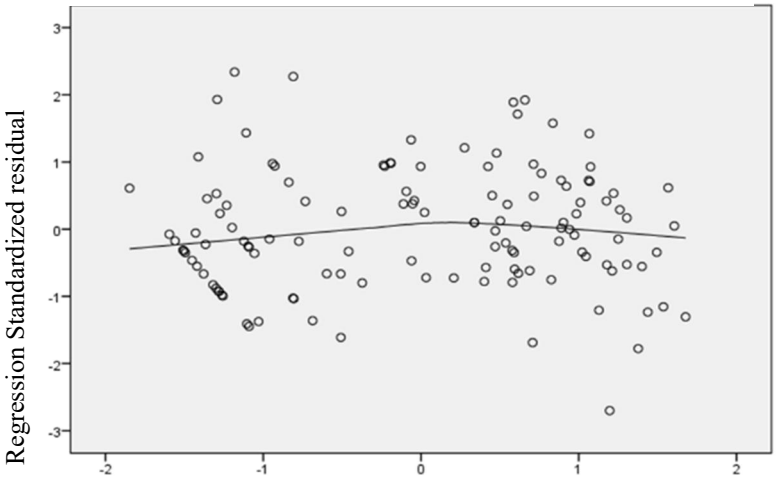



## Appendix G
## Multiple Regression (OLS assumptions)

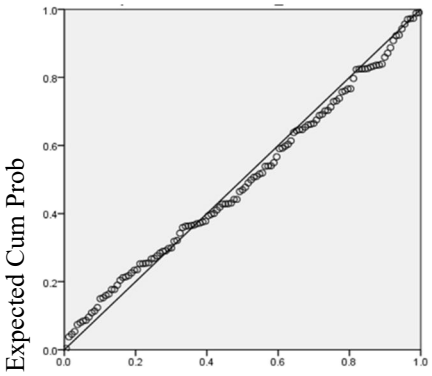
Plot 2: Partial Regression Plots (continued)




Plot 3: Scatterplot of standardized residuals against the standardized predicted value




Plot 4: P-P Plot of Regression Standardized Residual



## Appendix H
## Director affiliations and affiliated organizations (list of examples from data)

| Affiliation | Examples of organisations (and nature of affiliation) |
|---|---|
| Environmental affiliation | Australian Conservation Foundation (president)<br>Australian Institute of Marine Science (chair)<br>Clean Energy Finance Corporation (chair)<br>CSIRO (chair)<br>CSIRO Energy Transformed Flagship Advisory Committee(chair)<br>Global Carbon Capture and Storage Institute (chair)<br>Great Barrier Reef Foundation (chair)<br>Prime Minister Task Group on Emission Trading (member)<br>Snowy-Hydro Electric Scheme (chair)<br>World Wildlife Fund (WWF) (member/trustee) |
| Social affiliation | Anaesthesia and Pain Medicine Foundation (member/patron)<br>Australian Charities Fund (director)<br>Australian Volunteers International (director)<br>Pancreatic Cancer Research Foundation (director)<br>Baker IDI Hearth and Diabetes Institute (treasurer)<br>Brisbane Royal Children's Hospital Foundation (director)<br>Care Australia (director)<br>Cure Cancer Australia (chair)<br>Garvan Institute Medical Research (chair)<br>Harry Perkins Institute of Medical Research Inc. (chair)<br>Juvenile Diabetes Foundation (CEO)<br>Juvenile Diabetes Research Foundation Advisory Council<br>Missions Australia (board member)<br>Neurosurgical Research Foundation (member/patron)<br>Nossal Institute of Global Health (chair)<br>Oxfam (trustee)<br>Prince Henry's Institute of Medical Research (chair)<br>Schizophrenia Research Foundation (board member)<br>Smith Family (chair)<br>Starlight Foundation (chair)<br>Very Special Kids (governor and foundation board member)<br>WA Institute for Medical Research Incorporated (director)<br>World Vision and Ladder Project (director) |
| Community affiliation | *Sport, art, music and culture*<br>Art Gallery of NSW<br>Australian Business Arts Foundation (director)<br>Australian Chamber of Orchestra Council (Chair)<br>Australian Council for the Arts (chair)<br>Australian Football League (Commissioner)<br>Australian Rugby League Commission Limited (director)<br>Australian Rugby Union<br>Australian Sports Commission<br>Australian Sports Drug Agency (director)<br>Australian Tourism Commission<br>Basketball Australia (Chair)<br>Essendon Football Club (deputy chair)<br>Freemantle Football Club (director)<br>Melbourne Symphony Orchestra (chair)<br>Museum of Contemporary Art (Director)<br>Museum of Contemporary Art (director)<br>Sydney Cricket and Sports Ground Trust (deputy director)<br>Sydney Theatre Company Foundation (Chair)<br>Tennis Australia<br>WA Football Commission<br>WA Opera Company Inc (director) |

