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DETERMINANTS OF CARBON FINANCIAL ACCOUNTING AND  
CARBON DISCLOSURE PRACTICES: AN EXPLORATORY STUDY ON  
FIRMS AFFECTED UNDER EMISSION TRADING SCHEMES

A thesis presented in fulfilment of the requirements for the degree of  
Doctor of Philosophy  
in  
Accountancy  
at Massey University, (Albany), New Zealand

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2016

## ABSTRACT

**Purpose:** The purpose of this study is to investigate how and why the Emission Trading Scheme (ETS) affected firms are disclosing and financially accounting for carbon within a voluntary disclosure setting.

**Methodology and Data Sources Used:** The study is framed within institutional theory and examines inconsistencies and a lack of transparency in the carbon financial accounting and carbon disclosure practices of ETS affected firms. Findings are presented as empirical evidence to support the demand for uniform mandatory carbon financial accounting and disclosure guidance. The relation between various institutional pressures is also identified - coercive (i.e. regulations), mimetic (i.e. size, leverage, listing status and industry), and normative (i.e. auditors). Firms' carbon related disclosure practices and the way carbon financial accounting is being conducted by the firms affected under the EU ETS, Australian Carbon Tax and NZ ETS are examined to identify the incentives that may be motivating these firms' adoption of carbon financial accounting policy and the extent of their disclosures. The 2013 Annual reports of the UK, Australian and New Zealand companies affected under the European Union Emission trading scheme, Australian Carbon Tax and New Zealand ETS are analysed. The affected companies are selected from Carbonmarketdata Database (for UK companies), Liable Entities Public Information Database (LEPID) (for Australian companies) and New Zealand Emission Unit Registry Database (for New Zealand companies). Content analysis is implemented for the purpose of data collection from the annual reports. The IFRIC 3 template is used to identify the recognition, measurement and reporting practices of the affected companies for carbon emission allowances by five stages of the carbon emission allowances transactions namely when these carbon emission allowances are (1) received for free, (2) purchased, (3) used, (4) sold, and, (5) surrendered.

**Findings:** Inconsistencies in the carbon financial accounting practices and diversity in the carbon disclosure of ETS affected firms are observed. Whilst they treat carbon emission allowances as intangible assets, most ETS firms are providing incomplete information on their carbon financial accounting practices. Some firms did not specify how they are 'recognising' carbon emission allowances and in some cases, others did not specify how they are 'measuring' carbon emission allowances. The extent of carbon disclosure was also low for most ETS firms. The findings also provide some empirical evidence of the institutional pressures, especially coercive (regulation) and mimetic pressures (size and listing status) which are the main determinants of the ETS affected firms' carbon financial accounting practice and the extent of carbon disclosure.

**Research Contribution & Implications of Research Impact:** The findings of this study will assist accounting policy makers in understanding *how* and *why* the affected companies financially account and disclose their carbon allowances in certain ways. This can assist the development of a uniform carbon financial accounting and disclosure guidance, especially when the IASB is yet to issue any draft guidance on the financial accounting of carbon. Additionally, the findings presented by this study will be useful for establishing guidelines for auditors to help affected companies financially account and disclose carbon allowances and other carbon emission related information. Lastly, given the scant amount of studies in the field of financial accounting for carbon emissions under ETS, this research will also give meaningful insights to academics and researchers.

## PREFACE AND/OR ACKNOWLEDGEMENTS

Words fall short as I express my heartfelt gratitude to all the people who have been instrumental in helping me not just undertake this research, but also complete my journey as a PhD student. Life as a PhD student is really challenging, but with the blessings of the almighty and with the support of all these wonderful people in my life, my journey throughout the research and writing of this thesis actually turned out to be an enriching and enjoyable experience.

To begin with, all my supervisors – Professor Jill Hooks, Professor Asheq Rahman and Dr Borhan Bhuiyan, deserve a substantial credit in my work. I consider myself really fortunate to have had them as my supervisors, for their knowledge, experience and determination helped me grow as a PhD student. Dear supervisors, your keen critical eye ensured that I tried to address the research problem and that the results were theoretically sound, empirically correct and presented in a concise, specific manner.

Professor Hooks, I am immensely grateful to you for all your insightful and quick feedback, your support, your dedication, your encouragement, your concern and most importantly for being so understanding and patient towards me throughout the journey. Your positivity always made it seem that I was close to completing my thesis and I would thus look forward to finishing every step involved in writing this thesis with full enthusiasm and energy. You have been truly amazing and really made my journey easy.

Professor Rahman, you are the reason why I was motivated to do a PhD. You were not just my supervisor, but also someone who helped me realise my true potential as a student. I still remember, back during my bachelor's, if there was someone who strongly believed in my ability to come this far, it has always been you. Your advice on both my research, career and life in general, are priceless. You taught me to stay focussed, determined and most importantly helped me understand what the journey as a PhD student is all about. The encouragement, strength and motivation which I received from you and Professor Hooks, I shall never forget, as these helped me overcome all the odds which I experienced in the last few years of my journey as a PhD student. You and Professor Hooks have truly been a huge pillar of support and I shall forever be grateful to you both for this.

Dr Bhuiyan, thank you so much for being so helpful. You have been so patient towards me. You helped me gain further knowledge on statistics, without which this thesis would have been incomplete. Your input on the way I should present my ideas in the thesis were really valuable. You not only encouraged me to be creative, but also taught me to refine my research outputs so that they have the right impact on the readers of the thesis. Really, thanks for the same.

A huge thanks is also owed to Massey University and the Massey Business School Head, Professor Fawzi Laswad, for all the funding approved for my thesis. This financial support enabled me to have my data validated by an external validator and also helped enhance my thesis further through the proof reader – without which my thesis would have been incomplete.

To Haris, my PhD colleague, a big thank you for agreeing to be the external validator and for all your valuable input. Your feedback gave me the confidence that the data for the thesis has been collected appropriately and that the remaining data can be collected and analysed for the research work. Thanks once again for your wonderful support, Haris.

Mary Rossiter, thanks heaps for helping with proofreading the thesis. Your efforts are truly valuable and absolutely played a big role in bringing my thesis to its final state. A big thank you to you, too.

My thesis also greatly benefited from the feedback I received from Massey University's PhD symposium and SARS conferences. From the bottom of my heart, I wish to thank all the people who showed interest in my research and gave invaluable feedback on how my research could be improved further.

I also wish to deeply thank Professor Qingliang Tang from Western Sydney University for his time, valuable suggestions and guidance on my research topic. Thank you so much Sir, for your feedback gave me further insight on the Australian Carbon Pricing Mechanism.

To all my PhD colleagues – Oyuna, Haris, Fawad and Shahin – and the entire academic and administrative staff of Massey University's Business School: thanks for being there always, for all your guidance, help and encouragement. Attending conferences and presenting my thesis became a fun and enriching experience with you guys around. It was amazing having you all around as you guys not just boosted my confidence during my presentations, but also made the PhD a fun-filled experience with lots of laughter and good times together. Thanks heaps.

I also feel fortunate to have been a student of Massey University (Albany Campus). Both the environment and the facilities provided by Massey University, including the study rooms and the well-equipped library and disability support services, made PhD study an easy and a smooth experience for me.

A special thanks to my brothers, sisters-in-law and all my relatives, and Aunty Indu for their encouragement and for always making me feel proud of my work. A big hug to my little niece Mehr, who has truly been an angel and a positive force in my life. Her cute antics would always bring a smile to my face and kept me positive during my journey as a PhD student.

Last, but not the least, no amount of words can express the gratitude I feel towards my parents for their unconditional and steady support throughout my life and throughout all my studies to date. I feel blessed and fortunate to have their blessings and love. Mama, Papa, you both have been truly instrumental in making me realise the value of education and in making me the person I am today. You both not only sacrificed a lot, but also gave me the utmost courage to perform to the best of my ability, no matter what. You both inspired me to not just dream, but also helped me make the dream happen. Mama, I really admire your resolve and patience in taking such good care of me and being there for me always. You have always been my biggest source of strength. Papa, you were my inspiration and I shall never forget the times where you have showed your support by trying to help me in understanding accountancy during my initial days as a bachelor's student, albeit it was not your subject to begin with. I shall never forget those late nights where you stayed awake despite being tired after returning from work the whole day, only so that you could try to help me in my studies back then. Those moments are precious, as they show the amount of unconditional support you gave me for my studies. You both inspired me to work hard and were always by my side when times were tough. Love you both.

## DEDICATION

I dedicate this thesis to my parents for their unconditional love and support  
and for helping me achieve my dream.

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## LIST OF ABBREVIATIONS

CDP	Carbon Disclosure Project
CERS	Certified Emission Reduction Units
CPRS	Carbon Pollution Reduction Scheme
EFRAG	European Financial Reporting Advisory Group
ETS	Emissions Trading Scheme
EU ETS	European Union Emissions Trading Scheme
GRI	Global Reporting Initiative
LEPID	Liable Entities Public Information Database
NGER	National Greenhouse and Energy Reporting
NZ ETS	New Zealand Emissions Trading Scheme
NZ EUR	New Zealand Emission Unit Register
UNFCCC	United Nations Framework Convention on Climate Change

## Chapter 1: Introduction

*Different actions developed to tackle global climate change have accounting implications that deserve the research of accounting academics.*

(Bebbington and Gonzalez, 2008, p. 712)

### 1.1 Motivation and Research questions

There is currently no uniform guidance on financially accounting for carbon nor is there a uniform mandatory carbon disclosure requirement for firms affected under Emission Trading Schemes (i.e. ETSs). The disclosure setting is therefore voluntary. The absence of guidance can lead to inconsistencies in carbon financial accounting practices and a lack of transparency in carbon disclosure practices. This is likely to lead to issues in comparability of financial statements for investors and stakeholders; insufficient information will make it difficult for stakeholders to make informed decisions. Thus, given the increasing relevance of carbon financial accounting and the carbon disclosure practices of ETS affected firms, research on the way in which the firms affected under ETS are financially accounting for and providing carbon related disclosure, can provide useful information to accountants, auditors, accounting standard setters, investors, financial report preparers, researchers, government, regulators and other stakeholders (KPMG, 2008; Elfrink & Ellison, 2009; Haque & Deegan, 2010; Warwick & Ng, 2012).

With carbon as a material commodity that needs to be financially accounted for in different lifecycles (i.e. when received for free, when purchased, when used, when sold and when surrendered), and given the voluntary setting, ETS affected firms need guidance on how they could financially account for carbon in each of those lifecycles or phases. Thus, knowledge of ETS affected firms' carbon financial accounting practices is essential as it will help provide guidance to all other ETS affected firms on how they could financially account for carbon emission allowances. It will also help enhance the preparation and comparability of financial statements for accountants, auditors, financial report preparers, investors and other stakeholders, for decision making. The findings on carbon financial accounting practices will also provide empirical evidence on whether there are inconsistencies in the carbon financial accounting practices of the ETS affected firms. This evidence can thus support the demand for uniform carbon financial accounting guidance. This study is also timely and of significance to the accounting community

and the ETS affected firms and regulators who are seeking ideas on how to fill the void created by the withdrawal of carbon financial accounting guidance (i.e. the International Financial Reporting Interpretations Committee, interpretation 3 or IFRIC 3).

Knowing how ETS affected firms are providing carbon disclosure is essential as it will provide empirical evidence on whether there is diversity and/or a lack of transparency in the carbon disclosure practices of these firms. Any evidence found of a lack of transparency will add further support to the demand for a mandatory carbon disclosure requirement. Additionally, it will provide insight on the carbon disclosure areas that are of interest to stakeholders but are not being properly addressed and disclosed by ETS affected firms. Research suggests that there is clear evidence of a demand for disclosure around ETS affected firms' strategies and policies that have been implemented in order to deal with climate change (and ETSs) (Haque & Deegan, 2010). This is because these firms are expected to play an important role in stabilising climate change, and the control of greenhouse gas emissions is important for sustainable corporate development (Kauffman & Less, 2010; Rankin, Windsor & Wahyuni, 2011; Luo & Tang, 2014). Additionally, the increased risks faced by the firms affected under ETSs have caught the attention of various stakeholders such as institutional investors, banks, accounting firms, governmental agencies, NGOs and consumers, and there is a demand for disclosure regarding corporate climate change practices (Rankin et al., 2011; Eleftheriadis & Anagnostopolou, 2014). Thus, insight on the areas of carbon disclosure that are currently not being properly addressed by the ETS affected firms will help enhance the transparency of carbon related disclosures. Such transparency can further help inform investors and stakeholders of the firms' activities.

In addition to the knowledge of *how* the affected companies are financially accounting for and disclosing information on carbon emission allowances, it is also necessary to know *why* the affected companies are accounting for or disclosing carbon related information. In other words, what institutional pressures (or firm characteristics and market features – classified under coercive, mimetic and normative institutional pressures) influence an ETS affected firm's carbon financial accounting and carbon disclosure practices. Despite the lack of a carbon financial accounting standard and most of the carbon disclosure not being mandatory, many companies are taking a proactive emission reduction approach and not only financially accounting for carbon using IAS 8, but also making carbon disclosures (Luo, Lan & Tang, 2012). This motivates the need to investigate why some of the companies affected under ETSs, prefer to incorporate carbon financial accounting and disclosure as a part of their business operations and strategy, whilst others do not (Luo et al., 2012). Additionally, an understanding of how firms interpret and respond to the three institutional pressures is essential to establishing a regulatory and cultural framework for a low carbon environment (Luo et al., 2012). Since

there have also been discussions of enhancing climate change related corporate disclosures and accounting practices (Eleftheriadis & Anagnostopoulou, 2014), a contribution can be made to this discussion by outlining the firm characteristics and market features that are most likely to have a positive effect on carbon financial accounting and carbon disclosure practices. A study on the determinants of carbon financial accounting and carbon disclosure practices is therefore essential at this stage as it will help identify the institutional pressures or firm characteristics/market features that drive carbon financial accounting and carbon disclosure practices. These institutional pressures or firm characteristics/market features can further be considered by policy makers in their strategy to improve the uniformity and comparability of the carbon financial accounting and carbon disclosure practices of the ETS affected firms.

Thus, the study specifically addresses the following research questions:

Research question 1: How are the firms affected under ETSs financially accounting for carbon emission allowances in the absence of uniform accounting guidance?

Research question 2: How are the firms affected under ETSs providing carbon disclosure in the absence of a uniform mandatory carbon disclosure requirement?

Research question 3: What institutional pressures, in the form of firm characteristics and market features, are influencing the ETS affected firms' carbon financial accounting and carbon disclosure practices, in the absence of uniform accounting guidance and limited mandatory carbon disclosure requirements?

This study is of significance as it will help understand *how* and *why* the ETS affected firms financially account for and disclose carbon emission related information. This knowledge is essential and timely as the findings of 'how' and 'why' can help provide guidance to the ETS firms and the accounting professionals on the carbon financial accounting and carbon disclosure practices they can adopt, in the absence of any existing uniform guidance. This can further enhance the carbon financial accounting and carbon disclosure practices of the ETS affected firms by reducing inconsistencies in their carbon financial accounting practices and increasing their carbon disclosure transparency. Finally, the findings of the study will also help the accounting communities and regulators to develop and establish carbon financial accounting and carbon disclosure guidelines for accountants and auditors to ensure uniformity in carbon financial accounting and carbon disclosure practices.

## 1.2 Background

The Kyoto Protocol came into force in February 2005, with the first commitment phase starting in 2008 and ending on 31 December 2012 (UNFCCC<sup>1</sup>, 2015). Its purpose was to prevent the increasing impacts of human-induced climate change. It was negotiated in Kyoto, Japan, by an international community consisting of nearly 175 countries from all over the world as well as the European Union (EU) (CPA Australia, 2008; Jee Hoon, 2010). The Protocol basically sets legally binding targets and timetables for cutting the greenhouse gas emissions of 37 industrialised countries (those that have ratified the Protocol) and European nations (CPA Australia, 2008; Jiang, Sharp & Sheng, 2009). Later on, during a conference held in November 2012 in Doha, it was decided to proceed with the second phase from 1 January 2013 to 31 December 2020 (UNFCCC, 2015). To assist the countries in limiting their greenhouse emissions and meeting their obligations under the Protocol at a lower cost, the Protocol defines three flexibility mechanisms, namely, the clean development mechanism (CDM), joint implementation (JI), and the Kyoto emissions trading scheme mechanism i.e. ETS (CPA Australia, 2008; UNFCCC, 2015) (see Chapter 2 for a detailed discussion on these mechanisms).

Of these emission reduction mechanisms, ETSs have been widely adopted by various countries (e.g. European ETS or EU ETS, NZ ETS, Australian Carbon Tax, etc). The emissions trading schemes have accounting and disclosure implications for the affected companies as a previously costless activity has now become costly, thus creating a carbon market by means of marketable allowances (Cook, 2009).

With carbon as a commodity, there is a need for firms to financially account for their carbon in five different situations i.e. when received for free, when purchased, when used, when sold and when surrendered. Moreover, some of the carbon financial accounting implications arising due to ETSs are whether emission allowances are assets or liabilities and how they should be measured and valued (Elfrink & Ellison, 2009). Due to the introduction of ETSs, stakeholders are seeking and demanding the disclosure of information pertaining to greenhouse gas (GHG) emissions, governance policies adopted for reducing the emission levels to the desired target, as well as any regulatory, financial or physical risks associated with climate change (and ETSs) (for example, the Carbon Disclosure Project (CDP)) (KPMG, 2008; Haque & Deegan, 2010).

Currently, there is an absence of uniform carbon financial accounting guidance and a uniform mandatory carbon disclosure requirement for the firms affected under ETSs. As per the claims of prior studies, this voluntary setting has resulted in inconsistent carbon financial accounting and carbon disclosure practices. This is because firms are using IAS 8 'Accounting policies, Changes in accounting

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<sup>1</sup> United Nations Framework Convention on Climate Change

estimates and errors', which allows them to develop their own accounting policy for an ETS, as long as they are consistent with the underlying IFRS (Warwick & Ng, 2012). Additionally, inconsistencies in carbon disclosure practices may result from firms using different formats to provide carbon related disclosures, or they may even be transparent with respect to their carbon disclosures (Freedman & Jaggi, 2005; Kolk, Levy & Pinkse, 2008; Stanny & Ely, 2008; Doran & Quinn, 2009; Peters & Romi, 2009; Prado-Lorenzo, Alvarez & Sanchez, 2009; Andrew & Cortese, 2011; Berthelot & Robert, 2011; Rankin et al., 2011; Cotter & Najah, 2012; Bae Choi, Lee & Psaros, 2013; Stanny, 2013). Although carbon disclosure is not mandatory in most of the countries in the world (for example, New Zealand) (Luo et al., 2012), some countries have mandatory carbon related disclosure requirements. For example, Australia's NGER Act 2007 requires firms liable under the Australian Carbon Tax to provide disclosure on its Scope 1 and 2 emissions. However, apart from the information that firms may need to mandatorily disclose, there is some information that a firm may also voluntarily disclose, for example, disclosure on the financial accounting policies for carbon emission allowances. In other words, the scope of mandatory carbon disclosure requirements is limited and ambitions for consistent and comparable information are not currently recognised (Bebbington, Unerman & O'Dwyer, 2014).

To support the demand for uniform carbon financial accounting and mandatory carbon disclosure guidance and to back the claims that inconsistencies exist, prior studies in the carbon financial accounting and carbon disclosure area have attempted to provide empirical evidence of inconsistencies in the carbon financial accounting and carbon disclosure practices of the large emitters, firms belonging to Kyoto protocol ratifying countries, or firms responding to the CDP<sup>2</sup> questionnaire. At the time of the study however, there is scant empirical evidence in the carbon financial accounting literature on the inconsistencies in carbon financial accounting practices, with the exception of Warwick and Ng (2012) and Black (2013). Both these studies examined the carbon financial accounting practices of firms with significant emission liabilities under the EU ETS as well as large EU emitters. Both studies reported inconsistencies in the carbon financial accounting approaches of the firms. Prior studies in the carbon disclosure literature have mostly considered various reporting (disclosure) activities (Freedman & Jaggi, 2005; Prado-Lorenzo et al., 2009; Andrew & Cortese, 2011; Lodhia, 2011; Rankin et al., 2011), or the format (for e.g., annual reports, standalone report, etc) in which the reporting and disclosure of carbon information was being observed (Pellegrino & Lodhia, 2012). These studies also reported inconsistencies in the carbon disclosure practices of the firms.

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<sup>2</sup> The CDP (or Carbon Disclosure Project) constitutes an international voluntary code developed by a non-government, non-profit organisation through which investors have encouraged firms to consider disclosure of carbon related issues (namely climate change related risks and opportunities, their greenhouse gas emissions and their climate change management and processes) in decision making.

The current study supports the demand for uniform carbon financial accounting guidance and a uniform mandatory carbon disclosure requirement and provides further empirical evidence on whether inconsistencies in carbon financial accounting and carbon disclosure practices exist. Additionally, the study lends support to current voluntary carbon financial accounting and carbon disclosure practices, by providing guidance based on empirical findings. Compared to prior studies, the present study is timely and specifically focuses on the carbon financial accounting practices of ETS affected firms in more depth (particularly in Australia, New Zealand and the UK), while exploring their carbon disclosure practices. Further, while prior studies have examined just carbon financial accounting practices or carbon disclosure practices, the current study examines both the carbon financial accounting and carbon disclosure practices of ETS affected firms and presents the findings of both these practices in one study.

With 32 countries operating or participating in ETSs globally in 2012, and with other major economies moving towards the adoption of such schemes, worldwide ETSs were worth US \$30 billion in 2014 (Warwick & Ng, 2012; Worldbank, 2014). With the globalization of ETSs on the horizon (Warwick & Ng, 2012), the carbon financial accounting and carbon disclosure practices of ETS affected firms are likely to have increasing international relevance. Therefore, the present study focuses on the carbon financial accounting and carbon disclosure practices of ETS affected firms (rather than just large emitters or other firms as in prior studies). The study assumes ETS affected firms to be different from other firms i.e. the 'emitters', 'large emitting firms' and 'firms from Kyoto Protocol ratifying countries', all of which have been the focus of most studies in the carbon literature. ETS affected firms are considered as different from other firms as irrespective of their size they are not just emitters, but are also directly obliged to participate in carbon trading affairs and are therefore more likely to be under public scrutiny. The other firms may or may not choose to voluntarily participate in the carbon market and therefore may not be very involved in carbon trading. Additionally, ETS affected firms are likely to be under more pressure to provide carbon disclosure, given that they are participants in ETSs, as compared to other firms which may or may not be under public scrutiny. As a result of this, and given the increasing prominence of ETSs, it is essential that a study on the carbon financial accounting and carbon disclosure practices of these ETS affected firms be undertaken, as it will add to the carbon literature by providing more comprehensive and detailed carbon financial accounting and carbon disclosure guidance / recommendations from the perspective of these firms. Findings on carbon disclosure practices will also help to assess if the ETS affected firms appear to be responding to the carbon related information disclosure demand (irrespective of whether the demand for information is mandatory or voluntary) (Sullivan & Gouldson, 2012).

There is also an absence of rigorous research on the issue of carbon financial accounting in the Australasian and world contexts. Prior literature in the carbon financial accounting and carbon disclosure area does not appear to have surveyed the carbon financial accounting and disclosure practices of the firms affected under the oldest ETSs nor those affected under recent ETSs. A study on the carbon financial accounting and carbon disclosure practices of the firms affected under the oldest and more recent ETSs will add to the carbon literature by providing a comparison between the practices adopted by these firms. At the time of the study, Australia and New Zealand were recent entrants to the carbon market with ETSs whereas the UK, being a part of the European Union, was the oldest entrant (see Chapter 2 for detailed discussion on these ETSs). While the EU ETS was introduced in 2005, New Zealand's ETS has been operating since 2008 (Climate Change Information New Zealand, 2009). Following this, Australia's Emission Trading Scheme, known as the Australian Carbon Tax, came into force on 1 July 2012 (Clean Energy Regulator, 2015). As such, the study specifically focuses on the accounting and disclosure implications for UK, Australian and New Zealand firms affected under their respective ETSs.

The study uses institutional theory to explain the determinants behind carbon accounting and disclosure practices. At the commencement of the study, there did not appear to be any studies in the carbon financial accounting area that used institutional theory to examine carbon financial accounting practices. Other relevant prior studies were, however, considered, including those in the carbon disclosure area which used other theoretical perspectives to explain financial accounting and carbon disclosure practices. While some studies in the financial accounting area used positive accounting theory (Rahman, Perera & Ganesh, 2002; Waweru, Prot Ntui & Mangena, 2011), other studies adopted a costly contracting theory approach (Astami & Tower, 2006) to explain why firms voluntarily account for carbon. Likewise, prior studies in the carbon disclosure area used socio political economy theory, legitimacy theory, stakeholder theory and institutional theory to explain why firms may voluntarily provide carbon disclosure (Freedman & Jaggi, 2005; Stanny & Ely, 2008; Rankin et al., 2011; Tang & Lua, 2011; Luo et al., 2012; Pellegrino & Lodhia, 2012; Bae Choi et al., 2013; Haque, Deegan & Inglis, 2013; Jira & Toffel, 2013; Stanny, 2013). Most of these studies were undertaken from a multiple theory perspective i.e. they used more than one theory to explain the carbon disclosure practices of firms. In contrast, the current study adds to Rankin et al. (2011) who used an institutional theory to explore the determinants of carbon disclosure practices of ETS affected firms.

Institutional theory is used as it provides a complementary, rather than competitive, perspective to both stakeholder and legitimacy theory (Deegan, 2011). Using institutional theory, the study hypothesizes that carbon financial accounting and carbon disclosure practices are influenced by the ETS affected

firms' institutional pressures, namely, coercive, mimetic and normative pressures. In other words, the study uses the framework of 'institutional theory' and considers the EU ETS, the Australian Carbon Tax and the NZ ETS, as the institutional setting changes that have given rise to the carbon financial accounting and carbon disclosure issues in Australia, New Zealand and the UK. Regulations are coercive pressures whereas variables like firm size, listing status, leverage and industry are mimetic pressures. Big4 auditors are normative forces that could be influencing the ETS affected firms' carbon financial accounting and carbon disclosure practices, given the lack of uniform carbon accounting guidance and limited mandatory disclosure requirements.

Major variables pertaining to firm characteristics and market features (Regulation, Firm size, Leverage, Industry/Sector) that were found to have a positive or significant relationship with the firms accounting policy or carbon disclosure, were derived from prior financial accounting and carbon disclosure literature and considered for the study. Two variables (Auditors and Listing status of a firm) that were seldom used in prior studies, were also considered. All these variables were classified under the different institutional pressures, namely coercive (i.e. Regulation), mimetic (i.e. Firm size, Leverage, Listing status and Industry) and normative (i.e. Auditors). The purpose of doing so was to investigate if any or all of these institutional variables could explain the firms' motivation for carbon financial accounting and carbon disclosure.

Thus, the study investigates UK, Australian and New Zealand ETS affected firms' carbon financial accounting and carbon disclosure practices and also examines the determinants of institutional pressures behind these practices, given the voluntary setting.

### 1.3 Research purpose and objectives

The purpose of this study, therefore, is to investigate how and why the ETS affected firms are financially accounting for carbon and providing carbon disclosure, given the voluntary setting. Another objective is to examine if there are inconsistencies and/or a lack of transparency in the carbon financial accounting and carbon disclosure practices of the ETS affected firms. If inconsistencies and/or a lack of transparency are found then these findings will provide empirical evidence in support of the demand for uniform mandatory carbon financial accounting and disclosure guidance. In addition to this analysis the relation between (1) coercive institutional pressures (i.e. regulations), mimetic institutional pressures (i.e. firm size, leverage, listing status and industry), and normative institutional pressures (i.e. auditors); and (2) firms' carbon related disclosure practices along with the way carbon financial accounting is

being conducted by the firms affected under the EU ETS, Australian Carbon Tax and NZ ETS, will be examined to identify the incentives that may be motivating these firms' adoption of carbon financial accounting policies and their carbon disclosure level.

## 1.4 Methodology

A quantitative method was used as the study required a deductive approach to examine whether a theory (i.e. institutional theory) could explain the determinants behind the carbon financial accounting and carbon disclosure practices of the ETS affected firms. Assessing these practices in accordance with the IFRIC3 template and carbon disclosure checklist, required professional judgement and an interpretive approach. This involved subjective judgement but the assessment was performed by two researchers in order to validate the scoring. Annual reports for the year 2012-2013 of UK, Australian and New Zealand firms affected under the European Union ETS, the Australian Carbon Tax and the New Zealand ETS are analysed. Annual reports are used as they represent the most important channel for the firms to self-present their situation and communicate their corporate strategy to investors and stakeholders (Abrahamson & Hambrick, 1997; Song, Wang & Cavusgil, 2015). The ETS affected firms are selected from the Carbonmarketdata database, the Liable Entities Public Information Database (LEPID) and the New Zealand Emission Unit Registry Database. Content analysis is implemented for the purpose of data collection. The IFRIC 3 template is used to identify the recognition, measurement and reporting practices of the affected companies for carbon emission allowances by five stages of the carbon emission allowances transactions, namely, when these carbon emission allowances are (1) received for free, (2) purchased, (3) used, (4) sold, and, (5) surrendered. Similarly, for the purpose of coding a company's carbon emission related disclosure practice, a coding framework is used that was developed based on a checklist derived from the Carbon Disclosure Project (CDP) and further modified by Bae Choi et al. (2013). Finally, logistic regression analysis is performed on the data using SPSS.

## 1.5 Outline of thesis

The study is structured as follows. Chapter 1 (*Introduction*) provides the motivation, background and outline of the thesis. Chapter 2 (*Carbon Markets and Emission Trading Schemes*) provides an insight on what constitutes the carbon market. It begins by describing the early market mechanisms that existed (but were not popularly used) before the Kyoto Protocol was introduced. It then describes the current carbon market instruments and their mechanisms as well as similarities and differences

between each of these mechanisms. The chapter discusses ETSs and specifically focusses on the EU ETS, the Australian Carbon Tax and the NZ ETS. Finally, the chapter identifies the key issues (i.e. the carbon financial accounting and carbon disclosure issues) resulting from ETSs and notes that ETSs result in the need for affected firms to financially account for and provide carbon disclosure since carbon is now a material product with a price attached to it.

Chapter 3 (*Lack of empirical evidence on the inconsistencies in the Carbon Financial Accounting practices of ETS affected firms*) discusses the reason behind undertaking the first research question i.e. how are ETS affected firms financially accounting for carbon? In Chapter 2, the carbon financial accounting issues arising from ETSs are highlighted, and Chapter 3 notes that ETS affected firms may have inconsistent carbon financial accounting practices. Empirical evidence on the inconsistencies in carbon financial accounting practices is needed to provide strong support for uniform carbon financial accounting guidance. The chapter posits that uniform carbon financial accounting guidance is essential at this point of time as the absence of it may lead to inconsistencies in the financial statements of the firms and further lead to issues with their comparability. Following this, the chapter discusses prior studies in the carbon financial accounting literature with empirical evidence on the inconsistencies in carbon financial accounting practices. A gap in the literature is made apparent by the lack of empirical evidence of whether inconsistencies in the carbon financial accounting practices of ETS affected firms exist, and it is this gap that the first research question of the study attempts to address.

Chapter 4 (*Lack of empirical evidence on the inconsistencies in the Carbon Disclosure practices of ETS affected firms*) discusses the reasoning behind the second research question i.e. how are ETS affected firms providing carbon disclosure? Having highlighted that ETSs give rise to carbon disclosure issues as in Chapter 2, this chapter notes that ETS affected firms may be less transparent in their carbon disclosure. Empirical evidence is needed on the lack of transparency in carbon disclosure practices in order to give support for a uniform mandatory carbon disclosure requirement. The chapter highlights that a uniform requirement is essential at this stage as the absence of it may lead to a lack of transparency in the carbon disclosure practices of ETS affected firms. Following this, the chapter discusses prior studies in the carbon disclosure literature with empirical evidence on the lack of transparency in carbon disclosure practices. A gap in the literature is made apparent by the lack of empirical evidence on whether there is a lack of transparency in the carbon disclosure practices of ETS affected firms, and it is this gap that the second research question of this study attempts to address.

Chapter 5 (*Factors influencing a firm's decision to financially account for and disclose voluntarily*) discusses the reason behind undertaking the third research question i.e. what factors are influencing

the ETS affected firms' carbon financial accounting and carbon disclosure practices? The chapter notes that empirical evidence on the determinants of the carbon financial accounting and carbon disclosure practices of ETS affected firms is essential as it will help understand what motivates firms to voluntarily account for carbon and provide carbon disclosure. The chapter also states that the information on these determinants is needed to help policymakers in planning their strategy on how they could further improve uniformity and comparability of carbon financial accounting and carbon disclosure practices. The chapter first discusses the different theoretical perspectives that have been adopted by prior studies in the carbon literature to explain why firms may be involved in voluntary (accounting and carbon disclosure) practices, and notes that most studies have used a multiple theory approach, with institutional theory being the least adopted perspective. To fill this gap, the chapter takes a single theory approach using an institutional theory framework and asserts that the carbon financial accounting and carbon disclosure practices of the firms are driven by three institutional pressures, namely coercive, mimetic and normative pressures. Finally, the chapter discusses the variables examined by prior studies, classifies them under the three institutional pressures, and discusses the hypothesis for addressing the third research question.

Chapter 6 (*Methodology*) identifies the research method and design that is used for exploring the carbon financial accounting and carbon disclosure practices of the firms affected under the EU ETS, the Australian Carbon Tax and the NZ ETS.

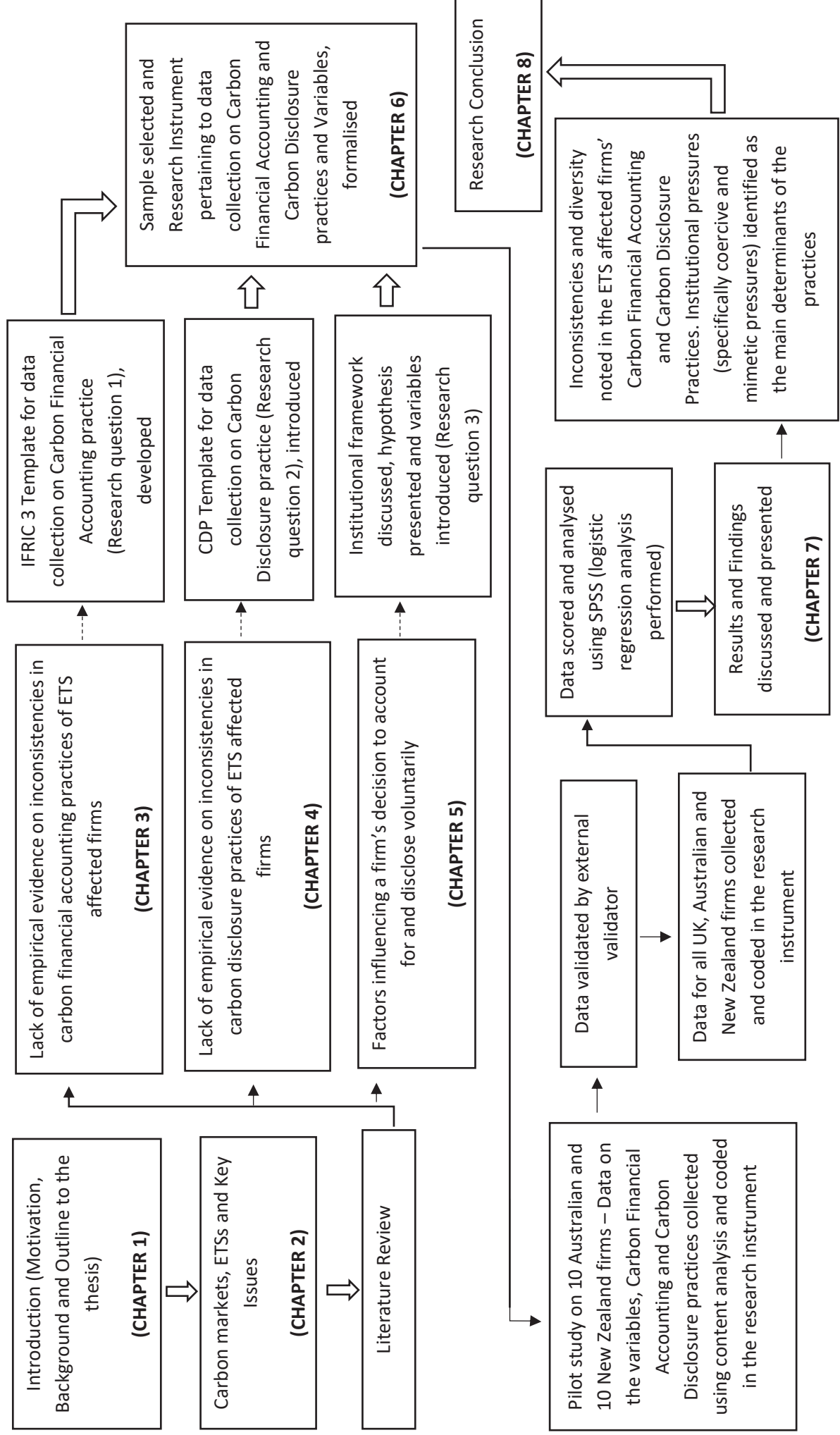
Chapter 7 (*Results and Discussion: The Carbon Financial Accounting practices, the Carbon Disclosure practices and their determinants*) presents and discusses the findings pertaining to each of the study's three research questions. The findings on the carbon financial accounting practices of the ETS affected firms, the carbon disclosure practices of the ETS affected firms, and the determinants of these carbon financial accounting and carbon disclosure practices are discussed. The findings are presented from the data collected from the sample of UK, Australian and NZ firms' annual reports.

Chapter 8 (*Summary, Limitations, Future research, Conclusion and Recommendations*) presents a summary of the research and its findings and discusses the study's limitations. The chapter also presents some conclusions on the findings and gives suggestions for future research. Some recommendations are also provided.

Figure 1.1 shows the overall structure of the research.

Figure 1-1: Research Structure

Determinants of Carbon Financial Accounting and Carbon Disclosure Practices: An Exploration of Firms affected under Emission Trading Schemes (ETSs)



## Chapter 2: Carbon Markets, Emission Trading Schemes and Key Issues

### 2.1 Introduction

The purpose of this chapter is to give insight on how ETSs work and set the basis for the rest of the thesis by highlighting, in brief, the key carbon financial accounting and carbon disclosure issues resulting from ETSs. First, section 2.2 looks at the growth of the carbon market by describing the early and current carbon markets. Further information on emission reduction mechanisms that were (or are being) adopted in these carbon markets is given in subsections 2.2.1 and 2.2.2. Following this, the most prominent emission reduction mechanism in the current carbon market with increasing international relevance and the focus of this study, i.e. the ETS, is discussed in section 2.3. Subsections 2.3.1 to 2.3.3 describe the EU ETS, the Australian Carbon pricing mechanism (i.e. the Australian Carbon Tax), and the NZ ETS in further detail. Finally, the key carbon financial accounting and carbon disclosure issues resulting from these ETSs are highlighted in brief in section 2.4, and the chapter concludes with a summary in section 2.5.

### 2.2 Carbon Markets

Carbon markets were created as a result of actions taken to combat human induced global warming, and were estimated at a value of US\$176 billion dollars in 2012 (Coelho, 2012). Carbon markets exist because 'carbon emissions' are no longer free, thus implying that a previously costless activity has now become costly by means of marketable allowances (Cook, 2009). Carbon markets are also likely to gain further relevance with the recent adoption of the Paris Agreement. Negotiations to develop measures that could be undertaken post the year 2020 to replace the Kyoto Protocol led to the culmination and adoption of the 'Paris Agreement' in Paris, in December 2015 (Bodansky, 2016). As compared to the Kyoto Protocol, the Paris Agreement is a more global and independent measure under the UNFCCC, the purpose of which is also to help address human induced climate change i.e. emissions of effluents (Bodansky, 2016; UNFCCC, 2016a). The Paris Agreement will also require all parties to set up their own "nationally determined contributions" or NDCs (UNFCCC, 2016b). This agreement shall come into force when ratified by the 55 parties to the convention, all of which account for an estimated 55% of the total greenhouse gas emissions.

The ratified agreement will also be legally binding to these parties (Bodansky, 2016; UNFCCC, 2016b). The Paris Agreement also prefers the mechanisms defined by the Kyoto Protocol, but classifies them into two market mechanisms, namely, “internationally transferred mitigation outcomes” (ITMOs) (new jargon for ETSs, see section 2.3), and “sustainable development mechanisms” (SDM), a combination of CDM and JI (Bodansky, 2016) (see subsection 2.2.2).

The discussion now focusses on the growth of carbon markets by describing the early and current carbon markets, and the emission reduction mechanisms that were (or are being) adopted in these markets.

### *2.2.1 Early carbon markets*

Prior to the Kyoto Protocol, carbon and environmental related issues were addressed by way of a regulatory mechanism (Mead, 2009). Tax on emitters, the Montreal Treaty (1986), the US Acid Rain trading scheme that began in the 1980s, and the Renewable Energy Certificate market (RECs) in the US, are some examples of regulation that led to the development of carbon markets.

Taxation: Taxation on emitters was one of the common methods used to address the environmental issue (Mead, 2009). Some examples of taxation were excise duty and customs charges that were applied on cross-border transactions or through a variety of different governmental agencies (Mead, 2009).

The Montreal Treaty (1986): The Montreal Treaty was introduced in 1986 to phase out chlorofluorocarbons (CFCs) that had been accumulating in the atmosphere and were responsible for the creation of a hole in the ozone layer in the stratosphere. This treaty was put in place to gradually phase out CFCs in a controlled manner over a period of years, and then ban them (Mead, 2009).

The US Acid Rain trading scheme: The US Acid Rain trading scheme began in the 1980s and under the Clean Air Amendment Act 1990, was further developed into a cap and trade market for sulphur dioxide (SO<sub>2</sub>). Under this scheme, the government elected to cap SO<sub>2</sub> emissions and permitted allowances trading for emitting SO<sub>2</sub>. Furthermore, the allowance allocations were based on the SO<sub>2</sub> intensity of the fuel's inputs (Mead, 2009).

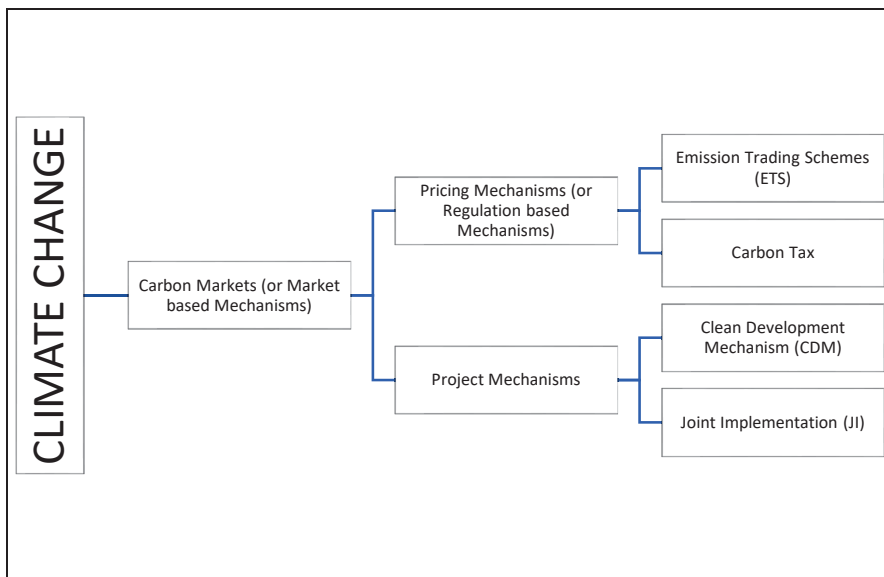
Renewable Energy Certificates (RECs): The Renewable Energy Certificate market in the US was somewhat similar to the US Acid Rain scheme and created a saleable certificate for each megawatt of

“green renewable” electricity (Mead, 2009). It was created to encourage investment in alternative energy generation and used both voluntary and regulatory frameworks (Mead, 2009).

### 2.2.2 Current carbon markets

The current carbon markets are now made up of two main instruments, namely regulatory or price mechanisms and project based mechanisms (Cook, 2009). Joint Implementation (JI) and the Clean Development Mechanism (CDM) are examples of project based mechanisms, whereas a carbon tax and emission trading schemes are examples of a regulatory or price mechanism (see Figure 2-1 below).

Figure 2-1: Current carbon market mechanisms



Project based mechanisms:

The clean development mechanism (CDM): CDM has been in operation since the beginning of 2006 and has already registered more than 1,650 projects (UNFCCC, 2013a). The CDM allows a country with an emission-reduction (or limitation) commitment under the Kyoto Protocol to implement an emission-reduction project in developing countries, which can earn saleable certified emission reduction (CER) credits, each

equivalent to one tonne of CO<sub>2</sub> which can further be counted towards meeting Kyoto targets (UNFCCC, 2013a). In other words, the clean development mechanism involves investment in sustainable development projects that reduce emissions in developing countries. This mechanism is the first truly global, environmental investment and credit scheme of its kind, providing a standardized emission offset instrument, CERs (Graveland, de Haan & Schenau, 2009; UNFCCC, 2013a;). According to UNFCCC (2013a), the mechanism stimulates sustainable development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction or limitation targets and might involve for example, a rural electrification project using solar panels or the installation of more energy-efficient boilers.

Joint implementation (JI): JI allows a country with an emission reduction (or limitation) commitment under the Kyoto Protocol to earn emission reduction units (ERUs) from an emission-reduction or emission removal project in another Annex B Party, each equivalent to one tonne of CO<sub>2</sub>, which can be counted towards meeting its Kyoto target (Graveland et al., 2009; UNFCCC, 2013b;). In other words, JI enables industrialized countries to carry out joint implementation projects with other developed countries. In doing so, JI offers parties a flexible and cost-efficient means of fulfilling a part of their Kyoto commitments, while the host party benefits from foreign investment and technology transfer (UNFCCC, 2013b). The process of receiving emission credits for JI projects is complex as it requires the emission reduction units (ERUs) to be subtracted from the host country's pool of assigned emission credits known as 'assigned amount units' (AAUs) (Graveland et al., 2009). This implies that JI leads to a reallocation of emission allowances and not to the creation of additional ones i.e. AAUs are converted into ERUs and subsequently these ERUs can further be transferred to the donor country, either as a return to a direct investment or as an additional transaction (Graveland et al., 2009).

#### Pricing (or regulatory) based mechanisms

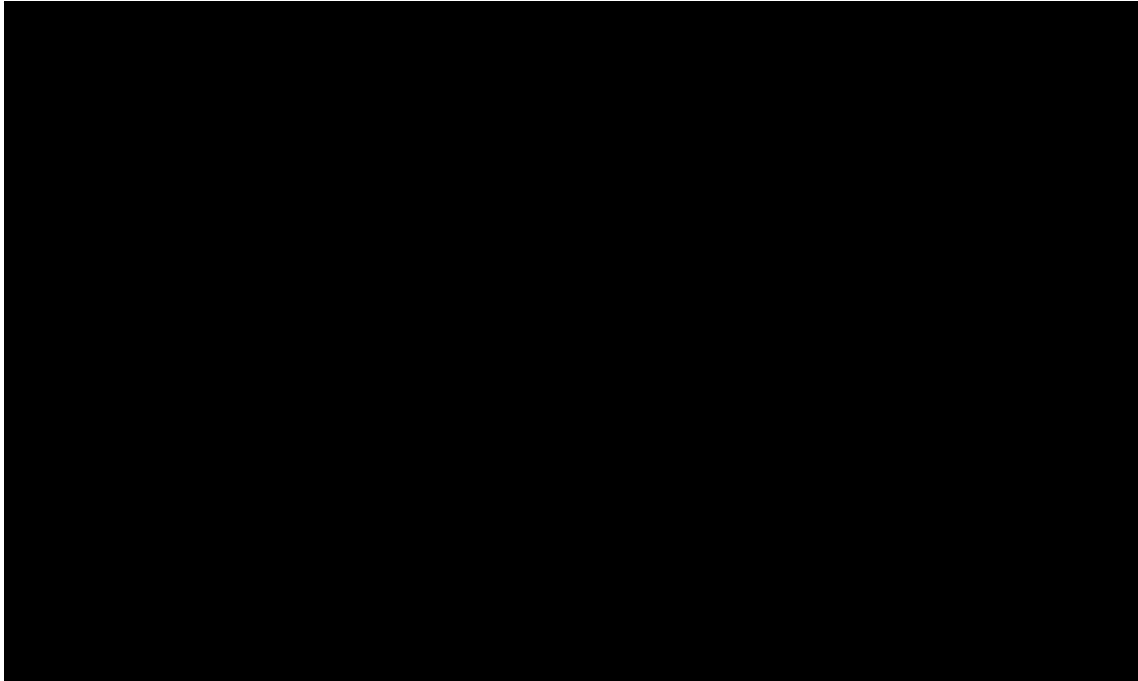
Carbon tax: A carbon tax is defined as a tax based on greenhouse gas emissions (GHG) generated from burning fuels. It puts a price on each tonne of GHG emitted, sending a price signal that will elicit a powerful market response across the entire economy, resulting in reduced emissions (Ministry of Finance, n.d.). In other words, a carbon tax is an environmental tax on energy sources that emit carbon dioxide. The primary

purpose of such a tax is to reduce emissions of carbon dioxide and thereby slow global warming (PwC, 2011). A carbon tax has the advantage of providing an incentive without favouring any one way of reducing emissions over another. Further, by reducing fuel consumption, increasing fuel efficiency, using cleaner fuels and adopting new technology, businesses and individuals can reduce the amount they pay in carbon tax, or even offset it altogether (Ministry of Finance, n.d.). A carbon tax has some supporters because it places a cost on the negative environmental consequences of burning fossil fuels and so directly addresses the problem of emitters of greenhouse gases not facing the full social cost of their actions (PwC, 2011). A number of countries, most notably in northern Europe, have implemented carbon taxes or energy taxes related to carbon content, however most of these are levied on energy products and motor vehicles rather than on CO<sub>2</sub> emissions (PwC, 2011).