## Appendix H
## Director affiliations and affiliated organizations (list of examples from data) (continued)

| | |
|---|---|
| Community affiliation | *Government organisation /academic institutions/prominent groups(member/chair/other)*<br><br>Advisory board of University College London School of Energy and Resources<br>Advisory Council of the Australian School of Business (UNSW)<br>APEC Business Advisory Council for Papua New Guinea<br>Auckland University Council<br>Australian High Commissioner<br>Australian Institute of Petroleum<br>Australian Petroleum Production and exploration association (APPEA) (member)<br>Board of governors Rhodes University<br>Board of INSEAD<br>Boards of Jobs NSW<br>Boards of National Petroleum Council, America's national gas alliance<br>Chief Scientist for Commonwealth of Australia<br>College of the National Security College (Head)<br>Committee for the Economic Development of Australia<br>Consultant to Prime Minister<br>Council of Deakin Uni (member)<br>Curtin University (Chancellor)<br>Department of Industry, Science and Resources (secretary)<br>Director of RBA<br>Federal Government Growth Centres Advisory Committee<br>Financial Reporting Council<br>Infrastructure Partnership Australia<br>Manufacturing Council of US Department of Commerce<br>Melbourne Business School (deputy chair)<br>Mining Education Australia (director)<br>Mining Engineering Advisory Board (chair)<br>Minister for Communication and Arts<br>Minister in the British Government<br>National Foreign Trade Council<br>NSW innovation and Productivity Council<br>NSW minerals council and Australian coal association<br>Prime Minister Council of Science and Technology<br>Royal Melbourne Institute of Tech (RMIT) (Chancellor)<br>Safe Work Australia<br>Senate Finance Committee and the UQ Faculty of Health Sciences Board<br>Sydney Medical School Deans Advisory Board<br>Tourism Australia<br>University of Melbourne Archives Advisory Board<br>University of Wollongong (Chancellor)<br>UWA business school advisory board<br>UWA Strategic Resources Committee (Chair) |

## Appendix I
## List of sample companies

| ASX Code | Companies* | GISC |
|---|---|---|
| BHP | BHP Billiton Limited | Materials |
| TLS | Telstra Corporation Limited | Telecommunication |
| WES | Westfarmers Limited | Food & Staples |
| CSL | CSL Limited | Pharmaceutical |
| WOW | Woolworths Limited | Food & Staples |
| WPL | Woodside Petroleum Limited | Energy |
| RIO | Rio Tinto Limited | Materials |
| TCL | Transurban Group Limited | Transport |
| BXB | Brambles Limited | Commercial services and supplies |
| AMC | Amcor Limited | Materials |
| ORI | Origin Energy Limited | Energy |
| RHC | Ramsay Health Care Limited | Health Care Equipment & Services |
| SYD | Sydney Airport Limited | Transportation |
| AZJ | Aurizon Limited | Transportation |
| OSH | Oil Search Limited | Energy |
| AGL | AGL Energy Limited | Utilities |
| RMD | Resmed Inc | Health Care Equipment & Services |
| NCM | Newcrest Mining Limited | Materials |
| APA | APA Group | Utilities |
| CWN | Crown Resorts Limited | Consumer Services |
| CTX | Caltex Australia Limited | Energy |
| SHL | Sonic Healthcare Limited | Health Care Equipment & Services |
| ORI | Orica Limited | Materials |
| STO | Santos Limited | Energy |
| JHX | James Hardie Industries | Materials |