Emission trading scheme (ETS): An emission trading scheme has a market-based approach and is also known as a 'cap and trade' scheme. It is used to control pollution by providing economic incentives for achieving reductions in carbon. There are several active emission trading schemes around the world. The largest and most established of these is the European Union Emissions Trading Scheme EU ETS which commenced operations in 2005 (discussed in further detail in subsection 2.3.1).

Figure 2-2 below provides a summary map of existing, emerging, and potential regional, national and sub-national carbon pricing instruments (including ETSs) as in the year 2014, and further details of ETSs are provided following Figure 2-2.

Figure 2-2: Summary of existing, emerging and potential ETSs and Carbon Tax



Source: Adaptation of an original diagram by the World Bank from their website  
<https://www.worldbank.org/en/news/feature/2014/05/28/state-trends-report-tracks-global-growth-carbon-pricing-dated-16th-May-2015>

### 2.3 Emission Trading Schemes (ETSs)

In ETSs, the government sets a cap on the amount of a pollutant that may be emitted. The cap is allocated or sold to firms in the form of allowances or permits which represent the right to emit or discharge a specific volume of a specified pollutant. The total number of allowances for a company cannot exceed the cap, thus limiting total emissions by the company. Companies that increase their emissions beyond the cap must buy allowances from those who require fewer allowances. The transfer of allowances is referred to as a trade. In effect, the buyer pays a charge for polluting, while the seller is rewarded for reducing emissions. Companies are thus encouraged to reduce emissions through the trading of carbon emission allowances (Stavins, 2001). Since this study attempts to examine the carbon financial accounting and carbon practices of the firms affected under the EU ETS, Australian Carbon Tax and NZ ETS, the discussion will now specifically focus on these three ETSs respectively.

### *2.3.1 European Union Emission Trading Scheme (EU ETS)*

As indicated earlier, the EU ETS is the largest, mandatory and most established ETS which became operational from 2005 onwards (Warwick & Ng, 2012; Parliament of Australia, 2013). It covers 12,000 installations, together which are responsible for emitting just over 40% of all greenhouse gases (Parliament of Australia, 2013). Similar to the design of a basic ETS, an overall emission limit (or cap) is set by each of the EU member states and is further converted into emission allowances (also known as European Union emission allowances (i.e. EUAs) (Warwick & Ng, 2012). These emission allowances have to be acquired by firms to cover the emissions from their installations and for every tonne of carbon emitted, the account holder must surrender one emission allowance and report the quantity of independently verified emissions to the governmental bodies of the EU member states by the financial year end (Warwick & Ng, 2012).

In case less than the required amount of allowances (or excess allowances) is held, the firms affected under EU ETSs are free to buy (or sell their) EUAs in the actively traded ETS market, a process which represents a market based approach for emission reduction (Bebbington & Larrinaga-Gonzalez, 2008; Warwick & Ng, 2012). In addition to buying, selling or meeting emission obligations by surrendering, the account holders may also hold emission allowances for trading (Warwick & Ng, 2012). The existence of these tradeable allowances imply that the carbon emission allowances be treated as a financial commodity and be recognised in the accounts and reported in the financial statements, thus creating further challenges for accountants (Bebbington & Larrinaga-Gonzalez, 2008; Warwick & Ng, 2012).

A fixed amount of these emission allowances are allocated for free to the account holders of the operator firms responsible for the installation's activities (Warwick & Ng, 2012). At the time of the study, the EU ETS consisted of three compliance phases. In phase one, at least 95% of the carbon emission allowances were freely allocated, followed by 90% in phase two and less than 50% in phase three (Parliament of Australia, 2013). The first compliance phase, during which the infrastructure of the carbon market was built and which affected 25 EU states, was a trial phase operating for a two year period (i.e. year 2005 to 2007) (Warwick & Ng, 2012; Parliament of Australia, 2013). Power stations, combustion installations, industry including oil refineries, coke ovens, iron and steel plants and production of cement, glass, bricks, ceramics, pulp, paper and board, were the sectors that were affected under phase one of the EU ETS (International Carbon Action Partnership (ICAP), 2016a). The second phase (i.e. the phase which was operating at the

commencement of the current study) affects a total of 27 EU states and is for a four year period, running from 2008 until the end of 2012 (Parliament of Australia, 2013). The second phase is targeted at all the sectors of phase one, apart from the aviation sector (International Carbon Action Partnership (ICAP), 2016a). Following this, the third phase which commenced in 2013, is for a seven year period and will run until the year 2020, affecting 27 EU states apart from Norway, Iceland and Liechtenstein (Parliament of Australia, 2013). The sectors affected under this phase were CCS installations, production of petrochemicals, ammonia, non-ferrous and ferrous metals, gypsum, aluminum, nitric, adipic and glyoxylic acid (International Carbon Action Partnership (ICAP), 2016a).

Financial penalties are incurred for non-compliance with the EU ETS (Warwick & Ng, 2012). Whilst the financial penalty for phase one was €40, the penalties for non-compliance are €100 for phases two and three respectively (Parliament of Australia, 2013).

### *2.3.2 Australian Carbon Tax (or Carbon Pricing Mechanism)*

Prior to the commencement of the current study, Australia's clean energy legislation introduced a price on carbon on 1 July 2012 through its carbon pricing mechanism (Clean Energy Regulator, 2015). The Australian Carbon Pricing Scheme (also known as the Australian Carbon Tax) applies to Australia's 377 liable entities (or biggest polluters), accounting for about 60% of Australia's greenhouse gas emissions, who have to report on and pay a price for their carbon pollution, which further creates incentives to reduce emissions (Parliament of Australia, 2013; Clean Energy Regulator, 2015). More specifically, the Australian Carbon Tax requires that any facility emitting beyond an annual threshold of 25,000 tonnes of carbon must surrender their emission permits to the government.

The Australian Carbon Tax would take the form of an ETS in two phases, with the price being fixed each year for the first three years (i.e. phase one), starting at \$23 a tonne in 2012–13 (rising 2.5% annually in real terms) and thereafter moving to a flexible market based price in 2015–16 (i.e. phase two) (KPMG, 2012; Parliament of Australia, 2013; Clean Energy Regulator, 2015). In other words, the market would decide the price during the 2015-16 period and the main market for permits will be at auction from the government (KPMG, 2012). The Australian Carbon Tax also had a provision where after 2015, the liable entities could meet up to 50% of their surrendering obligations by importing the European Union allowances (i.e. EUAs or CERs), with a sublimit of 12.5% imposed on the import of CERs. These restrictions were to be

fully lifted by 2018 (Parliament of Australia, 2013). In addition to this, the Australian Carbon Tax also introduced a carbon farming initiative, a framework within which farmers from the agricultural sector or landholders from landfill activities can earn and sell emission reduction credits as well as undertake, monitor and receive financial benefits for greenhouse gas projects (Parliament of Australia, 2013).

Carbon emission allowances (or emission permits) were allocated free of cost to firms with activities that were deemed emission intensive and trade exposed (EITE) in 2012 (Parliament of Australia, 2013). These liable entities received free carbon emission allowances amounting to 66% or 94.5% of the industry average, reducing at a rate of 1.3% annually (Parliament of Australia, 2013). Additionally, the free allocation of carbon emission allowances were based on whether the liable entities were moderately or highly emission intensive and except for these free carbon emission allowances, the rest of the carbon emission allowances were to be auctioned by the government (Parliament of Australia, 2013). Electricity generation, mining, industrial processes, fugitive emissions, non-legacy waste and construction, are a few of the sectors affected under the Australian Carbon Tax (Parliament of Australia, 2013). In case of non-compliance, the liable entities were entitled to a financial penalty which was estimated as twice the price of a carbon emission allowance or permit (Parliament of Australia, 2013).

However, following the election of a new government, the carbon pricing mechanism was repealed from July 2014 onwards and was to be replaced with another emission reduction mechanism known as the Direct Action Plan (Taylor & Hoyle, 2014; Guglyuvatyy & Stoianoff, 2015; Carbonmarketdata, 2016). The Direct Action Plan has 'emissions reductions fund' as its centrepiece, which will pay the firms or any other member of the community for projects to reduce their emissions (Guglyuvatyy & Stoianoff, 2015; Carbonmarketdata, 2016). Nevertheless, at the time of the study, the direct action plan is still under consideration and the future of the carbon pricing mechanism is still being debated (Guglyuvatyy & Stoianoff, 2015; Carbonmarketdata, 2016).

### *2.3.3 New Zealand Emission Trading Scheme (NZ ETS)*

The NZ ETS is a mandatory scheme with some voluntary opt-ins (International Carbon Action Partnership (ICAP), 2016b). It was established in the year 2008 with the help of the Climate Change Response (Emission trading) Amendment Act 2008 but later on a revised and a moderated emission trading scheme

was passed by Parliament with the help of the Climate Change Response (Moderated Emission trading) Amendment Act in 2012 (Climate Change Information New Zealand, 2013). A second review of the NZ ETS is currently underway and expected in the second half of 2016 (International Carbon Action Partnership (ICAP), 2016b).

The NZ ETS adopts the basic 'cap and trade' policy but covers all greenhouse gases and sectors and is much more comprehensive as compared to other ETSs developed by other countries, including the EU ETS or the Australian Carbon Tax (Jiang et al., 2009). The six greenhouse gases covered by the NZ ETS are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF<sub>6</sub>) (Climate Change Information New Zealand, 2009). Elaborating further on the cap and trade method of the NZ ETS, The Treasury (2007) and Gledhill, Grant and Low (2008) explain that under such a policy, permitted emissions of those gases would be capped (or limited) at a certain level for which the participating members would be required to match all their emissions with a corresponding number of emissions units, as administered by a central agency. Furthermore, the number of units released into the market is likely to be restricted to the prescribed capped level which will ensure that the pre-determined level of emissions is not exceeded. Commenting further, The Treasury (2007) and Gledhill et al. (2008) also suggest that participants can purchase an initial allocation of emissions units or receive them for free, and in the case of excess (or less) emissions over the initially allocated units, the participant would be forced to buy (or sell) excess units from other participants.

As with the Australian ETS, NZ ETS's free allocation of carbon emission allowances was based on the intensity of the industrial sector, with 90% and 60% of free allocation for highly and moderately emission intensive and trade exposed activities (International Carbon Action Partnership (ICAP), 2016b). However, with respect to the forestry sector, owners of pre-1990 forest land, were granted free a one off free carbon emission allowance allocation to partly compensate for the impact of the NZ ETS (International Carbon Action Partnership (ICAP), 2016b).

The NZ ETS was fully phased in by 2013 and covers greenhouse gas-emitting activities in all major sectors of the economy such as forestry, transport fuels, stationary energy, industrial processes, agriculture, waste and other sectors (Climate Change Information New Zealand, 2013). Sectors were gradually phased in over time with the forestry sector being the first to be affected under NZ ETS in 2008, followed by stationary energy, industrial processing and liquid fossil fuels in 2010, and finally the waste sector and synthetic

greenhouse gases sector in 2013 (International Carbon Action Partnership (ICAP), 2016b). Although the agricultural sector is also required under the NZ ETS to report their biological emissions, they currently face no surrender obligations (International Carbon Action Partnership (ICAP), 2016b).

In case of non-compliance with the NZ ETS, there is a financial penalty of \$NZ30 per carbon emission allowance permit, where each permit covers two tonnes of emissions (Parliament of Australia, 2013).

## 2.4 Key issues resulting from ETSs

The above discussion on the EU ETS, the Australian Carbon Tax and the NZ ETS highlights that carbon is now a financially relevant commodity for the firms affected under ETSs. This gives rise to the carbon financial accounting and carbon disclosure issues, discussed below.

### *2.4.1 Carbon Financial Accounting Issues*

With carbon as a commodity which is materially and financially relevant, there is a need for the ETS affected firms to financially account for their carbon in five different situations i.e. when received for free from the government, when purchased from a third party or in an auction, when used or emitted, when sold to a third party and when surrendered to the government. Given the absence of uniform carbon financial accounting guidance, there is a lack of clarity on how firms should financially account for carbon. Shedding some light on these financial accounting implications, Mackenzie (2009) points out that carbon allowances may be accounted for as intangible assets, financial instruments and government grants. Supporting Mackenzie and providing further insight on the financial accounting implications, Elfrink and Ellison (2009, p. 30) state that:

“... if EAs (emission allowances) are recorded as assets, how are they valued and classified? How do the EAs and GHG emissions affect the profit and loss statement? When and how are liabilities reported? When and how are government grants recognised? Is revaluation of the related assets and liabilities appropriate? How does a participant account for sales of EAs?”

Thus, one of the key issues of ETSs is that they give rise to the need for affected firms to financially account for carbon. The following subsection discusses the second key issue of ETSs: the carbon disclosure issue.

#### *2.4.2 Carbon Disclosure Issues*

Bebbington and Larrinaga-Gonzalez (2008) note that in addition to the financial or accounting information pertaining to carbon emissions, non-financial information will also be needed to provide relevant information about the risks associated with global climate change, i.e. carbon markets and emission trading schemes. In order to reflect a 'true and fair view' of corporate performance and the context of that performance, non-financial information disclosure will be needed to provide information about the impact on organisations of ETSs and their adoption (Bebbington & Larrinaga-Gonzalez, 2008; Tang & Luo, 2011; Bebbington et al., 2014). In other words, investors, policy makers and the public in general, may expect information from which they can assess the carbon intensity of corporate products and services and estimate the regulatory and competitive risks that a corporation may face (Bebbington & Larrinaga-Gonzalez, 2008). Additionally, there is also a need for information on the way an organisation manages its greenhouse gas emissions and the risks associated with the organisation's approach. This implies the need for non-financial accounting and reporting of and about greenhouse gas emissions. Tang and Luo (2011) emphasize the need for companies to provide non-financial information, namely, more detailed carbon sensitive information at the project and segment level; details of sustainable production methods that are part of the integral market development; quantitative measures of carbon tax related risks; accounting for carbon permits, and disclosure of the valuation basis for environmental items. Likewise, with respect to disclosure implications, due to the introduction of ETSs, stakeholders are seeking and demanding the disclosure of information pertaining to GHG emissions, governance policies adopted for reducing the emission levels to the desired target, as well as any regulatory, financial or physical risks associated with climate change (and ETSs) (KPMG, 2008; Haque & Deegan, 2010).

Thus, it would be fair to say that ETSs have accounting and disclosure implications for affected companies as a previously costless activity has now become costly, thus creating a carbon market by means of marketable allowances (Cook, 2009). ETSs require measurements and the financial accounting and reporting of carbon emission for two important purposes. The first of these is the monitoring of actual

emissions and the use and trading of emission allowances so regulators can ascertain whether or not companies are emitting within their stipulated caps and whether the purpose of the ETS is being served. The second reason is to inform investors in the emitting companies. The presence, use and purchase/sale of emission allowances are economic activities that affect the financial performance and net worth of companies. Carbon reduction or the lack thereof can be a source of financial risk and it therefore needs to be monitored by company shareholders and debt providers.

## 2.5 Chapter Summary

The purpose of this chapter was to set the basis for the subsequent chapters and for the rest of the study by highlighting the carbon financial accounting and carbon disclosure issues resulting from the design of ETSs. It is noted that amongst all the market mechanisms discussed, ETS is the most common and prominent emission reduction mechanism used by various countries (e.g. the European ETS or EU ETS, the NZ ETS, the Australian Carbon Tax) and therefore the main focus of this research. Generally, ETSs result in carbon financial accounting and carbon disclosures issues for the ETS affected firms as these firms are now expected to not only financially account for carbon, but also provide carbon disclosure. Carbon is a commodity and both financial as well as non-financial information on carbon is considered materially relevant by policymakers, stakeholders and investors. These issues are made more complex by individual ETSs such as the EU ETS, Australian Carbon Tax and NZ ETS, as UK, Australian and New Zealand firms are likely to have carbon financial accounting and carbon disclosure practices that will be motivated by the pressures of their institutional settings, in the absence of uniform carbon financial accounting guidance and a carbon disclosure requirement (see Chapter 6 for further discussion). As such there will be difficulties in comparing the financial statements and carbon related information of these ETS firms due to a lack of uniformity, which can make it difficult for stakeholders to make an informed decision.

Hereon, Chapters 3 to 5 will elaborate further on the lack of uniform guidance leading to inconsistencies in the carbon financial accounting and carbon disclosure practices of ETS firms, highlighting the gaps in the carbon literature which the study attempts to fill. It is hypothesized that these carbon financial accounting and carbon disclosure practices may be driven by the institutional pressures of the ETSs. Chapter 3 will review the literature pertaining to the first research question i.e. how are firms affected under ETSs financially accounting for carbon emission allowances in the absence of uniform guidance?

## Chapter 3: Lack of empirical evidence on inconsistencies in the carbon financial practices of ETS affected firms

### 3.1 Introduction

The first research question of this study is concerned with how ETS affected firms are financially accounting for carbon, given the absence of uniform accounting guidance. First, the chapter discusses how the research question was formulated. Following this, the prominent proposals and surveys on carbon financial accounting practices will be discussed to highlight the diversity in recommendations for these practices, a factor which also adds to the research question. The chapter is structured as follows: Section 3.2 discusses the formulation of the research question, in particular the lack of uniform guidance that has led to inconsistencies in carbon financial accounting practices and the lack of relevant empirical evidence in the academic research. Following this, Section 3.3 discusses the proposals and guidance for accounting for carbon emission allowances, including subsections which give details of some proposals/guidance such as IFRIC 3 (subsection 3.3.1), PricewaterhouseCoopers (subsection 3.3.2), Ernst & Young (subsection 3.3.3), KPMG (subsection 3.3.4), Macquarie University (3.3.5), ACCA (3.3.6), Warwick and Ng's (2012) study (subsection 3.3.7) and Black's (2013) study (subsection 3.3.8). Finally, Section 3.4 concludes with a chapter summary.

### 3.2 Lack of uniform guidance leading to inconsistencies in carbon financial accounting practices and lack of empirical evidence in academic research

Currently, there is no uniform carbon financial accounting guidance (KPMG, 2010) and prior studies have highlighted and discussed the need for such guidance. This is because the introduction of carbon markets and emission trading schemes have resulted in the need for companies to financially account for their carbon emission allowances in different situations (i.e. when received for free, when purchased, when used, when surrendered, when sold and when inventoried, etc). According to the GHG Management Institute (2009, p. 24):

“... carbon is rapidly emerging as a global commodity with massive market potential, diverse drivers and over-arching financial (accounting) implications. All across the globe hundreds of organisations now develop market and/or sell offsets and emission allowances involving a wide range of participants, prices, transaction types and projects. With this in mind, there is now immediate need to ensure transparent and competent greenhouse gas accounting practices and standards ...”

Additionally, it is also essential to note that in the absence of uniform carbon financial accounting guidance, firms are adopting IAS 8, as a result of which they can develop their own carbon financial accounting practice. In other words, the absence of uniform guidance is likely to give rise to multiple carbon financial accounting practices for a single transaction, given that firms are now free to financially account for carbon emission allowances in their own preferred way. Also, in the absence of this guidance, there have been some prominent surveys and carbon financial accounting standard IFRIC 3 has been withdrawn (both factors are discussed in the next subsection). These surveys and IFRIC 3 both recommend ways in which firms may financially account for carbon emission allowances. Further analysis of these surveys and the withdrawn standard indicates variations in their recommendations for carbon financial accounting practices. Thus, given the absence of authoritative accounting guidance on how to account for carbon emission allowances under ETs, various accounting treatments (as a result of firms adopting IAS 8, the recommendations made by the withdrawn IFRIC 3 standard, and organisations like the Big4 firms) have evolved which are likely to lead to volatility and material and/or counter-intuitive effects on financial statements in matters such as timing of recognition of assets, liabilities, profits and losses (KPMG, 2008).

As per Elfrink and Ellison (2009), official guidance on these (accounting) issues is shallow and still to be developed. As a result, in practice, accounting for carbon emission allowances lacks consistency. Such lack of uniformity and inconsistencies in accounting treatment of carbon allowances by companies may also, in turn, lead to issues in comparability of financial statements and can further make it difficult for stakeholders to make informed decisions. The European Financial Reporting Advisory Group (EFRAG) in their draft comment paper in December 2012 also recognised that since the withdrawal of IFRIC 3, there have been diverse practices in accounting for assets and liabilities arising from ETs (Deloitte, 2013). Thus, it is essential that uniform carbon financial accounting guidance be introduced at this stage as it will help ensure uniformity and consistency in carbon financial accounting practices. As a result, it will be easier for stakeholders to compare different firms' financial statements and thus make informed decisions.

Whilst most prior studies do state that inconsistencies in carbon financial accounting practices exist (Kerr & Sweet, 2008) and that uniform carbon financial accounting guidance needs to be developed, there is scant empirical evidence in the academic research to support the claim; it is an area that has not been empirically tested by prior academic study. However, Warwick and Ng (2012) and Black (2013) examined the carbon financial accounting practices of firms with significant emission liabilities under the EU ETS as well as large EU emitters. Organisations like PwC (2007), Ernst & Young (2008) and ACCA (in its research report for 2010) also surveyed the carbon emission accounting practices of participants in US emission programs and of large emitters. The findings of all these studies reported inconsistencies in the carbon financial accounting approaches of the firms. Big4 firms like KPMG have also published a report in this area suggesting ways of financially accounting for carbon (Warwick & Ng, 2012).

Nevertheless, given the scant amount of studies with a focus on ETS affected firms or with empirical evidence on the inconsistencies in carbon financial accounting practices, the current study's first research question seeks to examine how the firms affected under ETSs are financially accounting for carbon in the absence of uniform guidance. An understanding of the carbon financial accounting practices of ETS affected firms is essential at this stage, not just due to the materiality of carbon emission allowances, but also to help examine if inconsistencies in the carbon financial accounting practices of ETS affected firms do exist and if so, to provide empirical evidence of this. This empirical evidence can help back the claims made by prior studies on the immediate need for uniform carbon financial accounting guidance and will therefore add to the carbon financial accounting literature. Also, with the globalization of ETSs on the horizon (Warwick & Ng, 2012), the carbon financial accounting approaches of ETS affected firms are likely to have increasing international relevance and therefore, contrary to Warwick and Ng (2012), the study focuses on the carbon financial accounting approaches of the ETS affected firms (rather than just large emitters).

### 3.3 Financial Accounting for carbon emission allowances - Proposals / Guidance / Surveys to date

In the absence of uniform accounting guidance, various accounting firms, academics and policy makers have proposed carbon accounting practices (by way of three proposals and five surveys). The most prominent proposal on this topic is IFRIC 3 (*Emission Rights*) of the International Accounting Standards Board (IASB). The other two proposals are that of PwC and KPMG. Although all of the Big4 auditing firms

have been debating the financial accounting of carbon emission allowances, the PwC and KPMG proposals attend specifically to the issue of how to account for carbon emission allowances. Also, the PwC proposal also investigates the carbon financial accounting practices of the major firms affected under the EU ETS. Apart from PwC, the five surveys are (i) of CPA Australia members conducted by Macquarie University; (ii) on the US firms that apply US GAAP and are participants in emission programs undertaken by Ernst & Young (2008); (iii) on large EU emitters undertaken by ACCA's research report by Lovell, Sales de Aguiar, Bebbington and Larrinaga (2010) as well as by (iv) Warwick and Ng (2012); and (v) of firms with significant liabilities under the EU ETS, undertaken by Black (2013).

Of these five surveys, Warwick and Ng (2012) as well as Black (2013) appear to be the only surveys in the academic research that provide empirical evidence on the inconsistencies in the carbon financial accounting practices of the firms. The remaining three surveys, in addition to PwC (2007), are not in academic research, but rather undertaken by organisations. As will be observed from the discussion of each of these proposals and surveys, there are various ways in which carbon emission allowances can be financially accounted for during the different stages of its lifecycle. Whilst some proposals and surveys appear to have recommendations and preferred carbon financial accounting practices similar to the recommendations of IFRIC 3, others generally appear to depart from IFRIC 3 recommendations. Nevertheless, the discussion of each of these proposals and surveys reveals some inconsistencies in the recommendations for preferred carbon financial accounting practices. All three proposals and the five surveys are discussed below and are also used for developing a template identifying accounting practices in the key stages of the carbon emission allowance lifecycle within a company (Table 3-1). This template is also used for identifying the measurement methods of revaluations reported by the company. The main aim of this template is to make a factual determination of the manner in which accounting for carbon emission allowances is conducted by the ETS companies.

### *3.3.1 IFRIC-3 - Emission Rights*

Prior to the commencement of the European Union Greenhouse Gas Emission Trading Scheme (EU ETS) (Cummings, Dyball & Pang, 2009), the International Accounting Standards Board (IASB) released IFRIC 3 (Emission rights) in December 2004 (Deloitte, 2010). The purpose of IFRIC 3 was to provide guidance on accounting for a cap and trade emission rights scheme (EFRAG, 2005). IFRIC 3 made the following recommendations:

- Carbon emission allowances are intangible assets irrespective of whether they have been purchased or provided free of cost by the government.
- Subsequent to initial recognition, carbon emission allowances should be accounted for in accordance with IAS 38 (Intangible assets standard).
- When a participant produces emissions, provisions for emissions-related liabilities should be recorded at market value in accordance with IAS 37 (Provisions, contingent liabilities and contingent assets standard).

Furthermore, IFRIC 3 recommended that where allowances are issued by governments for less than the fair value, the difference between the fair value and the amount paid, if any, is a government grant. Such a grant should be immediately recognised as deferred income in the balance sheet and thereafter as income on a systematic basis. IFRIC 3 also recommended that changes in the value of revalued allowances (i.e. intangible assets) be recognised in equity, and movements on the provision for emissions be recognised in the income statement (PwC, 2007; KPMG, 2008).

In June 2005, six months after its issuance, IFRIC 3 was withdrawn by the IASB. This decision was made primarily because the European Financial Reporting Advisory Group (EFRAG) recommended that IFRIC 3 should not be endorsed for use in the European Union (Deloitte, 2010). Although the EFRAG agreed with the recommendations of IFRIC 3 (EFRAG, 2005), they pointed out that applying IFRIC 3 will not always reflect economic reality and provide relevant information. They also argued that the accounting requirements of IFRIC 3 will result in both measurement and reporting mismatches (EFRAG, 2005; Mackenzie, 2009). In particular, they pointed out a mismatch between the valuation of assets and the valuation of liabilities, which would lead to income volatility.

During its April 2009 meeting, the Financial Accounting Standards Board (FASB) discussed its joint project with the IASB on Emission Trading Schemes (KPMG, 2005). The purpose of the project was not to develop a new IFRS, rather, it was to address the carbon financial accounting issues arising due to ETs by revising either IAS 38 (Intangible Assets) or IAS 39 (Financial instruments) and IAS 20 (Accounting for Government grants) (Deloitte, 2016). In November 2010, it was decided to defer the joint project. However, in December 2012, the project was again formally reactivated by IASB as an IASB project only, and it was re-scoped in February 2015 with the project name changed to "Pollutant Pricing Mechanisms". Additionally, the scope of the project was broadened to include any other schemes apart from emission trading schemes

that may be using emission allowances to address emission related pollution (Deloitte, 2016). Also, an FASB Exposure Draft was expected in the second quarter of 2010 and a final standard was to be issued in 2011. To date, neither has been issued.

### *3.3.2 PricewaterhouseCoopers*

Two of PwC's publications on the debate on climate change and emissions attend to accounting for carbon emission allowances (PwC, 2007; PwC 2008). The 2007 publication reports the results of a Europe-wide survey of PwC in conjunction with the International Emissions Trading Association (IETA). It provides PwC's view on acceptable approaches for accounting for carbon emission allowances in the EU ETS. The survey investigated the accounting approaches applied by major organisations significantly affected by the EU ETS. The survey focused on accounting for the EU ETS but also covered accounting for Certified Emission Reductions (CERs).<sup>3</sup> The results of the majority of respondents' answers to the survey are presented in the footnotes to Table 3-1. The 2008 publication relates to the New Zealand ETS. This publication sets out the key design features of the NZ ETS and examines some of the implications and obligations for both businesses and households. The main area of debate discussed in this publication is how to account for emissions liability.

PwC presented two accounting approaches companies could use to account for carbon emission allowances under the EU ETS (PwC, 2007). These are the full market value approach and the cost of settlement approach. Their recommendations as to which financial statement elements to recognise are the same under both approaches. In essence, it appears that PwC's view on how to account for carbon emission allowances in an ETS is similar to the recommendations of IFRIC 3.

### *3.3.3 KPMG*

KPMG has provided guidance on accounting for carbon emission allowances. Its most prominent document in this area is, *Accounting for carbon – the impact of carbon trading on financial statements* (KPMG, 2008). The following is a summary of the key accounting recommendations in this document:

- Recognise carbon emission allowances as intangible assets when received for free and when purchased.

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<sup>3</sup> CERs are a type of carbon credit issued by the Clean Development Mechanism for reduction in carbon emissions.

- Recognise a government grant of carbon emission allowances when allowances are received for free.
- Measure the carbon emission allowances received as a government grant at a nominal value i.e. cost (which may be nil), or at fair value (based on market price).
- Recognise the grant as deferred income and release to the income statement on a systematic basis over the compliance period to which it relates.
- Recognise purchased allowances at cost less impairment if applicable.
- Measure at cost or revaluation. When revalued, recognise the movement in value directly in equity.
- Do not amortise carbon emission allowances.
- Recognise a liability when emissions occur as an expense in the income statement, measured at the best estimate of the expenditure required to settle the obligation.
- Only commodity brokers/traders should revalue allowances when recognised as inventory. The difference between fair value less costs to sell should be recognised in the income statement.

Similar to PwC, it appears that KPMG has adopted the recommendations of IFRIC 3 in their approach.

#### *3.3.4. Ernst & Young*

Ernst & Young (2008) undertook a survey on the carbon emission allowance practices of US firms that apply US GAAP and are participants of emission programs like EPA, RGGI, etc. Their findings indicated diversity in the carbon financial accounting practices of the 29 US firms, with most firms adopting either an intangible asset model or an inventory model. Under the intangible asset model, the firms prefer to account for free and purchased carbon emission allowances at cost. Additionally, the carbon emission allowances were not amortised. Under the inventory model, the firms' prefer to measure the emission allowances at weighted average cost, with the free emission allowances recorded at cost, and purchased emission allowances recorded at purchase price. Additionally, the weighted average cost of used emission allowances are charged to the cost of sales and the carbon emission allowances are subject to impairment. Also, under this model, the emission allowances are classified as inventory, with the relevant cash inflow/outflow classified as operating activities in the statement of cash flows. As per the inventory model, the emission allowances held for sale are accounted for at fair value at each reporting date. The findings of the study also reveal that under both models, the firms do not record obligations to deliver carbon emission allowances until the actual level for a given period exceeds the amount of the emission allowances held on the balance sheet date. Also, under both models, the gain is recognised in the period in which the emission allowances are sold.

### *3.3.5. Macquarie University Survey*

Macquarie University conducted a survey of CPA members in 2008 (Cummings, Dyball & Pang, 2009) to ascertain their preferred accounting treatment for carbon allowances under Australia's emission trading scheme, known as the CPRS (i.e. the Carbon Pollution Reduction Scheme). The survey investigated the initial and subsequent recognition and measurement of emission allowances, and the corresponding liability. The results show diversity in how CPA members believe carbon emission allowances should be recognised and measured. A majority of respondents prefer to recognise allowances as an intangible asset initially. What is interesting is that some prefer to recognise it as a current asset because they argue the allowances are tradable within one year. Others, however, prefer to recognise carbon emission allowances as a non-current asset as they argue the allowances will not be tradable until after one year. Most respondents indicated that if a company emits less than the allowances it holds, then the balance should be carried forward at either the initial value or a revalued amount. The responses of the majority of the respondents in the survey are shown in the footnotes to Table 4 at the end of the section.

### *3.3.6 ACCA*

In their research report '*Accounting for Carbon*' for ACCA, Lovell et al. (2010) attempted to investigate how large emitters in the EU ETS account for their emission allowances and why their accounting practices vary. For this, they did a detailed survey of the financial statements of the largest greenhouse gas emitters (i.e. 26 companies) in the EU ETS, followed by telephone interviews with accountants at five of these 26 companies to investigate in detail why accounting practices differ. The findings produced by this research indicated that the majority of the companies did not adopt IFRIC 3's recommendation of accounting for granted emissions allowances at fair value. Instead, these companies treat both granted and purchased emissions allowances as intangible assets at cost. Interestingly, the findings also reveal that the companies measure their obligation to surrender allowances on a 'cost with the balance at market value' basis. In other words, the valuation is based on the carrying value of granted or purchased allowances, while valuing at the market value the allowances that are yet to be purchased in order to cover emissions. This practice is not supported by IFRIC 3 and is in contrast to its recommendation of treating assets (allowances) independently to the liabilities arising under the EU ETS.

### *3.3.7 Warwick and Ng (2012)*

Warwick and Ng (2012) attempt “to gain an initial understanding of how companies in the EU are accounting for carbon emission allowances” (p. 61). They employ content analysis and survey how EU companies recognise granted carbon emission allowances, both upon initial receipt as well as subsequently, and how EU companies recognise purchased emission allowances and liabilities for emissions. The findings of the study indicated that there is no uniformity in accounting for emission allowances, especially amongst large emitting companies operating in the EU ETS as they seem to adopt a diversity of accounting practices to account for their carbon emission allowances. Interestingly, they reveal that these companies generally departed from IFRIC 3 and preferred to report granted carbon emission allowances as intangible assets, with a nil value recorded upon receipt (as compared to IFRIC 3’s recommendation of using fair value). This is also consistent with the findings of Lovell et al. (2010) in their ACCA research report, as previously discussed. Purchased emissions allowances were initially reported by the companies at cost, without any clear trend for subsequent reporting at the end of the reporting period. Finally, the obligation to deliver allowances was reported by the companies as a provision (or liability) at either the carrying amount or the purchase cost of allowances held at the end of the reporting period, and the amount outstanding at the market price at the end of the reporting period. This too, was in contrast to IFRIC 3’s recommendations of measuring the provision at the best estimate at the end of the reporting period.

### *3.3.8 Black (2013)*

Black (2013) examined the disclosed carbon financial accounting policies of firms with significant emission liabilities under the EU ETS and reported diversity in their carbon financial accounting approaches. The findings of the study identified three common approaches, namely, a net liability approach, an approach based on IFRIC 3 classification, and an approach based on inventory classification. The net liability approach classifies carbon emission allowances as intangibles, but only shows an emission liability when it exceeds the free allocation. The IFRIC 3 based approach recognises free carbon emission allowances at fair value and a corresponding gross liability under the EU ETS. Finally, the inventory classification approach recognises free carbon emission allowances at nil value.

### 3.4 Chapter Summary

In summary, the above discussion shows a variety of ways in which carbon emission allowances can be recognised and measured during their different lifecycle stages. The discussion illustrates the difficulty of keeping track of which financial statement elements are affected from when carbon emission allowance is acquired until it is used up. Additionally, the discussion also highlights that the current carbon financial accounting literature has limited empirical evidence on the inconsistencies in the carbon financial accounting practices of the ETS affected firms, given the absence of uniform guidance. This empirical evidence is essential at this point of time, given the increasing prominence of ETSs and can also help support the claims made by prior studies on the immediate need for uniform carbon financial accounting guidance, thus adding to the current carbon financial accounting literature. While the surveys undertaken by Ernst & Young (2008), Lovell et al. (2010), Warwick and Ng (2012), Black (2013), and to some extent PwC (2007), focus on the carbon emission accounting practices of participants in US emission programs, large EU emitters as well as firms with significant emission liabilities under EU ETS, the present study is a more recent one that focuses on the carbon emission accounting practices of ETS affected firms, (particularly UK, Australian and New Zealand firms) in more depth. It also explores the carbon emission allowance disclosure practices of these ETS affected emitters.

An additional step taken in this study is to identify the process of recognition of carbon emission allowances prior to disclosure. The process of recognition sheds light on how carbon emission allowances are measured and recorded prior to their disclosure in annual reports. Table 3-1 summarizes and identifies the essential elements affected by the recognition process using the eight documents discussed earlier. As most of the surveys discussed above based their findings and recommendations as in comparison to IFRIC 3's recommendations, Table 3-1 is considered as an IFRIC 3 template for the purpose of this study. The identification of the essential elements pertaining to the recognition process is done by identifying the most preferred (or recommended) accounting double-entries taken from these (i.e. from proposals and surveys discussed in the previous section) for the different stages of a carbon emission allowance lifecycle. More specifically, the stages are (1) receipt of free allowances, (2) purchase of allowances, (3) use of allowances (when emitting emissions), and (4) surrender of allowances (when used allowances are delivered) and when sold. Different shades are used for the likely journal entries for the different transactions. Each entry shows which accounts are affected. Revaluation entries are also shaded in a similar manner.

Chapter 4 now discusses the literature pertaining to the second research question of this study i.e. how are ETS affected firms disclosing information on carbon emission allowances, in the absence of uniform accounting guidance?

Table 3-1: Double entries for recognition of allowances at different stages and subsequent revaluation

Recognition and measurement practice for carbon emission allowances under different stages of dealing with carbon emission allowances (IFRIC 3 template)		Stages of carbon emission allowance lifecycle				
		Free	Used <sup>4</sup>	Purchased	Surrendered <sup>5</sup>	
<u>Asset Recognition</u>	Debit	Intangible Assets <sup>6</sup>	Intangible Assets	Intangible Assets <sup>7</sup>		Cash / A/c Receivables
	Credit		Intangible Assets	Cash / A/c Payables <sup>8</sup>	Intangible Assets	Intangible Assets
	Credit		Intangible Assets			
<u>Revenue Recognition</u>	Debit		Government grant		Loss (due to impairment)	Loss
	Credit	Government grant <sup>9, 10</sup>	Income <sup>11</sup>		Profit (due to impairment)	Income (Revenue)
	Credit					Profit
<u>Liability Recognition</u>	Debit				Liabilities to deliver allowances	
	Credit		Liability to deliver allowances <sup>12</sup>			
<u>Expense Recognition</u>	Debit		Emission expense			Cost of goods sold
	Credit					
<u>Equity Recognition</u>	Debit		Equity (Revaluation surplus) <sup>13</sup>			
	Debit		Equity (Revaluation surplus)			
	Credit		Equity (Revaluation surplus)			

Note: Same shade means accounts arising from the same journal entry

<sup>4</sup> PwC's view is to amortise intangible assets on a systematic and rational basis over the compliance period.

<sup>5</sup> Firms in the Ernst & Young survey do not record obligations to deliver carbon emission allowances until the actual level for a given period exceeds the amount of the emission allowances held on the balance sheet date

<sup>6</sup> Subject to impairment, but is not amortised. In the PwC survey, 86% of respondents support this. It is also the preferred recognition in the Macquarie University survey.

<sup>7</sup> Preferred recognition in the Macquarie University survey.

<sup>8</sup> In the PwC survey, 58% of respondents supported this double entry. Respondents in the Macquarie University survey preferred a provisional liability.

<sup>9</sup> In the PwC survey, 65% of respondents supported this double entry.

<sup>10</sup> Preferred recognition in the Macquarie University survey is a provisional liability.

<sup>11</sup> In the PwC survey, 50% of respondents supported this double entry, although one third say to credit revenue, one third to cost of sales, and one third to other.

<sup>12</sup> In the PwC survey, 70% of respondents said an obligation should be recognised based on a pro-rating of the forecast shortfall for the compliance year on a per unit of production basis.

<sup>13</sup> In the PwC survey, 79% of respondents said there should be no revaluation.

## Chapter 4: Lack of empirical evidence on inconsistencies in the carbon disclosure practices of ETS affected firms

### 4.1 Introduction

The second research question this study aims to address is how the companies that are affected under ETSs are disclosing information on carbon given the (mostly) voluntary setting. The way in which the research question was formulated will first be discussed. Following this, prior studies on carbon disclosure practices will be discussed to highlight the diversity, lack of transparency and inconsistencies in carbon disclosure practices. The chapter is structured as follows: Section 4.2 discusses the lack of mandatory uniform guidance leading to inconsistencies in carbon disclosure practices. Section 4.3 discusses prior literature with empirical evidence on inconsistencies in carbon disclosure practices. Finally, Section 4.4 concludes the chapter with a chapter summary.

### 4.2 Lack of mandatory uniform guidance leading to inconsistencies in carbon disclosure practices

Currently, there is no uniform mandatory disclosure requirement for ETS affected firms on how and what information they should disclose pertaining to issues surrounding ETS and carbon emission allowances. Some countries like the UK, Australia and New Zealand have mandatory environmental and carbon reporting requirements which are however, limited in scope. These mandatory requirements are listed and summarised in Table 4-1 below.

Table 4-1: Mandatory environmental disclosure regulations for UK, Australian and New Zealand firms

Country	No.	Regulation	Firms affected	Mandatory disclosure requirements
<b>ENVIRONMENTAL DISCLOSURE REGULATIONS IN UK</b>				
UK	1	Quoted companies GHG Reporting 2013	UK incorporated companies listed on the London Stock Exchange main market	Will have to report their levels of greenhouse gas emissions. The Government will require that the chosen methodology is made clear in the report. Companies will be able to reuse data already collected for other schemes such as Climate Change Agreements, the EU Emissions Trading Scheme and Carbon Reduction Commitment Energy Efficiency Scheme to populate their report. If companies take advantage of this provision, they must make it clear in the report that they are doing so.
	2	Companies Act 2006 (Strategic Report and Directors' Report) Regulations 2013	All UK companies	There are more onerous obligations on all UK companies to report their strategy and business model, as well as on GHG emissions, human rights and diversity in the company. The new rules will take effect for financial years ending on or after 30 September 2013.
	3	The Climate Change Act 2008	All UK companies	This Act was introduced to ensure that the UK accounts for all six of its Kyoto gas groups. The government is required to exercise powers under the Companies Act to require the inclusion of GHG reporting in a company's Directors' Report.
<b>ENVIRONMENTAL DISCLOSURE REGULATIONS IN AUSTRALIA</b>				
Australia	1	Corporations Act - Sect 229, 2001	Companies that prepare an annual Directors' Report	This act requires companies that prepare an Annual Directors' Report to specify whether the entity's operations are subject to any significant environmental regulations under state or national law. The report must also provide details of the entity's performance in relation to these environmental regulations. On 1 July 2004 the Corporate Law Economic Reform Program (Audit Reform & Corporate Disclosure) Bill 2003 (CLERP 9) extended this to the operations and financial position of the entity and its business strategies and prospects (Section 99A [1]).
	2	Regulatory Guide 247 on operating and financial review (OFR) 2013	Listed companies	The aim of the guide is to increase the effective disclosure of OFRs, and it mirrors the Disclosure on Management Approach requirements in the Global Reporting Initiative (GRI) Framework. It promotes better communication of relevant and meaningful information to investors, and aims to assist directors in understanding and complying with the OFR disclosure requirements.
	3	Requirements under the Financial Services Reform Act (FSRA) 2010	Issuers of financial products	Issuers of financial products are obliged to disclose the extent to which "labor standards or environmental, social or ethical considerations are taken into account in the selection, retention or realization of an investment". Product issuers are required to make two separate Product Disclosure Statements (PDS): the first on labor standard considerations, the other concerning environmental, social and ethical deliberations. The original Financial Services Reform Act 2001 was promulgated in March 2002, and requires fund managers and financial product providers to state "the extent to which labor standards or environmental, social or ethical considerations are taken into account in the selection, retention or realization of the investment".

				Subsequent amendments since 2011 regard the establishment of mechanisms to combine the CPM with existing regulatory schemes and processes including reporting under the National Greenhouse and Energy Reporting (NGER) Act, as well as inter alia requirements for notification of significant holdings of carbon units and record-keeping obligations.
4	The Clean Energy Act, 2011 [taking into account amendments to Clean Energy Amendment (International Emissions Trading and Other Measures) Act 2012]	Covered entities	Corporations in Australia that meet specified emissions and energy use thresholds	The NGER Act requires corporations in Australia that meet specified emissions and energy use thresholds to annually report Scope 1 and 2 greenhouse gas emissions, energy production and energy consumption data.
5	National Greenhouse and Energy Reporting 2007		ASX Listed firms	Under ASX Listing Rules companies are required to provide a statement in their annual report disclosing the extent to which they have followed the Corporate Governance Council's Principles and Recommendations, or an explanation why if they did not. It is thus only where a recommendation is not followed or where a disclosure requirement is specifically identified that a disclosure obligation is triggered. Principle 7 states that companies should establish a sound system of risk oversight, management and internal control.
6	ASX Listing Rules regarding Corporate Governance Council Principles and Recommendations 2010		Firms belonging to the energy sector	In order to achieve its aim, the Act requires large energy-using businesses to: 1) undertake an assessment of their energy efficiency opportunities, and 2) report publicly on the outcomes of that assessment.
7	Energy Efficiency Opportunities Act 2006 (with an amendment in 2007)		Industrial firms	The NPI requires industrial companies to report emissions and inventories for specific substances and fuel to regulatory authorities for inclusion in a public database.
8	National Pollutant Inventory 1998			
<b>ENVIRONMENTAL DISCLOSURE REGULATIONS IN NEW ZEALAND</b>				
New Zealand	1	Climate Change Response Act 2002, ss62 and ss65	NZ ETS participants	In relation to environmental disclosure, an important point is that the NZ ETS requires its participants to keep track of the GHG emissions that they are responsible for under the scheme. At the moment, NZ ETS participants only have to disclose their emissions to the government, not to other stakeholders. Participants only have to disclose their emissions from some activities - for instance, oil companies would not have to record or disclose the emissions related to the running of their headquarters.

Source: Self-developed table with data on regulations taken from the GRI (2015) website <https://www.globalreporting.org> and Boardman (2015).

As can be ascertained from Table 4-1, each of these countries have different requirements, however, much of the carbon disclosure is still voluntary. This is also evidenced by further comparison of the mandatory requirements with the disclosure index of the Carbon Disclosure Project (i.e. CDP), used and further modified by Bae Choi et al. (2013) in their study on carbon disclosure practices (see Table 4-2). The CDP and GRI constitute an international voluntary code developed by a non-government, non-profit organisation through which investors have encouraged firms to consider carbon related issues (namely climate change related risks and opportunities, their greenhouse gas emissions and their climate change management and processes) in decision making, which can further help bridge the gap between individual companies' sustainability initiatives and mandatory, legal regulation (Tang & Luo, 2011; Sullivan & Gouldson, 2012). The apparent success of the CDP not only seeks disclosure from firms, but also provides voluntary guidance on disclosure of most of the carbon disclosure areas (Bebbington & Larrinaga-Gonzalez, 2008; GRI, 2015). A comparison of the voluntary recommendations made by stakeholders via the CDP and the mandatory carbon related disclosure requirements currently in place (Table 4-2), highlights the remaining areas that are not yet regulated, but are still considered to be of relevance by stakeholders and investors.

In addition to making disclosures in the areas required by the CDP, the firms affected under ETSs may also disclose information on how emissions are being financially accounted for, apart from information on the meaning of the terms/acronyms associated with carbon, the ETSs and climate change, and disclosure of the financial amount pertaining to carbon emission liabilities (Bebbington & Larrinaga-Gonzalez, 2008; Tang & Luo, 2011; Bae Choi et al., 2013). However, despite the large number of firms reporting climate change related information, investors have consistently criticised firms for not providing information that can be readily used in investment decision making whereas firms, in turn, have criticised investors for not utilising the information that they provide (Sullivan & Gouldson, 2012).

Nevertheless, given that some aspects are still voluntary (Table 4-2), firms may be less transparent, inconsistent and not uniform in their carbon disclosure practices, similar to what is being argued to be the case for carbon financial accounting practices in the absence of uniform guidance. This suggests that there is an immediate need for a uniform and mandatory carbon disclosure requirement as it would enable stakeholders and investors to make an informed decision, and ensure that firms are transparent and provide information that is consistent and essential for decision making. To support this claim on the need for a uniform mandatory carbon disclosure requirement, there have been various studies (discussed in the next section) in the carbon disclosure area that have provided empirical evidence on the inconsistencies in the carbon disclosure practices of firms. However, none of them appear to focus on the carbon disclosure practices of ETS affected firms.