*presented by market capitalisation at 30 June 2015, that meet selection criteria outlined in Chapter 4

## Appendix J
## List of ECC_Total** by company (Yr1 to Yr5)

LAGERS <----------> LEADERS

| Company | Yr1 % | Yr2 % | Yr3 % | Yr4 % | Yr5 % | IND SEC |
|---|---|---|---|---|---|---|
| RIO TINTO LIMITED | 54.10 | 57.38 | 57.38 | 54.10 | 52.46 | MAT |
| WOOLWORTHS LIMITED | 53.33 | 53.33 | 56.67 | 58.33 | 61.67 | MAT |
| BHP BILLITON | 52.46 | 54.10 | 57.38 | 62.30 | 65.57 | FOOD_STA |
| AMCOR LIMITED | 45.90 | 55.74 | 57.38 | 44.26 | 49.18 | MAT |
| NEWCREST MINING LIMITED | 44.26 | 44.26 | 49.18 | 49.18 | 32.79 | MAT |
| SANTOS LIMITED | 48.33 | 56.67 | 56.67 | 50.00 | 58.33 | ENERGY |
| WESFARMERS LIMITED | 41.67 | 48.33 | 50.00 | 45.00 | 50.00 | FOOD_ST |
| WOODSIDE PETROLEUM LTD | 41.67 | 45.00 | 48.33 | 51.67 | 51.67 | ENERGY |
| AGL ENERGY | 38.33 | 38.33 | 48.33 | 58.33 | 55.00 | UTIL |
| CSL LIMITED | 33.33 | 33.33 | 33.33 | 33.33 | 35.00 | PHARM |
| ORICA LIMITED | 34.43 | 34.43 | 32.79 | 37.70 | 39.34 | MAT |
| TELSTRA CORPORATION LTD | 36.67 | 46.67 | 48.33 | 51.67 | 53.33 | TEL |
| TRANSURBAN GROUP LTD | 33.33 | 33.33 | 35.00 | 31.67 | 43.33 | TRANSP |
| OIL SEARCH LIMITED | 26.67 | 31.67 | 40.00 | 40.00 | 40.00 | MAT |
| BRAMBLES LIMITED | 20.00 | 30.00 | 40.00 | 38.33 | 38.33 | COMMERC |
| ORIGIN ENERGY LIMITED | 15.00 | 15.00 | 16.67 | 18.33 | 23.33 | ENERG |
| APA GROUP | 8.33 | 8.33 | 8.33 | 8.33 | 8.33 | UTIL |
| CALTEX AUSTRALIA LIMITED | 3.33 | 3.33 | 10.00 | 10.00 | 10.00 | ENERG |
| RESMED INC | 1.67 | 20.00 | 20.00 | 20.00 | 20.00 | HEALTH |
| JAMES HARDIE INDUSTRIES PLC | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | MAT |
| AURIZON LIMITED | 0.00 | 0.00 | 0.00 | 20.00 | 26.67 | TRANSP |
| CROWN RESORTS LIMITED | 0.00 | 0.00 | 8.33 | 38.33 | 25.00 | CONSUM |
| RAMSAY HEALTH CARE LIMITED | 0.00 | 0.00 | 0.00 | 11.67 | 11.67 | HEALTH |
| SONIC HEALTHCARE LIMITED | 0.00 | 8.33 | 8.33 | 8.33 | 8.33 | HEALTH |
| SYDNEY AIRPORT | 0.00 | 0.00 | 0.00 | 20.00 | 40.00 | TRAN |

KEYS

**ECC_Total is the total disclosure score attained by the company as a proportion of total maximum score, using the ECC Index

> 50% for all years

>40% for all years

>30% for all years

<30% for Yr1 with improvements over the 5 year period