Table 4-2: Comparison of mandatory carbon disclosure requirements with voluntary recommendations made by the CDP

CARBON DISCLOSURE ITEMS - FROM THE CDP CHECKLIST (VOLUNTARY RECOMMENDATIONS)		MANDATORY CARBON DISCLOSURE REQUIREMENTS				
		UK	AUSTRALIA	NEW ZEALAND		
1	Climate change: risks and opportunities	CC1	assessment/description of the risks (regulatory, physical or general) relating to climate change and actions taken or to be taken to manage the risks.	No	Yes	No
		CC2	assessment/description of current (and future) financial implications, business implications and opportunities of climate change	No	Yes	No
2	GHG emissions accounting	GHG1	description of the methodology used to calculate GHG emissions (e.g. GHG Protocol or ISO)	Yes	No	No
		GHG2	existence external verification of quantity of GHG emission - if so by whom and on what basis	No	No	No
		GHG3	total GHG emissions - metric tonnes CO2-e emitted	Yes	Yes	Yes
		GHG4	disclosure of Scopes 1 and 2, or Scope 3 direct GHG emissions	No	Yes	No
		GHG5	disclosure of GHG emissions by sources (e.g. coal, electricity, etc)	No	No	No
		GHG6	disclosure of GHG emissions by facility or segment level	No	No	No
		GHG7	comparison of GHG emissions with previous years	No	No	No
3	Energy consumption accounting	EC1	total energy consumed (e.g. tera-joules or peta-joules)	No	No	No
		EC2	quantification of energy used from renewable sources	No	No	No
		EC3	disclosure by type, facility or segment	No	No	No
4	GHG reduction and cost	RC1	detail of plans or strategies to reduce GHG emissions	No	No	No
		RC2	specification of GHG emissions reduction target level and target year	No	No	No
		RC3	emissions reductions and associated costs or savings achieved to date as a result of the reduction plan	No	No	No
		RC4	cost of future emissions factored into capital expenditure planning	No	No	No
5	Carbon emission accountability	ACC1	indication of which board committee (or other executive body) has overall responsibility for actions related to climate change	No	No	No
		ACC2	description of the mechanism by which the board (or other executive body) reviews the company's progress regarding climate change	No	No	No

Source: CDP Index taken from Bae Choi et al. (2013).

### 4.3 Prior literature with empirical evidence on inconsistencies in the carbon disclosure practices

Prior studies in the carbon disclosure literature mostly considered various carbon reporting (disclosure) activities taking place in different sources of documents, namely, via CDP disclosures, annual reports, sustainability reports, and a combination of annual and sustainability reports (Freedman & Jaggi, 2005; Kolk et al., 2008; Stanny & Ely, 2008; Doran & Quinn, 2009; Peters & Romi, 2009; Prado-Lorenzo et al., 2009; Andrew & Cortese, 2011; Berthelot & Robert, 2011; Rankin et al., 2011; Cotter & Najah, 2012; Bae Choi et al., 2013; Stanny, 2013). While some studies investigated carbon disclosure practices on the basis of the climate change disclosures made by firms in response to a CDP questionnaire (Kolk et al., 2008; Stanny & Ely, 2008; Peters & Romi, 2009; Stanny, 2013), other studies investigated the carbon disclosure practices of US firms in their 10-K reports (Doran & Quinn, 2009). Likewise, whilst some studies examined carbon disclosures in annual reports and sustainability reports (Freedman & Jaggi, 2005; Prado Lorenzo et al, 2009), others examined carbon disclosures in the annual report only (Berthelot & Robert, 2011; Borghei, Leung & Guthrie, 2015). In addition to all this, some prior studies attempted to survey the carbon disclosure practices between firms from Kyoto Protocol ratifying versus non-Kyoto Protocol ratifying countries (Freedman & Jaggi, 2005), or between firms from developing countries versus non-developing countries.

Further evaluation of the findings of all the aforementioned studies revealed diversity in carbon disclosure practices of the companies. This is because, while some companies preferred to voluntarily disclose as per the CDP or GRI recommendations to comprise information on the description of the method used to calculate the greenhouse gas emissions and comparison of the emission levels with prior years (Prado-Lorenzo et al., 2009; Rankin et al., 2011; Tang & Luo, 2011; Bae Choi et al., 2013), other companies preferred to disclose as per their environment management system (EMS) (Rankin et al., 2011). Additionally, while some companies are providing more carbon disclosure and are more transparent, other companies are less transparent and provide limited carbon related disclosure (Freedman & Jaggi, 2005; Tang & Luo, 2011). Another carbon disclosure issue pertains to the formats in which the disclosure of carbon information is being presented. The lack of guidance on the disclosure format will also lead to inconsistency in formats utilised for carbon disclosures by ETS affected firms. The formats (for e.g., annual reports, standalone format, etc) preferred by companies for reporting and disclosure of carbon information, were observed in a study by Pellegrino and Lodhia (2012). Their findings suggested that the four key bodies (in Australia's mining industry) utilised a variety of media of communication for disclosure on climate change information – namely annual reports, carbon pollution reduction scheme green paper submissions, media releases, corporate websites, sustainability reports and videos. This highlights that there appears to be no consistency in the formats used for carbon

disclosure by the companies, further giving rising to the issue of comparability of carbon disclosure information. This is also supported by Andrew and Cortese (2011), who considered self-regulated carbon disclosure practices and found that various countries are providing carbon disclosure in accordance with the recommendations of the GHG protocol, the IPIECA oil and gas industry guidelines, national legislation and other regulatory schemes, ETS, ISO guidelines, or CAPP guidelines.

However, as indicated earlier, while there has been ample research with empirical evidence on the inconsistency of carbon disclosure practices, not much research has been undertaken on the carbon disclosure practices of ETS affected firms. Also, provision of or disclosure of financial and non-financial information pertaining to the impact of carbon emissions is arguably crucial for the operation of ETSs and remains topical for standard setters and report users (Bebbington & Larrinaga-Gonzalez, 2008; Lovell, Bebbington, Larrinaga & Sales de Aguiar, 2013; Bebbington et al., 2014). Thus, the current study is one of the most recent to examine the extent, quality and nature of a comprehensive set of carbon related disclosures for a sample of ETS affected firms, more specifically firms from the UK, Australia and New Zealand. At the time of the study, Australia and New Zealand were new entrants into the carbon market with ETSs whereas the UK, being a part of European Union, was the oldest entrant.

Focussing on the carbon disclosure practices of the ETS affected firms via the annual reports, will make it possible to (1) overview the carbon disclosure practices of ETS affected firms from different countries from an important document i.e. the annual report; (2) identify whether adequate carbon disclosure is being made in the annual report in comparison to the CDP checklist which has been compiled by taking into account stakeholders' expectations of carbon related information; (3) identify which aspects of carbon related disclosures are falling short of investor expectations and suggest areas of carbon disclosure wherein regulation is essential, to address the gap between firms' carbon disclosure practices and stakeholder expectations of carbon related disclosure; (4) explore the country differences in these carbon disclosure practices; and, (5) compare the carbon disclosure practices of the recent ETS affected firms (i.e. Australian and New Zealand firms) with the carbon disclosure practices of the old ETS affected firms (i.e. the UK).

#### 4.4 Chapter Summary

From the discussion in this section, it can be observed that there is a likelihood of diversity in carbon disclosure practices. Although mandatory carbon reporting requirements exist for the UK, Australian and New Zealand firms affected under the EU ETS, Australian Carbon Tax and NZ ETS, these

companies are also likely to voluntarily provide additional carbon related disclosure, thus leading to inconsistencies in carbon disclosure activities. Thus, a common issue identified in this chapter is essentially the 'tensions between – accuracy, consistency and certainty' (Kolk et al., 2008; Andrew & Cortese, 2011; Bowen & Wittneben, 2011) with reporting regimes yet to mature, in terms of how to measure and report carbon in a way that is likely to be useful to the stakeholder (Bebbington et al., 2014). The companies may prefer to voluntarily disclose carbon information as per the GRI, CDP or various other reporting regimes/recommendations. The format in which the carbon disclosure is being made also appears to be inconsistent. This suggests a strong need for consistent and comparable information pertaining to carbon emission disclosure, in the form of a uniform mandatory carbon disclosure requirement.

Whilst there is empirical evidence highlighting the inconsistencies in carbon disclosure practices to further support a mandatory carbon disclosure requirement, prior literature in the carbon disclosure area has not yet surveyed the carbon emission disclosure practices of the firms affected under ETSs. With ETSs gaining prominence, this study therefore seeks to examine the carbon reporting/disclosure practices of the firms affected under ETSs, particularly UK, Australian and New Zealand firms affected under the EU ETS, Australian Carbon Tax and NZ ETS.

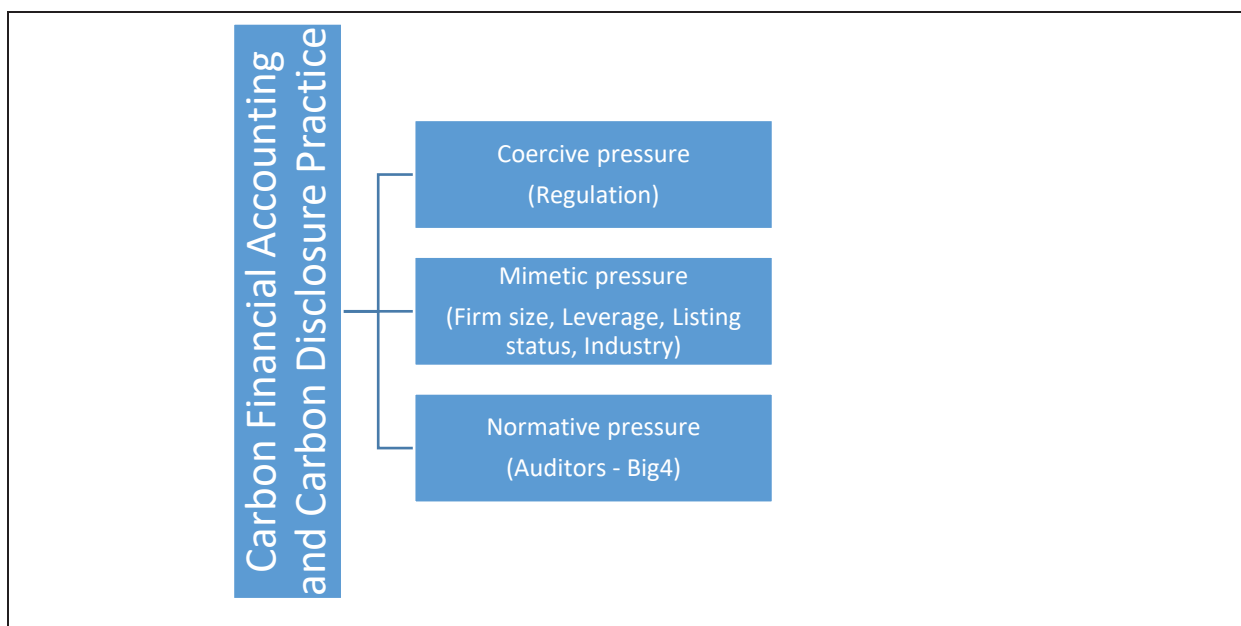
Chapter 5 will discuss the literature related to the study's third research question i.e. what factors influence a firm to account for and disclose carbon information in a certain way, using an institutional theory framework.

## Chapter 5: Factors influencing a firm's decision to account for and disclose voluntarily

### 5.1 Introduction

The third purpose of this study is to investigate which firm characteristics and market features are influential in a firm's decision to account for and disclose carbon related information, given the absence of uniform accounting guidance and limited mandatory disclosure requirements. In order to address this question, the study takes an institutional theory perspective, which is broader than legitimacy theory. Institutional theory indicates that organisations are faced with institutional pressures, and as a result of these pressures, organisations within a field tend to become similar in their forms and practices (Deegan, 2011, p. 356). These pressures can be coercive, mimetic or normative, and the resulting institutional image can sometimes be more apparent than real. Within the frame of institutional theory, not only regulations (coercive pressure), but also firms' characteristics and market features, such as firm size (mimetic pressure), listing status (mimetic pressure), industry/sector (mimetic pressure), leverage (mimetic pressure) and auditors (normative pressure), can influence and require a firm to account for and provide disclosure on carbon related information. Figure 5-1 below presents a summary of institutional pressures and the relevant variables.

Figure 5-1: Institutional pressures affecting a firm's carbon financial accounting and carbon disclosure practice



As discussed in the previous two chapters, currently for UK, Australian and NZ firms affected under ETSs, carbon financial accounting and some portions of carbon disclosure practice is voluntary (e.g., disclosure on carbon financial accounting policy). Since the current study uses an institutional theory framework to discuss the factors or variables influencing these voluntary practices, a total of 34 prior studies examining these factors were considered. Of these 34 studies, 31 were from the voluntary carbon disclosure area. The remaining three, however, were from the voluntary financial accounting area. There do not appear to be any prior studies in the carbon financial accounting or environmental accounting literature, which discuss explanatory theories of why a firm may voluntarily account for carbon permits, nor the factors that may influence a firm's carbon accounting practice.

In order to further examine if firm characteristics and market features influence carbon financial accounting practice (i.e. part of the third research question), it is essential to know why firms are voluntarily accounting for carbon and what factors are motivating firms to voluntarily account for carbon permits. This chapter therefore focuses on three prior studies (as these were the only prominent ones) from the financial accounting literature as it is assumed that the factors affecting voluntary financial accounting practice, may also affect voluntary carbon financial accounting practice, as the latter is an extension of the 'financial accounting' area.

Brief summaries and detailed findings of all 34 prior studies are presented in Appendix A and Tables 5-1 and 5-2. Appendix A provides an insight on all the voluntary financial accounting and carbon disclosure studies considered for the literature review, whereas the other two tables more specifically focus on the studies' theoretical perspectives (see Table 5-1), and further elaborate on the findings that are briefly highlighted in Appendix A (see Table 5-2).

This chapter develops the hypothesis for the current study. Institutional theory frames the study and the 31 carbon disclosure and three financial accounting studies are used to discuss the firm characteristics and market feature variables (i.e. regulations, firm size, leverage, listing status, industry and auditors) that influence a firm to account for and provide carbon disclosure voluntarily. Apart from these firm characteristics and market feature variables, the study does not consider other variables from the 34 prior studies, such as previous disclosures, Kyoto protocol, market to book and performance measures (like return on equity (ROE), return on assets (ROA) and foreign sales). These variables were not considered for the following reasons:

Previous disclosures: This variable is not considered as it will require data for an additional year or data from another source, i.e. CDP, whereas the current study uses data for a one year period and from a common source i.e. annual report.

Kyoto Protocol: This variable is not considered as the study does not intend to examine the carbon financial accounting and carbon disclosure practices of the companies in Kyoto protocol and non-Kyoto protocol ratifying countries.

Performance measures (ROE, ROA and foreign sales) and market to book: These variables are not considered as the majority of prior studies (see Table 5-3) appear to find more association between a firm's financial accounting and carbon disclosure practices and firm characteristics like size, leverage and industry and financial accounting and carbon disclosure practice, than these performance measures, including market to book.

The discussion in this chapter will therefore proceed as follows. Section 5.2 will discuss the theories used by prior studies (as presented in Table 5-1) on voluntary financial accounting and carbon disclosure practice, wherein subsection 5.2.1 will focus on theories explaining a firm's financial accounting choice and subsection 5.2.2 will focus on theories explaining a firm's need to provide carbon disclosure. Additionally, this section will also identify the first gap in the literature, that prior carbon financial accounting and carbon disclosure studies have not used institutional theory (except for Rankin et al., 2011; Tang & Luo, 2011) to explain which factors influence both a firm's adoption of carbon financial accounting practice and the extent of its carbon disclosure. More specifically, the present study uses institutional theory to explain why firms affected under ETSS may financially account for and provide disclosure on carbon, in order to fill this gap in the carbon financial accounting and disclosure literature.

Following this, section 5.3 will discuss institutional theory in further detail. The section will also note the findings of prior studies that discuss the factors or determinants associated (or not associated) with a firm's financial accounting and carbon disclosure practice (also presented in Table 5-2). Additionally, this section will use an institutional theory framework and classify these factors/ determinants as coercive, mimetic and normative pressures that influence the firms affected under ETSS to financially account for and provide disclosure on carbon emission allowances in a certain way. Subsection 5.3.1 will focus on coercive pressures and their relevant determinants, followed by subsections 5.3.2 and 5.3.3 which will focus on mimetic and normative pressures and their relevant determinants, respectively.

Finally, this section develops the hypothesis of the study and highlights another gap in the carbon financial accounting and carbon disclosure literature, namely that although most of the prior studies in the carbon disclosure area (although none in the carbon financial accounting area), have used firm characteristics and market features to empirically test their association with carbon disclosure level,

these firm characteristics did not specifically relate to the ETS affected firms. Following this, Section 5.4 summarises the chapter.

## 5.2 Theories used by prior studies to explain a firm's carbon financial accounting and carbon disclosure practice

As can be observed from Table 5-1 below, most of the studies (from the carbon disclosure literature) used more than one theory (i.e. legitimacy, stakeholder and cost benefit theories) to explain why firms may provide voluntary carbon disclosure. On the other hand, studies in the financial accounting literature, preferred to use a single theory to explain the firm's reason to financially account. The following subsections provide further discussion.

Table 5-1: Theories used to explain financial accounting and carbon disclosure

		Literature Review — Theoretical perspectives used by prior financial accounting and carbon disclosure studies									
Financial accounting studies		Year	Positive accounting theory	Costly contracting theory	Legitimacy theory	Stakeholder and/or Agency theory	Institutional theory	Cost Benefit and/or Political economy theory			
1	Rahman, Perera & Ganesh	2002	√								
2	Astami & Tower	2006		√							
3	Waweru, Prot Ntui & Mangena	2011	√								
Carbon disclosure studies		Year	Positive accounting theory	Costly contracting theory	Legitimacy theory	Stakeholder and/or Agency theory	Institutional theory	Cost Benefit and/or Political economy theory			
1	Freedman & Jaggi	2005			√	√		√			
2	Stanny & Ely	2008			√			√			
3	Prado-Lorenzo, Rodriguez-Domiguez, Gallego-Alvarez & Garcia-Sanchez	2009			√	√		√			
4	Liu & Anbumozhi	2009				√					
5	Peters & Romi	2009			√	√					
6	Berthelot & Robert	2011			√	√					
7	Dawkins & Fras	2011			√	√					
8	Freedman & Jaggi	2011			√	√					
9	Rankin, Windsor & Wahyuni	2011					√				
10	Tang & Luo	2011				√	√				
11	Cotter & Najah	2012				√					
12	Gallego-Alvarez & Vicente-Villardón	2012			√						
13	Hrasky	2012			√						
14	Luo, Lan & Tang	2012			√	√					
15	Borghesi-Ghomi & Leung	2013			√	√					
16	Bae Choi, Lee & Psaros	2013			√	√					
17	Ieng Chu, Chatterjee & Brown	2013			√						
18	Haque, Deegan & Inglis	2013				√					
19	Jira & Toffel	2013									√
20	Luo, Tang & Lan	2013									√
21	Stanny	2013			√						
22	Peng, Sun & Luo	2015			√	√					
23	Gonzalez-Gonzalez & Zamora Ramirez	2016			√	√					
24	Guenther, Guenther, Schiemann & Weber	2016			√	√					

Source: Adapted from Hahn, Reimsbach and Schiemann (2015).

### *5.2.1. Theories explaining a firm's financial accounting practice*

With respect to financial accounting practice, the studies undertaken by Rahman et al. (2002) as well as Waweru et al. (2011), use a positive accounting theory perspective and note that firms may financially account in a certain way if doing so enables them to meet their individual objective (if any). On the other hand, Astami and Tower (2006) use costly contracting theory to explain the accounting practices of the firm. These studies however, do not use institutional theory, which suggests that firms may financially account in a certain way due to coercive, mimetic and normative forces. Additionally, these studies do not specifically focus on the financial accounting of carbon emission allowances, rather they focus on general financial accounting practice.

Therefore, the current gap in the carbon financial accounting literature is the lack of prior studies on voluntary carbon financial accounting practice which use institutional theory to explain the carbon financial accounting practices of firms. The current study aims to address this gap by being the first study to use institutional theory to explain the carbon financial accounting practices of firms affected under ETSS.

### *5.2.2. Theories explaining a firm's carbon disclosure practice*

Unlike the carbon financial accounting literature discussed in subsection 5.1.1 above, where no prior studies were found to use institutional or any other theory to explain the carbon financial accounting practices of the firms, there are a lot of studies (Freedman & Jaggi, 2005; Stanny & Ely, 2008; Tang & Luo, 2011; Luo et al., 2012; Bae Choi et al., 2013; Haque et al., 2013; Stanny, 2013) in the area of carbon disclosure. These studies have used various theories (i.e. legitimacy, stakeholder, cost benefit and institutional theories) to explain voluntary carbon disclosure practices.

Coming from the legitimacy theory perspective for voluntary carbon disclosure, prior studies argue that companies disclose only that information which is feasible, which further indicates that the provision of such information is to reassure or alter the perceptions of public or governments (Freedman & Jaggi, 2005; Stanny & Ely, 2008; Peters & Romi, 2009; Prado-Lorenzo et al., 2009; Berthelot & Robert, 2011; Dawkins & Frasc, 2011; Freedman & Jaggi, 2011; Gallego-Alvarez & Vicente-Villardón, 2012; Luo et al., 2012; Hraskey, 2012; Bae Choi et al., 2013; Borghei-Ghomi & Leung, 2013; Ieng Chu, Chatterjee & Brown, 2013; Stanny, 2013; Peng, Sun & Luo, 2015; Gonzalez-Gonzalez & Zamora Ramirez, 2016).

The cost benefit theory assumes that the firms are likely to disclose voluntarily if the benefit of doing so exceeds the costs. Supporting this, Stanny and Ely (2008) claim that firms that are more closely scrutinized are more likely to disclose because the costs of not doing so are higher for them. Various studies (Freedman & Jaggi, 2005; Stanny & Ely, 2008; Prado-Lorenzo et al., 2009; Berthelot & Robert, 2011; Dawkins & Fras, 2011; Freedman & Jaggi, 2011; Jira & Toffel, 2013; Luo, Tang & Lan, 2013) use a cost benefit (or political economy theory) perspective and note that a firm's motivation to disclose information is based on an evaluation of the costs and benefits of voluntary disclosure.

In contrast to the above and taking a stakeholder theory perspective, Haque et al. (2013) state that firms provide (carbon) disclosure to satisfy the information needs of stakeholders. Tang and Luo (2011) claim that stakeholder theory provides different yet complementary justifications for the development of carbon disclosure practices and that the information needs of stakeholders are associated with carbon transparency. As with legitimacy theory, stakeholder theory has also been used by various studies (Freedman & Jaggi, 2005; Liu & Anbumozhi, 2009; Peters & Romi, 2009; Prado-Lorenzo et al., 2009; Berthelot & Robert, 2011; Dawkins & Fras, 2011; Freedman & Jaggi, 2011; Cotter & Najah, 2012; Luo et al., 2012; Borghei-Ghomi & Leung, 2013; Peng et al., 2015; Gonzalez-Gonzalez & Zamora Ramirez, 2016; Guenther, Guenther, Schiemann & Weber, 2016).

Finally, using an institutional theory perspective, Rankin et al. (2011) as well as Tang and Luo (2011), note that a firm's GHG reporting and carbon disclosure transparency are both associated with coercive, mimetic and normative institutional pressures, and that these pressures have a significant effect on ensuring that firms provide more carbon disclosure.

The issue with all the prior carbon disclosure studies discussed in this subsection is that most have used more than one theory to either explain a firm's need to voluntarily disclose carbon related information or explain a firm's carbon disclosure level or transparency. Additionally, most of these prior studies were based on the carbon disclosure practices of large emitters or of firms from Kyoto Protocol ratifying countries, and not specifically ETS affected firms (or the participants in ETSs) (see Table 5-1). The study thus follows Tang and Luo (2011) as well as Rankin et al. (2011) and uses institutional theory to explain the carbon transparency, or the extent of carbon disclosure, of the firms affected under ETSs.

In summary, the current gap in the voluntary carbon disclosure literature is the lack of prior studies in the voluntary carbon disclosure area which use institutional theory to explain why firms affected under ETSs may voluntarily provide high or low carbon disclosures, given the limited mandatory carbon

disclosure requirement. The present study therefore aims to address this gap by using institutional theory to explain the extent of carbon disclosure of the firms affected under ETSs.

### 5.3. Institutional theory and factors motivating a firm's accounting policy and disclosure practice

As indicated earlier, the study takes an institutional theory perspective to address the third research question of what company characteristics and market features are influencing firms' decisions to financially account for and disclose carbon related information.

Some of the early studies in voluntary disclosure (Singhvi & Desai, 1971; Chow & Wong-Boren, 1987; Hossain, Perera & Rahman, 1995) provide empirical evidence on the firm characteristics that act as determinants. In addition to regulation, firm specific variables also have an explanatory and predictive power in relation to a firm's carbon disclosure (Freedman & Jaggi, 2005; Stanny & Ely, 2008; Prado-Lorenzo et al., 2009; Andrew & Cortese, 2011; Rankin et al., 2011; Tang & Luo, 2011; Luo et al., 2012; Bae Choi et al., 2013), or accounting policy choice behaviour (Gray, 1988; Craswell & Taylor, 1992; Radebaugh & Gray, 1993; Ball, 1995; Nobes, 1998; Rahman et al, 2002). In support, from a positive accounting theory perspective, Watts and Zimmerman (1986), and Rahman et al. (2002) citing Hossain et al. (1995), note that firms with different characteristics will adopt different disclosure and measurement (or accounting) practices.

Taking the above discussion into consideration and adopting an institutional theory perspective, the current study considers ETS as an institutional setting. It is hypothesised that in the event of uncertainty on how to financially account for carbon emission allowances, and in the event of voluntary carbon disclosure (albeit that some amount of mandate for carbon disclosure exists), the firms affected under ETSs may adopt or have similar carbon financial accounting and carbon disclosure practices, as other firms within a particular organisation field, due to coercive, mimetic and normative pressures, all of which comprise firm characteristics and market features like regulation, size, leverage, industry, listing status and auditors. Their aim is to further increase their legitimacy as well as improve their chances of survival.

The reason for adopting an institutional theory perspective for the study is that the theory explains how the mechanisms (proposed by both stakeholder theory and legitimacy theory) through which firms may seek to align perceptions of their practices with social and cultural values (to gain legitimacy) become institutionalised in certain firms (Deegan, 2011). Institutional theory provides a complementary, rather

than competitive perspective, to both stakeholder and legitimacy theory (Deegan, 2011). Using this theory will therefore help in understanding why firms affected under ETSs are financially accounting for and providing disclosure on carbon emission allowances in the (mostly) voluntary setting.

Institutional theory argues that external pressures or forces drive a firm's decision making in adopting a similar organisational practice (Hirsch, 1975; Clemens & Douglas, 2006; Lai, Wong & Cheng, 2006; Sarkis, Zhu & Lai, 2011). Specifically, the underlying assumption behind the theory is that institutional pressures result in firms within a field tending to be similar in their forms and practices (Deegan, 2011). These institutional pressures (coercive, mimetic and normative) strongly motivate firms within a field to adopt similar financial accounting and disclosure practices, and therefore, institutional theory has become a significant framework for explaining environment related (accounting or disclosure) practices (Lounsbury, 1997; Rankin et al., 2011; Sarkis, Zhu & Lai, 2011; Tang & Luo, 2011).

The present study supports the view that coercive, mimetic and normative pressures lead to firms or organisations within a particular organisational field, financially accounting for carbon and disclosing carbon related information in a certain way, in order to increase their legitimacy and chances of survival in the event of uncertainty (Deegan, 2011). Table 5-2 below presents the findings of all the studies considered in the literature review to highlight the determinants and their association with the financial accounting and carbon disclosure level. The following subsections discuss these pressures in further detail, along with developing the hypothesis for the current study.

Table 5-2: Determinants of voluntary financial accounting and carbon disclosure practices

Financial accounting studies		Literature Review – Determinants of voluntary financial accounting and carbon disclosure practices															
		Year	Coercive pressures					Institutional Pressures							Normative pressures		
			Country level regulations	Kyoto Protocol	Size	Leverage	Industry	Listing status	Performance measures	Emission levels	Ownership concentration / Corporate governance	Others*	Auditors	Previous disclosures			
1	Rahman, Perera & Ganesh	2002	+		sig	nil	sig						sig	-	+		
2	Astami & Tower	2006			nil	-	sig		nil					sig			
3	Waweru, Prot Ntui & Mangena	2011			+	nil								sig			
	Carbon disclosure studies	Year	Country level regulations	Kyoto Protocol	Size	Leverage	Industry	Listing status	Perf measures	Emission levels	Ownership concentration / Corporate governance	Others*	Auditors	Previous disclosures			
1	Freedman & Jaggi	2005		+	+	nil	+		nil								
2	Stamny & Ely	2008			+	nil	-		nil			sig			+		
3	Prado-Lorenzo, Rodriguez-Domiguez, Gallego-Alvarez & Garcia-Sanchez	2009			+				-					+		nil	
4	Liu & Anbumozhi	2009			sig		sig		nil								
5	Peters & Romi	2009	sig											sig			
6	Reid & Toffel	2009	+		+					nil							
7	Brouhle & Harrington	2010	+		nil		nil	+								+	
8	Berthelot & Robert	2011			+						+		+	nil			
9	Dawkins & Fras	2011			nil	nil			nil								
10	Freedman & Jaggi	2011		+	+					nil							
11	Kim & Lyon	2011	+		+					nil				sig			
12	Rankin, Windsor & Wahyuni	2011	nil		+	nil	+		nil		+					+	
13	Scholten & Kleinsmann	2011	sig											sig			
14	Tang & Luo	2011	+		+	+	+										
15	Cotter & Najah	2012			+	sig	sig		nil					+		+	



### *5.3.1 Coercive pressure and hypothesis*

Coercive pressure is a formal or informal pressure exerted on an organisation by a superior organisation upon which the former organisations depend and can also result from the cultural environment in which an organisation operates (Antwi, 2010). Such pressures might be perceived as force, persuasion or an invitation to adopt a particular policy, in most cases to increase its legitimacy (Antwi, 2010). Given this definition, the study considers 'regulation' as a coercive pressure, or one of the market features, that are likely to influence an ETS affected firm's adoption of carbon financial accounting practice and level of carbon disclosure.

#### *Regulation*

Regulation is defined as the intentional restriction of a subject's choice of activity by an entity not directly party to or involved in the activity e.g. external regulators (Rahman et al., 2002). Rahman, Perera and Ganeshanandam (1996) note that disclosure requirements in both NZ and Australia are set by company/corporation statutes, listing requirements and accounting standards, whereas measurements (or accounting rules) are only set by accounting standards. Prior studies (Rahman et al., 2002) in the financial accounting literature reveal that 'regulation' is positively associated with accounting practice harmony and is one of the factors that motivate a firm's accounting and disclosure level.

In the case of accounting (level), accounting rules such as government, accounting bodies and stock exchanges, impose restrictions on and suggest the ways in which accounting can be conducted (Rahman et al., 2002). This implies that firms with regulations imposed on them are likely to have a higher level of carbon financial accounting practice as compared to firms with no regulations imposed on them. This is because firms with regulations imposed on them are likely to be under a greater level of scrutiny as compared to firms subject to fewer or no regulations.

Therefore the adoption of carbon financial accounting practice is higher for firms with stringent regulations (i.e. detailed and extensive regulations), as compared to the firms with less regulation. Consequently:

H1a: The adoption of carbon financial accounting practice is higher for firms with stringent regulations.

Similarly, prior studies in carbon disclosure found that 'regulation' significantly affects a firm's disclosure level (Peters & Romi, 2010; Scholtens & Kleinsmann, 2011; Gallego-Alvarez & Vicente-Villardón, 2012; Bae Choi et al., 2013). Another set of studies (Freedman & Jaggi, 2005; Reid & Toffel, 2009; Brouhle & Harrington, 2010; Freedman & Jaggi, 2011; Kim & Lyon, 2011; Tang & Luo, 2011; Luo et al., 2012; Jira & Toffel, 2013; Luo et al., 2013; Stanny, 2013) indicate a positive association between regulation and carbon related disclosure level. In contrast, a few studies (Rankin et al., 2011), find a less significant association between regulation and the carbon related disclosure level of the firms. Overall, the findings of the majority of these studies indicate that regulation has a positive association with a firm's disclosure level and that a firm's level of disclosure will be high, if affected by regulation.

The current study suggests that, just like the government and accounting bodies impose restrictions on and suggest the ways in which accounting is to be conducted (Rahman et al., 2002), the same can also hold true for the 'carbon disclosure practices' of the firms. Under stringent regulation, the extent of a firm's carbon disclosure will be higher than firms under no or less regulation, as stringent regulation will put more pressure (i.e. coerce) on the ETS affected firms to provide more disclosure, in order to increase their legitimacy in the eyes of their stakeholders and therefore increase their prospects of survival. Accordingly:

H1b: The extent of carbon disclosure is greater for firms with stringent regulations than for firms with less regulation.

### *5.3.2 Mimetic pressure and hypothesis*

Mimetic pressure stems from standard responses to uncertainty. It is a powerful force that encourages imitation and in the event of uncertainty, an organisation might elect to model itself on, mimic or copy the accounting and disclosure practices of successful or similar organisations to increase their legitimacy and survival prospects (DiMaggio & Powell, 1983; Antwi, 2010; Deegan, 2011). Given this definition, the present study considers firms with similar characteristics such as 'size', 'leverage', 'industry' and 'listing status'. These characteristics are viewed as mimetic pressures which lead firms affected under ETSS to adopt certain carbon financial accounting practices and to have a certain carbon disclosure level. Each of these characteristics are discussed below.

### *Firm size*

Rahman et al. (2002) found a significant association between firm size and financial accounting practice, in contrast to Waweru et al. (2011) who found only a positive association between the two factors. Further, no association was observed between financial accounting practice and firm size in Astami and Tower (2006). However, firm size is an important determinant of accounting policy choice (Watts & Zimmerman, 1990; Rahman et al., 2002). Watts and Zimmerman (1990) note that large firms are more likely than small firms to use accounting choices that reduce reported profits as it helps them in achieving the political cost objective. Supporting this further, Rahman et al. (2002) state that large firms will have a greater need for using a variety of accounting policies as they will have a greater amount as well as variety of activities than small firms, and therefore, there is likely to be a higher variability of measurement practice for large firms than for small firms. Thus, large firms will have a greater need to adopt a variety of accounting policies as they will have more activities as compared to small firms, thereby leading to variations in accounting practice.

However, the current study deviates from the above argument and considers 'large size' as a mimetic pressure resulting from the uncertainty in financially accounting for carbon in the absence of uniform accounting guidance, which can encourage imitation of accounting policies by firms affected under the institutional settings of ETSs (DiMaggio & Powell, 1983; Antwi, 2010; Deegan, 2011). The study supports the assumption that in the event of uncertainty on how to financially account for carbon permits (or emission allowances), large companies will elect to model, mimic or adopt the carbon financial accounting practices of successful or similar large sized firms to increase their legitimacy and survival prospects, as they may have a similar variety of activities as compared to small firms (DiMaggio & Powell, 1983; Antwi, 2010; Deegan, 2011). Thus:

H2a: The adoption of carbon financial accounting practice is higher for large size firms than for small size firms.

Firm size is also an important determinant of carbon disclosure choice (Watts & Zimmerman, 1990; Rahman et al., 2002). Most of the carbon disclosure studies have found that firm size is positively associated with a firm's extent of disclosure (Freedman & Jaggi, 2005; Prado-Lorenzo et al., 2009; Reid & Toffel, 2009; Berthelot & Robert, 2011; Freedman & Jaggi, 2011; Kim & Lyon, 2011; Rankin et al., 2011; Tang & Luo, 2011; Cotter & Najah, 2012; Luo et al., 2012; Borghei-Ghomi & Leung, 2013; Bae

Choi et al., 2013; Ieng Chu et al., 2013; Luo et al., 2013; Stanny, 2013; Wegener, Elayan, Felton & Li, 2013; Eleftheriadis & Anagnostopoulou, 2014; Peng et al., 2015; Gonzalez-Gonzalez & Zamora Ramirez, 2016), and one study (Liu & Anbumozhi, 2009) found a significant association between them. No association was observed between firm size and carbon disclosure in Brouhle and Harrington (2010) as well as Dawkins and Fris (2011).

As with most of the prior studies discussed above, the current study suggests that firm size is positively associated with extent of carbon disclosure and therefore considers 'firm size' as a mimetic pressure, that will encourage imitation of carbon disclosure policies by firms affected under the institutional settings of ETSs (DiMaggio & Powell, 1983; Antwi, 2010; Deegan, 2011). The study supports the assumption that in the event of uncertainty on how to provide disclosure on carbon permits (or emission allowances), the large and small size companies will elect to model, mimic or copy the carbon disclosure practices of successful or similar sized firms to increase their legitimacy and survival prospects (DiMaggio & Powell, 1983; Antwi, 2010; Deegan, 2011). This is because large size firms will also be under public or investors' (or stakeholders') scrutiny of their carbon emissions and therefore will be under pressure to provide more carbon disclosure. As such, in the event of uncertainty, the affected large size firms will mimic the carbon disclosure practices of their successful or similar counterparts. Accordingly:

**H2b:** The extent of carbon disclosure is greater for large size firms than for small size firms.

### *Leverage*

Leverage is an important determinant of accounting policy choice (Watts & Zimmerman, 1990; Rahman et al, 2002). Firms with high leverage are more likely to use similar accounting practice to achieve their individual objective (for example, increasing income) (Watts & Zimmerman, 1990). However, none of the prior voluntary financial accounting studies reviewed (Rahman et al, 2002; Astami & Tower, 2006; Waweru et al., 2011) indicated any positive association between leverage and the financial accounting practice. Whilst, Astami and Tower (2006) found a negative relationship, Rahman et al. (2002) and Waweru et al. (2011) found no association between leverage and financial accounting practice.

In contrast to the findings that leverage is not associated with accounting practice, within the frame of institutional theory, the current study considers 'leverage' as a mimetic pressure, which can encourage imitation of carbon financial accounting policies. The study suggests that in the event of uncertainty on how to financially account for carbon permits (or emission allowances), the firms with high leverage will elect to model, mimic or copy the carbon financial accounting practices of successful or similar high leverage firms. This is because, the higher the leverage, the more these firms may feel the need to financially account for carbon emission allowances, in a way that prevents them from having a debt contract that defines a breach in terms of accounting numbers. And therefore, owing to uncertainty in financially accounting for carbon permits, these high leverage firms will model their carbon financial accounting practice as per the carbon financial accounting practice of similarly leveraged firms. The study therefore argues that leverage is positively associated with carbon financial accounting practice. Thus:

H3a: The adoption of carbon financial accounting practice is higher for firms with high leverage than for firms with low leverage.

With respect to the carbon disclosure studies, very few found a positive association between leverage and carbon disclosure (Tang & Luo, 2011), or a significant association between leverage and carbon disclosure (Cotter & Najah, 2012). In contrast, several studies found no association between leverage and carbon disclosure (Freedman & Jaggi, 2005; Stanny & Ely, 2008; Liu & Anbumozhi, 2009; Dawkin & Fras, 2011; Rankin et al., 2011; Luo et al., 2012; Bae Choi et al., 2013, Borghei-Ghomi & Leung, 2013; Ieng Chu et al., 2013; Eleftheriadis & Anagnostopolou, 2014). Additionally, three voluntary carbon disclosure studies (Wegener et al., 2013; Luo et al., 2013; Peng et al., 2015) found a negative association between leverage and carbon disclosure.

Despite the fact that the majority of the above mentioned studies did not find any association between carbon disclosure and leverage, the current study considers leverage as an important determinant of carbon disclosure, as the higher the leverage, the more likely these firms will provide carbon disclosure to prevent them from having a debt contract that defines a breach in terms of disclosure. Debtholders are concerned about carbon related liabilities and need the information to negotiate debt contracts and reduce risk and uncertainty (Luo et al., 2012). Additionally, Luo et al. (2012) also note that such information is utilized to inspect carbon emissions as well as monitor management for opportunistic

behaviour, so as to mitigate their concerns and ensure compliance with the debt contract. Thus, with higher leverage, management will be under more pressure to disclose more carbon information. Therefore, given the uncertainty in carbon disclosure practice, the high leverage firms will mimic the carbon disclosure practice of similarly leveraged firms. Accordingly:

H3b: The extent of carbon disclosure is greater for firms with high leverage than for firms with low leverage.

#### *Listing status*

Prior studies in carbon disclosure provide mixed evidence on the association between listing status and carbon disclosure. Two studies (Brouhle & Harrington, 2010; Gonzalez-Gonzalez & Zamora Ramirez, 2016) found a positive association, whereas Borghei-Ghomi and Leung (2013) found a significant association between the listing status of a firm and a firm's level of carbon disclosure. In contrast, no association was observed between the listing status and the carbon disclosure level by leng Chu et al. (2013).

The current study considers listing status as one of the important determinants of a firm's carbon accounting and carbon disclosure practice. Specifically, listed companies have public accountability as their 'listing status' places them in the spotlight (Zeng, Xu, Yin & Tam, 2012; Gonzalez-Gonzalez & Zamora Ramirez, 2016), and therefore, similar to large size firms, they too are at a risk of being scrutinized for their carbon financial accounting practice (Luo et al., 2012). As such, given the uncertainty surrounding the financial accounting practice of carbon emission allowances as well as the uncertainty surrounding carbon disclosure practice, the firms with 'listing status' may feel the need to mimic the carbon financial accounting and carbon disclosure practices of similar listed firms to increase their legitimacy and survival prospects. Accordingly:

H4a: The adoption of carbon financial accounting practice is higher for firms with listing status than for firms that are not listed.

Likewise:

H4b: The extent of carbon disclosure is higher for firms with listing status than for firms that are not listed.

### *Industry*

All the firms affected under ETSs belong to different industries. The industries have a huge impact on carbon emissions and can be highly or moderately intensive. The highly intensive industries face greater business risk and are likely to generate greater public and regulatory concern (Rankin et al., 2011). Thus, depending on the emission intensity of the industry, the ETS affected firms may have similar carbon financial accounting practices. For example, an ETS affected firm in a highly emission intensive industry like manufacturing, may seek to model itself on and mimic the carbon financial accounting practices of a firm in a similar highly emission intensive industry, to increase its legitimacy and survival prospects. Likewise, an ETS affected firm in a low or moderately emission intensive industry may mimic the carbon financial accounting practice of a firm in a similar moderately emission intensive industry. Rahman et al. (2002) as well as Astami and Towers (2006) found a significant association between financial accounting and industry and note that the level of general (accounting) practice harmony is not independent of the industry. In other words, accounting choice will differ by industry (Rahman et al, 2002). Therefore, the present study hypothesizes that in the event of uncertainty, the adoption of carbon financial accounting practice will differ by industry as these industries may elect to model their carbon financial accounting practices in accordance with the practices implemented in similar industries. Thus:

H5a: The adoption of carbon financial accounting practice is dependent on industry.

Several studies found a positive association (Liu & Anbumozhi, 2009; Rankin et al., 2011; Scholtens & Kleinsmann, 2011; Luo et al., 2012; Bae Choi et al., 2013; Hrasky, 2013; Ieng Chu et al., 2013) between industry and the extent of carbon disclosure. One study (Tang & Luo, 2011) found a significant association between industry and firms' extent of carbon disclosure. A few studies however, also found no relationship (Stanny & Ely, 2008; Jira & Toffel, 2013; Stanny, 2013; Wegener et al., 2013) or a negative relationship (Yu & Ting, 2012) between industry and carbon disclosure. Overall, it appears that industry is also an important determinant of the extent of carbon disclosure. Depending on the type of

industry, ETS affected firms may provide more or less disclosure to increase legitimacy and survival prospects. Thus, as hypothesised for carbon financial accounting practice above, the study hypothesises that the extent of carbon disclosure will differ by industry as these industries may elect to model their carbon disclosure practices in accordance with the practices implemented in similar industries. Thus:

H5b: The extent of carbon disclosure is dependent on industry.

### *5.3.3 Normative pressure and hypothesis*

Normative pressure is attributable to professionalization i.e. a collective struggle of members and an occupation to define the conditions and methods of their work (Antwi, 2010). This is basically a pressure arising from group norms to adopt particular practices (DiMaggio & Powell, 1983; Deegan, 2011). Given this definition, the study considers 'Auditors' as a normative pressure, that is likely to lead to firms affected under ETSs to financially account for and provide disclosure of carbon emission allowances in a certain way.

#### *Auditors*

Generally, auditors do not encourage their clients to financially account for or report data in excess of the standard requirements (Alsaeed, 2006). However, to discourage litigation, auditors can influence the scope of voluntary carbon financial accounting practices and carbon disclosures by encouraging their client firms to comply with voluntary recommendations and adopt more carbon financial accounting practices and disclose more carbon related information (Berthelot & Robert, 2011). As per Radebaugh and Gray (1993), Big6 auditors (now Big4) are multinational auditors, with greater reputations at stake. They are perceived as having high standards of practice, which they tend to use across countries (and companies). The risks pertaining to climate change can be highly significant for a number of firms and therefore Big4 firms are likely to encourage these firms to adopt carbon financial accounting practices and provide more carbon disclosure as per their recommendations (Berthelot & Robert, 2011). These carbon financial accounting and carbon disclosure recommendations of the Big4 auditors can become a norm and, therefore, Big4 auditors can be considered one of the main determinants leading the ETS affected firms to adopt more carbon financial accounting practices and have high carbon disclosure. Additionally, the spread of insight on recommended carbon financial accounting and carbon disclosure

practices in the absence of uniform guidance, are more likely to be facilitated by auditors, more specifically, Big4 auditors than non Big4 auditors. Accordingly:

H6a: The adoption of carbon accounting practice is higher for firms with Big4 auditors than for firms with non Big4 auditors.

Likewise:

H6b: The extent of carbon disclosure is greater for firms with Big4 auditors than for firms with non Big4 auditors.

Table 5-3 below presents a summary of all the hypotheses proposed in this chapter.

Table 5-3: Hypotheses

Association between firm characteristics as well as market features and firms' adoption of carbon financial accounting practices and extent of carbon disclosure			
		Adoption of Carbon Financial Accounting	Extent of Carbon Disclosure
1	Regulation	H1a: The adoption of carbon financial accounting practice is higher for firms with stringent regulations than for firms with less regulation.	H1b: The extent of carbon disclosure is higher for firms with stringent regulations than for firms with less regulation.
2	Firm Size	H2a: The adoption of carbon financial accounting practice is higher for large size firms than for small size firms.	H2b: The extent of carbon disclosure is higher for large size firms than for small size firms.
3	Leverage	H3a: The adoption of carbon financial accounting is higher for firms with high leverage than for firms with low leverage.	H3b: The extent of carbon disclosure is higher for firms with high leverage than for firms with low leverage.
4	Listing status	H4a: The adoption of carbon financial accounting is higher for firms with listing status than for firms not listed.	H4b: The extent of carbon disclosure is higher for firms with listing status than for firms not listed.
5	Industry	H5a: The adoption of carbon financial accounting is dependent on industry.	H5b: The extent of carbon disclosure is dependent on industry.
6	Auditors	H6a: The adoption of carbon accounting is higher for firms with Big4 auditors than for firms with non Big4 auditors.	H6b: The extent of carbon disclosure is higher for firms with Big 4 auditors than for firms with non Big4 auditors.

## 5.4 Chapter Summary

In summary, this chapter has addressed the third research question of which company characteristics and market features are influencing a firm's decision to financially account for and provide disclosure of carbon emission allowances, given the absence of uniform accounting guidance and limited mandatory disclosure requirements. Given the two areas (carbon financial accounting and carbon disclosure) on which the third research question is based, the present study is supported by studies from the financial accounting and carbon disclosure literature.

However, although prior studies exist that provide proposals on how the firms affected under ETSs should account for (or are accounting for) carbon emission allowances (see Chapter 3), further research into the carbon financial accounting literature indicated that no prior studies exist that discuss theories to explain why a firm may voluntarily account for carbon emission allowances, or explore the factors that may influence a firm's adoption of carbon financial accounting practice. In order to further examine if firm characteristics and market features influence the carbon financial accounting practice of firms affected under ETSs (i.e. part of the third research question), it is essential to know why firms voluntarily account for carbon financially, or what factors provide motivation for firms to voluntarily financially account for carbon, given the absence of uniform accounting guidance. The chapter therefore is supported by three prior studies from the financial accounting literature (Rahman et al., 2002; Astami & Tower, 2006; Waweru et al., 2011), in the belief that the factors affecting voluntary financial accounting practice, can also provide reasons for firms' voluntary carbon financial accounting practice. This also indicates that the current study is timely and required in order to update the carbon financial accounting literature.

As with carbon financial accounting practice, it is important to know what factors are associated with firms' carbon disclosures, and then examine their association with the extent of ETS affected firms' carbon disclosure. As discussed above, in the carbon financial accounting literature, no studies currently exist that use theories to explain what motivates a firm to voluntary account for carbon nor explore the factors that may influence a firm's carbon accounting practice. However, a review of the carbon disclosure literature revealed about 24 prominent studies that used various theories (discussed below) to explain why firms provide carbon disclosure and what factors motivate the extent of their carbon disclosure.

Analysis of the three voluntary financial accounting and 31 voluntary carbon disclosure studies revealed that firms may voluntarily account in a certain way, as interpreted through a positive accounting theory perspective, and may provide voluntary carbon disclosure for legitimacy, cost benefit, stakeholder or

institutional reasons. Additionally, as per these prior studies, firm characteristics and market features, such as regulations, firm size, leverage and industry, are some of the main determinants of a firm's financial accounting and carbon disclosure practice. Apart from these, prior studies also highlight other determinants like previous disclosures, performance measures (like ROE, ROA and foreign sales) and a country's ratification with the Kyoto protocol, as influencing a firm's carbon disclosure. These variables, however, are not considered in this study.

Quite a few shortcomings were observed in a review of the 34 studies mentioned above, and some gaps in the carbon financial accounting and carbon disclosure literature were identified. Firstly, there are no studies in the carbon financial accounting literature which use theory (or theories) to explain why a firm may voluntarily account for carbon permits. Secondly, there are no studies in the carbon financial accounting literature which discuss the factors that may motivate the firms to voluntarily account for carbon. Thirdly, no prior studies exist in the carbon financial accounting and carbon disclosure literature which uses institutional theory to explain why the adoption of carbon financial accounting practice and the extent of carbon disclosure is high for some ETS affected firms and low for others. Finally, the studies in the carbon financial accounting and carbon disclosure literature have not yet examined whether firm characteristics and market features like firm size, industry, listing status, leverage, regulations and auditors lead to firms voluntarily accounting for and providing disclosure of carbon in a certain way.

The study aims to address the above highlighted gaps and proposes the use of institutional theory to help explain why a firm may financially account for or provide disclosure on carbon emission allowances in a certain way. In line with the institutional theory perspective, the study notes that a firm's carbon financial accounting and carbon disclosure practice will be influenced by coercive, mimetic and normative pressures. More specifically, the study hypothesizes that not just regulations (coercive pressure), but also firm characteristics and market features, such as firm size (mimetic pressure), firm listing status (mimetic pressure), firm industry/sector (mimetic pressure), firm leverage (mimetic pressure) and firm auditors (normative pressure), influence a firm (affected under ETS) to financially account for and provide disclosure on carbon emission allowances in a certain way.

The next chapter presents the theoretical and empirical model for the study and discusses the methodology in further detail.

## Chapter 6: Methodology

### 6.1 Introduction

This chapter discusses how the research was conducted in order to answer the three research questions of the study i.e. how are firms affected under ETSSs financially accounting for carbon emission allowances in the absence of uniform accounting guidance; how are firms affected under ETSSs disclosing information on carbon; and what firm characteristics and market features are influencing the ETSS affected firms' carbon financial accounting and carbon disclosure practices. The research methodology comprised the following steps:

- 1) Population and sample selection.
- 2) Empirical analysis performed in three stages, comprising:
  - a) Analysis of the carbon financial accounting practice data obtained through content analysis;
  - b) Analysis of the carbon disclosure practice data obtained through content analysis;
  - c) Data validation; and
  - d) Analysis of the factors that influence the adoption of carbon financial accounting practice as well as the extent of carbon disclosure, using an institutional theory model. The model was empirically tested using an equation and logistic regression analysis.

Section 6.2 below describes the population and sample selection process and is followed by Section 6.3 which discusses the research methodology in further detail. Subsection 6.3.1 relates to the first research question and discusses the research technique for analysis of the carbon financial accounting practice data through content analysis and subsection 6.3.2 relates to the second research question and focuses on the research technique for analysis of the carbon disclosure practice data, also obtained through content analysis. Subsection 6.3.3 discusses the data validation process. Finally, subsection 6.3.4 relates to the third research question and focuses on analysis of the factors influencing carbon financial accounting and carbon disclosure practice. The chapter concludes with a summary in Section 6.4.

### 6.2 Population and sample selection

The annual reports of the firms affected under ETSSs, i.e. UK firms (affected under EU ETS), Australian firms (affected under the Australian Carbon Tax), and NZ firms (affected under the NZ Emission Trading Scheme), were used for the study.

The annual reports were used as the source of carbon financial accounting and carbon disclosure data as they represent corporate communications and are the most important means of self-presentation. They are also an appropriate channel for announcing and communicating strategic emphasis (Abrahamson & Hambrick, 1997; Song et al., 2015). Annual reports were used in this study as they are important disclosure documents that can be said to provide a firm's carbon financial accounting and carbon disclosure practice information, and one of the purposes of the study was to assess the carbon financial accounting and carbon disclosure practice of the firms. These annual reports were examined to ascertain how the ETS affected firms are financially accounting for carbon emission allowances and disclosing information on carbon, in the absence of uniform carbon financial accounting and carbon reporting (or disclosure) guidance. In doing so, the focus was mostly on ascertaining how the ETS affected firms disclose their carbon emission related information and how they recognise and measure their carbon emission allowances, in comparison to the carbon disclosure checklist and recommendations of the withdrawn standard, IFRIC 3 (detailed discussion in section 6.2).

The annual reports for the 2012-2013 financial year were selected, as the Australian Carbon Tax came into force in 2012 (as compared to 2005 for the EU ETS and 2008 for the NZ ETS), and this period would therefore allow for cross country comparison between UK, Australian and New Zealand firms' carbon financial accounting and carbon disclosure practices.

The Carbonmarketdata database was used as the source for UK firms affected under the EU ETS. This database lists 911 installations (classified under Energy, Mineral, Metal and Other sectors), the account holders of which are either individuals or UK firms. Since the purpose was to select the 'annual reports', only those installations with UK firms as their account holders were selected. Subsequently, Google search was used to find those UK firms' websites and obtain their annual reports. The Australian government's 'Clean Energy Regulator' website was used as a source for the list of Australian firms affected under the Australian Carbon Tax. The website had a database known as 'liable entities public information database' (or LEPID), which provided a list of 347 (at the time of study) Australian entities considered liable under the Australian Carbon Tax. Similarly, the New Zealand Emission Unit Register (NZ EUR) database was used, as it had a list of 2,571 participant companies under the NZ ETS (at the time of study). The NZ EUR also classified those 2,571 participants into sectors, namely, agriculture, forestry, forestry removal activities, industrial processes, liquid fossil fuels, other removal activities, stationery energy and waste.

Some issues were encountered during the sample selection process, as a result of which a total of 201 firms (i.e. 69 UK firms, 65 Australian firms and 67 New Zealand firms) were considered for the study, for the 2012-2013 financial year period. These issues/limitations are listed below:

1. The website for some firms was not found or not accessible, or the annual reports were not available. These firms were not considered for the study.
2. Additionally, most of the Australian and NZ firms were subsidiaries of other companies mentioned in the same database. As a result, the annual reports of these firms were not considered, since they had common annual reports and this would have caused duplication of data. Likewise, for the UK, most of the account holder firms owned multiple installations, as a result of which the UK firm sample size was further reduced.

In summary, given the aforementioned limitations, the 69 UK firms, 65 Australian firms and 67 New Zealand firms were further narrowed down to a sample of 150 firms, comprising 64 UK firms, 46 Australian firms and 40 New Zealand firms for the study.

Table 6-1 (Panel A) below provides a summary of the UK, Australian and New Zealand firms selected and their distribution. Table 6-1 (Panel B) provides information on the distribution of the final sample by industry, under which they were classified for the purpose of analysis. Table 6-1 (Panel B) also suggests that whilst most UK (67.2%) and Australian firms (52.2%) were from the Energy and Utilities industry, most New Zealand firms (55%) belonged to the Primary industry.

Table 6-1: Distribution of firms

Panel A: Summary of UK, Australian and NZ firms selected and their data distribution

Firms' data distribution	Total	UK	Australia	New Zealand
Total annual reports considered	201	69	65	67
Annual reports with no carbon information	(51)	(5)	(19)	(27)
Total annual reports with information on carbon financial accounting or carbon disclosure practice	150	64	46	40

Table 6-1

## Panel B: Distribution of firms by industries

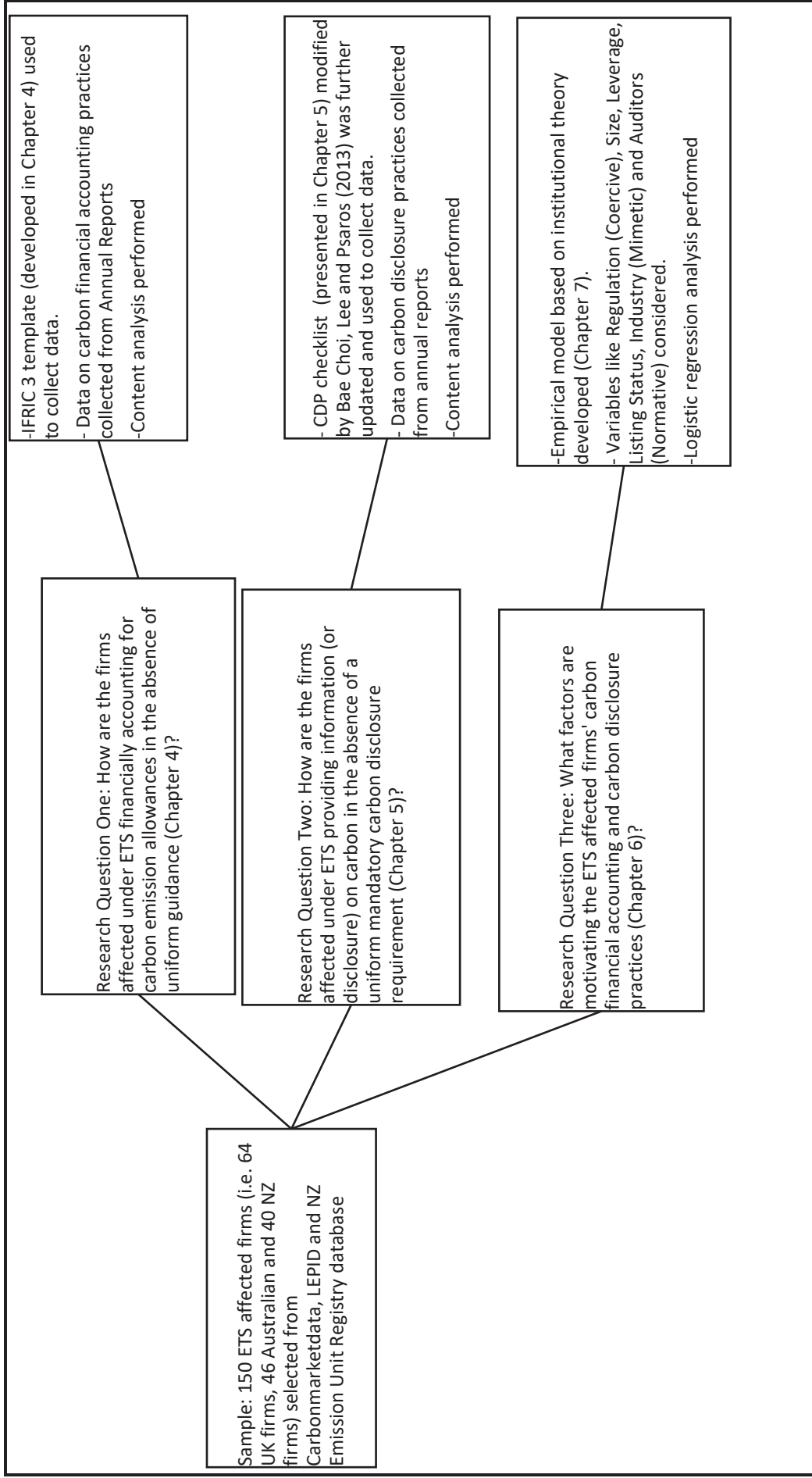
<b>Distribution of firms by industries</b>									
Industries	All firms (N=150)	%	UK (N=64)	%	Australia (N=46)	%	New Zealand (N=40)	%	
<u>Energy and Utilities:</u>									
Energy	68	45.3%	43	67.2%	12	26.1%	13	32.5%	
Utilities	12	8.0%	0	0.0%	12	26.1%	0	0.0%	
<b>Total</b>	<b>80</b>	<b>53.3%</b>	<b>43</b>	<b>67.2%</b>	<b>24</b>	<b>52.2%</b>	<b>13</b>	<b>32.5%</b>	
<u>Manufacturing and Industrial Process:</u>									
Minerals	14	9.3%	13	20.3%	1	2.2%	0	0.0%	
Materials & Metals	14	9.3%	1	1.6%	13	28.3%	0	0.0%	
Industrial process	10	6.7%	0	0.0%	5	10.9%	5	12.5%	
<b>Total</b>	<b>38</b>	<b>25.3%</b>	<b>14</b>	<b>21.9%</b>	<b>19</b>	<b>41.3%</b>	<b>5</b>	<b>12.5%</b>	
<u>Primary:</u>									
Paper	7	4.7%	7	10.9%	0	0.0%	0	0.0%	
Agriculture	4	2.7%	0	0.0%	0	0.0%	4	10.0%	
Forestry	5	3.3%	0	0.0%	0	0.0%	5	12.5%	
Forestry removal	9	6.0%	0	0.0%	0	0.0%	9	22.5%	
Other removal activities	7	4.7%	0	0.0%	3	6.5%	4	10.0%	
<b>Total</b>	<b>32</b>	<b>21.3%</b>	<b>7</b>	<b>10.9%</b>	<b>3</b>	<b>6.5%</b>	<b>22</b>	<b>55.0%</b>	

After the population and sample selection process discussed above, the empirical analysis was performed in three stages. The following section discusses these in further detail.

### 6.3 Research design and empirical analysis

Currently carbon emissions accounting and (some) carbon disclosures are voluntary activities. Therefore the general design of prominent carbon financial accounting guidance and carbon disclosure studies have been used in this research. Figure 6-1 below provides a summary of the methodology used for the study.

Figure 6-1: Summary of the methodology used for the study:



### *6.3.1 Analysis of carbon financial accounting practice*

For the purpose of addressing the first research question, i.e. how the ETS affected firms are financially accounting for carbon, as well as for the purpose of coding a company's adoption of carbon financial accounting practice, a coding framework (the IFRIC 3 template) was developed on the basis of recommendations from the carbon financial accounting proposals and surveys that were discussed earlier (see Chapter 4). More specifically, this framework provides the double entries taken from the carbon financial accounting proposals and surveys for the different stages of a carbon emission allowance lifecycle i.e. (1) on receipt of free allowances, (2) on purchase of allowances, (3) on use of allowances (when emitting emissions), (4) on surrender of allowances (when used allowances are delivered), and when sold. This enabled the recording of the information presented in annual reports into accounts to be debited and credited during the different stages of carbon allowance acquisition and use. Additionally, the carbon financial accounting policies were also noted and coded. Where the firms did not appear to provide any information on their carbon financial accounting policy for a particular stage, a code of 0 was applied. For every different carbon financial accounting policy used by firms, which resulted in different double entries, a code of between 1 and 5 was used. The firms' carbon financial accounting policy was also noted. The framework (Table 6-2) was also used as a score sheet to record the information firms provide regarding how they recognise and measure their carbon emission allowances. A score of 1 was allotted where the firms appeared to adopt carbon financial accounting practice for each of the different stages of carbon emission allowance lifecycle. For example, where a firm appeared to adopt and report a carbon financial accounting practice for both 'free' and 'purchased' carbon emission allowances, a score of 2 was used as it was inferred that the firm is adopting carbon financial accounting practice for two stages of carbon emission allowance lifecycle. Likewise, where a firm appeared to adopt and report a carbon financial accounting practice for all stages of the carbon emission allowance lifecycle (i.e. free, used, purchased, surrendered and sold), a score of 5 was used. Using this approach, a firm's adoption of carbon financial accounting practice was noted.

Table 6-2: Accounting and measurement practice for carbon emission allowances (IFRIC 3 template)

Recognition and measurement practice for carbon emission allowances under different stages of dealing with carbon emission allowances (IFRIC 3 template)				
Free	Used	Purchased	Surrendered	Sold
Dr Intangible assets (Allowances) Cr Government grant (Deferred income)  Recognition / Measurement	Dr Intangible assets (Allowances) Cr Equity  Dr Government grant (Deferred income) Cr Income  Dr Emissions expense Cr Liability to deliver allowances  Recognition / Measurement	Dr Intangible assets (Allowances) Cr Cash / A/c payable  Recognition / Measurement	Dr Liability to deliver allowances Dr Loss due to impairment Cr Intangible assets (Allowances) Cr Profits or loss  Recognition / Measurement	Dr Cash / A/c Receivable Cr Revenue  Dr Cost of goods sold Cr Intangible assets Cr Profit or loss  Recognition / Measurement

Content analysis was employed to gather and record the data. Content analysis has been widely used as a consistent, structured and valid method to examine disclosures in annual reports and other media (Hooks & van Staden, 2011). According to Elo and Kyngas (2007), content analysis helps to analyse written, verbal or visual communication and is a method that has been used in research for making replicable and valid inferences from data to their context, with the intention of providing knowledge, new insights, representation of facts and a practical guide to action. The aim of content analysis is to attain a condensed and broad description of the phenomenon, with the outcome of analysis being concepts or categories describing the phenomenon (Elo & Kyngas, 2007).

The content of annual reports of companies was analysed and classified according to predetermined categories. The identification of a carbon financial accounting practice i.e. whether a firm has debited or credited certain accounts, and the identification of the measurement method used were both derived as implied by the reporting method used by the firm. For example, if a firm reported that it is accounting for its free carbon permits/emission allowances as 'intangible assets', it was inferred that they had debited the intangible assets account when the carbon permits were received free of cost. Similarly, if a firm reported that it accounted for its purchased carbon permits at market value, it was inferred that the firm measured its purchased carbon permits at market value.

### *6.3.2 Analysis of carbon disclosure practice*

To address the second research question on the carbon disclosure practices of the ETS affected firms, and for the purpose of coding a firm's carbon emission related disclosure practice, a coding framework was developed. This framework was developed on the basis of a checklist that was derived from the Carbon Disclosure Project (CDP) and further modified and used by Bae Choi et al. (2013). The checklist is presented in Table 6-3. A code of 0 was used if a firm did not provide any disclosure pertaining to any item from the checklist and a code of 1 was used if the firm disclosed any information related to the checklist item. As per the checklist, the maximum score a firm can obtain is 18, given the 18 items mentioned therein (Bae Choi et al., 2013). However, for the study, the checklist was further updated with four additional carbon disclosure items (GHG8 to GHG11), thus giving a maximum score of 22. These additional four disclosure items were disclosure of carbon emissions financial accounting policies (GHG8), disclosure of the firm's carbon liability in financial amount (GHG9), disclosure of an index related to terms associated with carbon and climate change (GHG10), and finally disclosure of carbon credits in units (or tonnes) (GHG11). These items were included in the disclosure checklist as they may help indicate further transparency in the carbon disclosure practices of the firms. Another

reason for including these items (GHG8, 9 and 11) in the disclosure checklist was that disclosure of financial information pertaining to the impact of carbon emission is arguably crucial for the operation of ETSs and remains topical for standard setters and report users, as noted in Lovell et al. (2013) and Bebbington et al. (2014). As can be observed in Table 14, all 22 items were identified in five specific categories, namely: Climate change: risks and opportunities (CC), GHG emissions accounting (GHG), Energy consumption accounting (EC), GHG reduction and cost (RC), and Carbon emission accountability (ACC). Disclosures made by each firm could then be observed.

Table 6-3: Disclosure checklist template

	Categories	Items	
1	Climate change: risks and opportunities	CC1	assessment/description of the risks (regulatory, physical or general) relating to climate change and actions taken or to be taken to manage the risks
		CC2	assessment/description of current (and future) financial implications, business implications and opportunities of climate change
2	GHG emissions accounting	GHG1	description of the methodology used to calculate GHG emissions (e.g. GHG Protocol or ISO)
		GHG2	existence external verification of quantity of GHG emission - if so by whom and on what basis
		GHG3	total GHG emissions - metric tonnes CO <sub>2</sub> -e emitted
		GHG4	disclosure of Scopes 1 and 2, or Scope 3 direct GHG emissions
		GHG5	disclosure of GHG emissions by sources (e.g. coal, electricity, etc.)
		GHG6	disclosure of GHG emissions by facility or segment level
		GHG7	comparison of GHG emissions with previous years
		GHG8	disclosure of carbon emissions financial accounting policies
		GHG9	disclosure of carbon tax/liability/credits \$ figures
		GHG10	meaning / description / acronyms /terms related to carbon and climate change
		GHG11	disclosure of carbon credits in units / tonnes
3	Energy consumption accounting	EC1	total energy consumed (e.g. tera-joules or peta-joules)
		EC2	quantification of energy used from renewable sources
		EC3	disclosure by type, facility or segment
4	GHG reduction and cost	RC1	detail of plans or strategies to reduce GHG emissions
		RC2	specification of GHG emissions reduction target level and target year
		RC3	emissions reductions and associated costs or savings achieved to date as a result of the reduction plan
		RC4	cost of future emissions factored into capital expenditure planning
5	Carbon emission accountability	ACC1	indication of which board committee (or other executive body) has overall responsibility for actions related to climate change
		ACC2	description of the mechanism by which the board (or other executive body) reviews the company's progress regarding climate change

As with the adoption of carbon financial accounting discussed above, content analysis was used as a research technique to gather and record the carbon disclosure practice data. Several prior studies in the carbon disclosure literature have used content analysis as a research technique (Freedman & Jaggi, 2005; Clarkson, Li, Richardson & Vasvari, 2008; Brammer & Pavelin, 2008; Prado-Lorenzo et al., 2009; Gallego-Alvarez, 2012; Haque & Deegan, 2010; Eleftheriadis & Anagnostopoulou, 2014). The identification of carbon disclosure practice, i.e. whether a firm has provided carbon emission related disclosure, was derived as implied by the firm's disclosure context. For example, if a firm disclosed that it had invested in XYZ project to help reduce its emissions, it was inferred that they are disclosing information on their 'strategy to reduce emissions' (i.e. RC1 under the 'GHG reduction and cost' category specified in the disclosure checklist provided in Table 6-3 above). Similarly, if a firm disclosed that it was now liable under the EU ETS, Australian Carbon Tax or the NZ ETS and that expenses could increase, it was inferred that they are disclosing information on their 'financial implications due to EU ETS, Australian Carbon Tax or NZ ETS' (i.e. CC2 under the 'Climate change: risks and opportunities' category).

### *6.3.3 Data validation*

Of the original sample selected for both the Australian and New Zealand firms, the data for 20 firms was validated using content analysis, by involving an independent person, i.e. a validator, who had no direct association with the study. This process was undertaken after collecting the data for the Australian and NZ firms. Since the UK firms were considered at a later stage, the data for the UK firms could not be considered for validation. The purpose of the data validation process was to assess if the data had been collected appropriately for the study and whether content analysis by the validator would obtain similar results. Of the 20 firms, 10 were Australian and 10 were New Zealand firms. These firms were randomly selected for the data validation process. The results of the data validation process by the validator revealed the following:

- 1) Most of the data collected by the validator was similar to the original data collected for the study.
- 2) The data collected for the carbon financial accounting and carbon disclosure practices of NZ firms was similar for both the validator and the original data.
- 3) For Australian data, however, the validator found less carbon related disclosures in the annual reports of Australian companies as compared to the original data. In particular, this data pertained to the disclosure of carbon financial accounting policies, which the validator did not code, but was

however coded in the original data. It was concluded that the original data was more comprehensive and should be retained.

#### *6.3.4 Analysis of factors influencing the adoption of carbon financial accounting practice and the extent of carbon disclosure*

After preparing the coding templates and undertaking content analysis and data validation as discussed earlier, the factors and determinants that may influence the carbon financial accounting and carbon disclosure practice were analysed. Firstly, a theoretical model was constructed to identify the variables influencing firms' carbon financial accounting and carbon disclosure practice. As discussed in Chapter 6, the study's theoretical model is based on the assumption that carbon financial accounting and carbon disclosure practice are a function of the three institutional pressures namely, coercive, mimetic and normative pressures. The theoretical model of the study can therefore be described in the following form:

$$\begin{aligned} &\text{Carbon financial accounting and Carbon disclosure practice} \\ &= f(\text{coercive pressure, mimetic pressure, normative pressure}) \end{aligned}$$

where 'Carbon financial accounting and Carbon disclosure practice' operationalizes the adoption of carbon financial accounting practice as well as the extent of carbon disclosure, and where the coercive pressure is regulation, the mimetic pressures are firm size, leverage, listing status and industry, and the normative pressure is auditors.

The above model was empirically tested by using the two logistic regression equations, specifying the dependent and independent variables. In other words, to investigate the determinants of the adoption of voluntary carbon financial accounting practice and the extent of carbon disclosure, a logistic regression analysis of the carbon financial accounting practice and carbon disclosure scores against the firm characteristics and market features was conducted. The two logistic regression equations are stated below, followed by a description of the dependent and independent variables.

$$\begin{aligned} CACCP_t = &\beta_0 + \beta_1 REG + \beta_2 SIZE + \beta_3 LEV + \beta_4 LIST + \beta_5 AUD + INDUSTRY \\ &+ \varepsilon \dots \dots \dots (1) \end{aligned}$$

$$CDISCP_t = \beta_0 + \beta_1REG + \beta_2SIZE + \beta_3LEV + \beta_4LIST + \beta_5AUD + INDUSTRY + \varepsilon \dots \dots (2)$$

These variables are defined as follows:

*Dependent variables:* To address the third research question on which determinants are influencing the ETS affected firms' carbon financial accounting and carbon disclosure practice, two indicator variables were used in the study. ( $CACCP_t$ ) and ( $CDISCP_t$ ) are the two indicator variables, i.e. the adoption of carbon financial accounting practice and the extent of carbon disclosure of the ETS affected firms, which were used. The data for these variables was obtained from the annual reports of the firms and coded in the carbon financial accounting (i.e. IFRIC 3) and carbon disclosure index templates described earlier. Both  $CACCP$  and  $CDISCP$  were coded as 0 or 1 where the score for the adoption of carbon financial accounting practice as well as for the carbon disclosure, was lower or higher for the ETS affected firms. High / low score was determined by comparing the firm score against the mean score of the sample firms. 'Above the mean' is referred to as a high score and 'below the mean' as a low score.

*Independent variables:* Independent variables include a set of proxies and dummy variables for coercive, mimetic and normative pressures. These independent variables were also discussed in Chapter 6 and are further described below.

*Coercive pressure:* Regulation (REG) – REG is an indicator (dummy) variable. All the withdrawn and mandatory carbon financial accounting and carbon disclosure related regulations were used as a proxy for REG. These proxies consisted of: Withdrawn IFRIC 3 standard (for all firms); Quoted companies GHG Reporting Act 2013 (for UK firms); Companies Act 2006 (for UK firms); The Climate Change Act 2008 (for UK firms); The Corporations Act 2001 (for Australian firms); Regulatory Guide 2013 (for Australian firms); The Financial Service Reform Act 2010 (for Australian firms); The Clean Energy Act 2011 (for Australian firms); The NGER Act 2007 (for Australian firms); ASX Listing Rules 2010 (for Australian firms); The Energy Efficiency Act 2006 (for Australian firms) and The National Pollutant Inventory 1998 (for Australian firms); and The Climate Change Response Act 2002 (for New Zealand firms). The aforementioned proxies were used to represent REG to test H1a and H1b, and were coded as 1 if the UK / Australian / New Zealand firms were affected under their respective regulations, and 0 otherwise.

*Mimetic pressure:* Firm Size (SIZE) – Various proxies have been used to represent SIZE by prior studies. Some studies (Freedman & Jaggi, 2005; Brammer & Pavelin, 2008; Stanny & Ely, 2008;

Eleftheriadis & Anagnostopoulou, 2014) have used the natural logarithm of total assets. Other studies (Prado-Lorenzo et al., 2009) preferred to use total revenues or natural logarithm of revenues (Gallego-Alvarez, 2012). This study uses natural logarithm of total assets as a proxy for SIZE to test H2a and H2b. The data for total assets is taken from the annual reports of the firms.

Leverage (LEV) – Leverage can be defined using the debt equity ratio, long term debt equity ratio or a ratio of total liabilities over total assets (Zinkeviciene & Rudzioniene, 2005). Debt to equity ratio (Freedman & Jaggi, 2005; Gallego-Alvarez, 2012; Eleftheriadis and Anagnostopoulou, 2014) and Debt to asset ratio (Brammer & Pavelin, 2008; Clarkson et al., 2008; Stanny & Ely, 2008) are the two most used proxies in prior studies. As both proxies are equally used, the study opts for debt to equity ratio as a proxy for LEV to test H3a and H3b. The data for this ratio is taken from the annual reports of the firms.

Industry (INDSECTOR) – INDSECTOR is an indicator (dummy variable) and will be represented by sectors to test H4a and H4b. The selected firms belong to several sectors, all of which were further classified into three main industries: the Energy and Utilities Industry (comprising the Energy and Utilities sector), the Manufacturing and Industrial Process Industry (comprising the Minerals sector, Materials and Metals sector and Industrial Process sector), and the Primary Industry (comprising the Paper, Agriculture, Forestry, Forestry removal, Liquid fossil fuels, Other removal activities sector). Thus, the INDSECTOR variable takes the value of 0 or 1 if the firm is not or is a member of industry sectors (Energy and Utilities Industry, Manufacturing and Industrial Process Industry, and Primary Industry). The data for the sectors to which the firms belong was taken from the Carbonmarketdata database (for UK firms), NZ EUR database (for NZ firms), and the GICS report (for Australian firms).

Listing status (LIST) – Listing status is an indicator (dummy variable) which will take the value of 1 if it is listed on any securities exchange and 0 if it is not listed on any exchange. The securities exchange (on which the firms are listed) is taken as representing the listing status, to further test H5a and H5b. The data on the listing status of the firms was taken from the annual reports and GICS.

*Normative pressure:* Auditors (AUD): Auditor is an indicator variable (dummy variable) represented by Big4s v/s non Big4s and has the value of 1 if the auditor of the firm is a Big4 or 0 where the auditor of a firm is a non-Big4. This variable was used to test H6a and H6b and the data on the auditor of a firm was taken from the annual reports.

The following table (Table 6-4) provides a summary of the factors that may influence the firms' adoption of carbon financial accounting practice and the extent of carbon disclosure, their variables and proxies, the data for proxies collected from, the hypothesis to be tested and the expected sign.

Table 6-4: Summary of data related to proxies for the institutional pressures

	Institutional Factors / Pressures	Variables	Proxies used / Represented by	Data taken from	Hypothesis to be tested	Expected sign
1	Coercive	Regulations	Withdrawn IFRIC 3 standard (for all firms); Quoted companies GHG Reporting Act 2013 (for UK firms); The Companies Act 2006 (for UK firms); The Climate Change Act 2008 (for UK firms); The Corporations Act 2001 (for Australian firms); Regulatory Guide 2013 (for Australian firms); The Financial Service Reform Act 2010 (for Australian firms); The Clean Energy Act 2011 (for Australian firms); The NGER Act 2007 (for Australian firms); ASX Listing Rules 2010 (for Australian firms); The Energy Efficiency Act 2006 (for Australian firms); The National Pollutant Inventory 1998 (for Australian firms); and The Climate Change Response Act 2002 (for New Zealand firms)	GRI (Global Reporting Initiative website)	H1a and H1b	+
2	Mimetic	Firm Size	Log of total assets	Annual reports	H2a and H2b	+
		Leverage	Debt/equity ratio	Annual reports	H3a and H3b	+
3	Normative	Industry	Energy and Utilities Industry (comprising the Energy and Utilities sector), Manufacturing and Industrial Process Industry (comprising the Minerals sector, Materials and Metals sector and Industrial Process sector) and Primary Industry (comprising the Paper, Agriculture, Forestry, Forestry removal, Liquid fossil fuels, Other removal activities sector).	Carbonmarketdata, GICS and NZ EUR	H4a and H4b	+/-
		Listing Status	All stock exchanges	Annual reports and GICS	H5a and H5b	+
		Auditors	Big4 v/s Non Big4	Annual reports	H6a and H6b	+

## 6.4 Chapter Summary

In summary, the research design involved various steps as depicted in Figure 6-1 earlier. Firstly, the design involved planning an appropriate accounting instrument that adequately captures the carbon financial accounting practices of the firms. Secondly, the design involved planning an appropriate disclosure instrument that will capture the carbon disclosure practices of the firms. The research design also involved collection of data from the annual reports using content analysis. The data was further coded and scored into the templates and analysed to form a conclusion on how the firms are financially accounting for carbon emission allowances and how the firms are disclosing carbon emission allowances. Finally, an empirical and theoretical model based on institutional theory was developed for identification of factors that affect the disclosure of these items in the annual report. Logistic regression analysis was used to assess what factors are influencing the affected companies to account for and provide disclosure of carbon emission allowances in a certain way.

The following chapter presents the findings of the study.

## Chapter 7: Results and Discussion

### 7.1 Introduction

This chapter presents the findings of the three research questions of the study, i.e. how are the firms affected under ETSs financially accounting for carbon emission allowances in the absence of a uniform accounting guidance?; how are the firms affected under ETSs disclosing information on the carbon?; and, what firm characteristics and market features are influencing the ETS affected firms' carbon financial accounting and carbon disclosure practices? The chapter presents the findings from the data collected from the sample of UK, Australian and NZ firms' annual reports. Section 7.2 and Section 7.3 relate to the findings for the first research question. Section 7.2 discusses the format in which the firms affected under ETSs provide the information on their carbon financial accounting practice. Section 7.3 presents the carbon financial accounting practices of the UK, Australia and NZ firms, with subsections 7.3.1 to 7.3.7 presenting the findings related to the seven stages of carbon emission allowances (i.e. when received for free, when used, when purchased, when surrendered, when inventoried, when sold and an unidentified stage). Section 7.4 relates to the findings of the second research question i.e. how the firms affected under ETSs are providing disclosure on carbon, with subsections 7.4.1 and 7.4.2 discussing the findings related to the carbon disclosure score and percent distribution of carbon disclosure items for all firms. Following this, subsection 7.4.3 provides a few examples of the different formats used by the ETS firms for carbon disclosure. Section 7.5 relates to the findings of the third research question on the determinants of carbon financial accounting and carbon disclosure practices, with subsections 7.5.1 to 7.5.4 discussing the descriptive analysis, t-tests analysis, correlation and logistic regression analysis results. Finally, the chapter ends with the summary in section 7.6.

### 7.2. Carbon financial accounting practices of ETS affected firms

#### *7.2.1. Presentation of information on the carbon financial accounting practice*

Figure 7-1 and 7-2 below provide a few examples of the ways in which the information on carbon is being financially accounted for by firms (reported and presented in the annual report). Almost all of the firms preferred to provide the information on their carbon financial accounting practice in the 'notes to (consolidated) financial statements' section of the annual reports and the information was mostly presented in a narrative format. Some firms presented their carbon financial accounting policies in

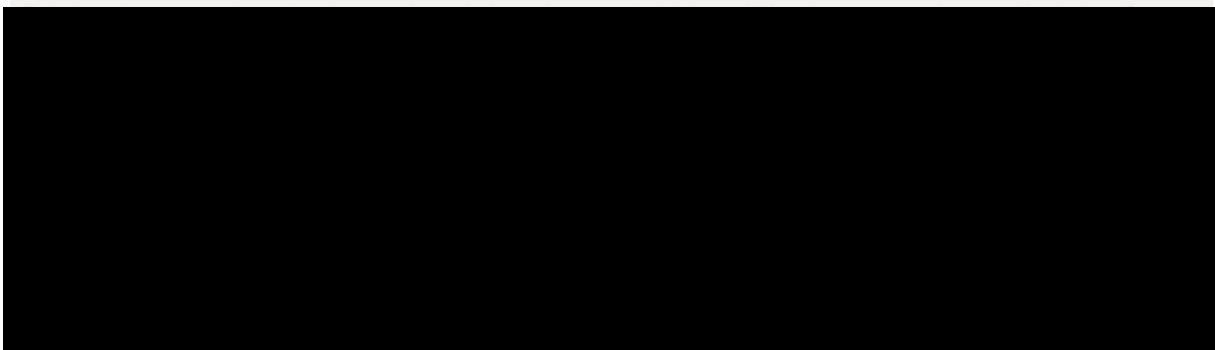
bullet point format (Figure 7-1), whereas some firms presented their carbon financial accounting policies in a paragraph format with relevant financial figures (Figure 7-2).

Figure 7-1: Example of information on the carbon financial accounting practice in a narrative form with bullet points



Source: GDF SUEZ (UK firm, Installation name: Case New Holland Boilerhouse) Annual Report 2013, p. 211.

Figure 7-2: Example of information on the carbon financial accounting practice in a narrative paragraph form with financial figures



Source: National Grid Plc (UK firm, Installation name: Aberdeen Compressor Station) Annual Report 2012-2013, p. 130.

### 7.3. Most preferred carbon financial accounting practices of ETS affected firms

#### 7.3.1. *Free carbon emission allowances*

Information on the firms' carbon financial accounting policies for recognition of free carbon emission allowances was not provided by most firms (i.e. 117 of the total 150 firms or 78%) (Table 7-1 (Panel A)). Also, as can be observed from Table 7-1 (Panel A), the majority of UK (47 of 64 firms or 73.4%), Australian (39 of 46 firms or 84.8%) and NZ (31 of 40 or 77.5%) firms, did not provide any information on their recognition policies for free carbon emission allowances. Similarly, the majority of UK (i.e. 46 of 64 or 71.9%), Australian (i.e. 39 of 46 or 84.8%) and NZ (i.e. 30 of the 40 or 70%) firms did not provide any information on how they are measuring free carbon emission allowances (Table 7-1 (Panel B)). Nevertheless, an overall variation was observed (Table 7-1 (Panel A and B)) in the accounting policies employed by those firms that did provide the relevant information in their annual reports.

The UK (i.e. 8 of the 64 UK firms or 12.5%) and NZ firms (i.e. 4 of the 40 NZ firms or 10%) mostly prefer to account for free carbon emission allowances by initially recognising the emission allowances received from the government as 'intangible assets'. Australian firms (i.e. 3 of the 46 Australian firms or 6.5%) prefer to account for free carbon emission allowances by recognising these allowances as 'intangible assets' with the difference between the fair value and nominal amount recognised as a 'government grant'. The recognition practices adopted by the UK, Australian and NZ firms for free carbon emission allowances, appear to be more or less similar to the recommendations of IFRIC 3 and prior studies that free carbon emission allowances be recognised as intangible assets and government grants (i.e. Ernst & Young, 2008; KPMG, 2008; Lovell et al., 2010; Warwick & Ng, 2012).

With respect to measurement practice, the UK firms (i.e. 12 of 64 or 18.8%) and Australian firms (i.e. 4 of 46 or 8.7%) prefer to measure free carbon emission allowances at nil value or cost, contrary to the recommendations of IFRIC 3 which recommends measuring free carbon emission allowances at fair value. NZ firms (i.e. 4 of 40 or 10%) on the other hand, prefer to measure free carbon emission allowances at market value.

Table 7-1: Recognition and measurement of 'free carbon allowances'

Panel A: Recognition of free carbon emission allowances

	Accounting Policies - Recognition of 'free carbon emission allowances'	Countries - UK, Australia and New Zealand											
		All firms			UK			Australia			New Zealand		
		Frequency	Percent		Frequency	Percent		Frequency	Percent		Frequency	Percent	
1	Unavailable information.	117	78.0		47	73.4		39	84.8		31	77.5	
2	Received allowances are recognised in the balance sheet as intangible assets. The difference between fair value and the nominal amount paid for the rights is recognised in the balance as a government grant (deferred income).**	7	4.7		2	3.1		3	6.5		2	5.0	
3	Emission rights received from governments free of charge are initially recognised as intangible assets.*	13	8.7		8	12.5		1	2.2		4	10.0	
4	Carbon emission allowances are accounted for as intangible assets.	3	2.0		2	3.1		1	2.2				
5	Emission rights allocated for free are booked in inventories.	2	1.3		2	3.1							
6	Emission rights granted by governments are not recorded in the consolidated statement of financial position, as they have a cost equivalent to zero.	1	0.7		1	1.6							
7	When emission rights are received, they are recognised as current intangible assets under other receivables in the balance sheet and as grants received on the liabilities side.	1	0.7		1	1.6							
8	Emission allowances are recorded as intangible assets within current assets. Where emission allowances are granted by relevant authorities, receipts of such grants are treated as deferred income.	2	1.3		1	1.6		1	2.2				
9	Free Carbon Units are classified as financial assets with a corresponding entry to deferred income.	1	0.7					1	2.2				
10	The (free carbon emission) allocation is recognised as deferred income and recognised in profit or loss on a systematic basis over the period to which the grant relates.	1	0.7								1	2.5	
11	The compensation units received from government for deforestation restriction under ETS, are valued as intangible assets and recognised as income in the financial statements.	2	1.3								2	5.0	
	Total	150	100.0		64	100.0		46	100.0		40	100.0	

\*Preferred Carbon Financial Accounting Practice for 'All firms', 'UK firms' and 'NZ firms'.

\*\*Preferred Carbon Financial Accounting Practice for 'Australian firms'.

Table 7-1: Recognition and Measurement of 'free carbon allowances'

Panel B: Measurement of free carbon emission allowances

	Countries - UK, Australia and New Zealand											
	All firms			UK			Australia			New Zealand		
	Frequency	Percent		Frequency	Percent		Frequency	Percent		Frequency	Percent	
Accounting Policies - Measurement of 'free carbon emission allowances'												
1 Unavailable information.	115	76.7		46	71.9		39	84.8		30	75.0	
2 At nil (zero) value or cost.*	16	10.7		12	18.8		4	8.7				
3 At market value.**	6	4.0		2	3.1					4	10.0	
4 Initially at fair value and subsequently at cost, amortised on a straight line basis over expected useful lives.	1	0.7		1	1.6							
5 Initially at fair value i.e. market value or value at which they could be sold for on the carbon credit market.	1	0.7								1	2.5	
6 At fair value.	5	3.3		1	1.6		2	4.3		2	5.0	
7 Initially at fair value at grant date and subsequently at amortised cost	1	0.7					1	2.2				
8 On market value at the date of initial recognition and not amortised, but recognised at an amount not exceeding their market value at the balance sheet date.	1	0.7		1	1.6							
9 Initially at cost, which is a proxy for market value and regularly reviewed for impairment with any movements taken to income statement. Initial market value is determined with reference to quoted price.	2	1.3								2	5.0	
10 Initially at cost, and subsequently at fair value.	1	0.7										
11 Initially at cost, and subsequently at cost subject to impairment.	1	0.7		1	1.6					1	2.5	
<b>Total</b>	<b>150</b>	<b>100.0</b>		<b>64</b>	<b>100.0</b>		<b>46</b>	<b>100.0</b>		<b>40</b>	<b>100.0</b>	

\*Preferred Carbon Financial Accounting Practice for 'All firms', 'UK firms' and 'Australian firms'.

\*\*Preferred Carbon Financial Accounting Practice for 'New Zealand firms'.

### 7.3.2. *Used carbon emission allowances*

Table 7-2 (Panel A) shows that none of the NZ firms (i.e. 100%) gave any information on their accounting policy for 'used or emitted carbon emission allowances'. Similarly, the majority of UK (i.e. 48 of the 64 or 75%) and Australian (37 of the 46 or 80.4%) firms did not provide any information on their 'used or emitted carbon emission allowances'. The NZ firms (100%) and the majority of the UK (i.e. 56 of 64 or 87.5%) and Australian (i.e. 42 of 46 or 91.3%) firms, also did not specify how they measure used carbon emission allowances (Table 7-2 (Panel B)).

Overall, the UK firms (i.e. six of the 64 UK firms or 9.4%) and the Australian firms (i.e. 2 of 46 Australian firms or 4.3%) account for used carbon emission allowances as a provision and state that 'to the extent that it is expected that the number of allowances needed to settle the carbon emissions exceeds the number of emission allowances owned, a provision be recognised'. This practice is consistent with the recommendation of IFRIC 3. Australian firms also prefer to account for recognition of used carbon emission allowances in several ways. Some Australian firms (i.e. 2 of 46 Australian firms or 4.3%) account for 'used carbon emission allowances' by recognising the used emissions as expensed under other operating costs and presented as a provision. Other Australian firms (i.e. 2 of 46 Australian firms or 4.3%) recognised the carbon emission liabilities when the emissions were generated and further recorded that carbon expense and deferred income from carbon emission allowances as a part of cost of inventory. Finally, other Australian firms (i.e. 2 of 46 Australian firms or 4.3%) treated used carbon emission allowances as a provision, with the expenses incurred for the recognition of the provision reported under cost of materials.

With respect to measurement practice, the UK firms prefer to measure used carbon emission allowances at the carrying amount of emission rights held (i.e. 2 of the 64 UK firms or 3.1%), whereas Australian firms prefer to measure the used carbon emission allowances at an estimated amount (2.2%) (also recommended by KPMG (2008) in Chapter 3), or at purchase cost (2.2%), at fair value (2.2%), or present value (2.2%), needed to extinguish the liability.

Table 7-2: Recognition and measurement of 'used carbon allowances'

Panel A: Recognition of carbon emission allowances used

	Accounting Policies - Recognition of 'used carbon emission allowances'	Countries - UK, Australia and New Zealand									
		All firms		UK		Australia		New Zealand			
		Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent		
1	Unavailable Information	125	83.3	48	75.0	37	80.4	40	100.0		
2	The emissions realised are expensed under other operating costs in the income statement and presented as a provision in the balance sheet.**	4	2.7	2	3.1	2	4.3				
3	Emission charges are recognised in the income statement in the period in which emissions are made.	3	2.0	2	3.1	1	2.2				
4	To the extent that it is expected that the number of allowances needed to settle the carbon emissions exceeds the number of emission allowances owned, a provision is recognised.*	8	5.3	6	9.4	2	4.3				
5	Because emission rights are not depleted as part of the production process, they are reported as intangible assets. A provision is recognised for emissions produced. The expenses incurred for the recognition of the provision are reported under cost of materials.**	5	3.3	3	4.7	2	4.3				
6	A current liability is recognised based on the level of emissions recorded.	1	0.7	1	1.6						
7	The emissions produced are recognised at cost and as a liability together with the corresponding government grant as income both based on the value at the date of initial recognition. Rights consumed that are within the original range have no positive or negative effect on profit for the period.	1	0.7	1	1.6						
8	Carbon emission liabilities are recognised when the emissions are generated. Carbon expense and deferred income from free carbon permits are recorded as part of the cost of inventory.**	2	1.4			2	4.3				
	<b>Total</b>	<b>150</b>	<b>100.0</b>	<b>64</b>	<b>100.0</b>	<b>46</b>	<b>100.0</b>	<b>40</b>	<b>100.0</b>		

\*Preferred Carbon Financial Accounting Practice for 'All firms', 'UK firms' and 'Australian firms'.

\*\*Preferred Carbon Financial Accounting Practice for 'Australian firms'.

Table 7-2: Recognition and measurement of 'used carbon allowances'

Panel B: Measurement of used carbon emission allowances

	Accounting Policies - Measurement of 'used carbon emission allowances'	Countries - UK, Australia and New Zealand											
		All firms			UK			Australia			New Zealand		
		Frequency	Percent		Frequency	Percent		Frequency	Percent		Frequency	Percent	
1	Unavailable information.	138	92.0		56	87.5		42	91.3		40	100.0	
2	At carrying value of any allowances procured, as well as the current market value of any additional allowances required to settle the obligation.	1	0.7		1	1.6							
3	At cost including any directly attributable expense.	1	0.7		1	1.6							
4	At carrying amount of the emission rights held, or in case of shortfall, at the current fair value of the emission rights needed.	1	0.7		1	1.6							
5	At the estimated amount of expenditure required to settle the obligation.*	2	1.3		1	1.6		1	2.2				
6	At cost of purchase, up to the level of allowances held, the liability is measured at cost of purchase. When the liability exceeds the allowances held, the net liability is measured at market value selling price.**	2	1.3		1	1.6		1	2.2				
7	At the carrying amount of emission rights held.***	2	1.3		2	3.1							
8	At fair value at the end of reporting period.**	2	1.3		1	1.6		1	2.2				
9	At present value of carbon permits needed to extinguish the liability.	1	0.7					1	2.2				
	Total	150	100.0		64	100.0		46	100.0		40	100.0	

\*Preferred Carbon Financial Accounting Practice for 'All firms' and 'Australian firms'.

\*\*Preferred Carbon Financial Accounting Practice for 'All firms'.

\*\*\*Preferred Carbon Financial Accounting Practice for 'All firms' and 'UK firms'.

### *7.3.3. Purchased carbon emission allowances*

As can be observed from Table 7-3 (Panel A), most UK (53 of 64 or 82.8%), Australian (38 of 46 or 82.6%) and NZ (37 of 40 or 92.5%) firms did not provide information on their accounting policies for 'purchased carbon emission allowances'. Further, Table 7-3 (Panel B) indicates that most UK (49 of 64 or 76.6%), Australian (40 of 46 or 87%) and NZ (36 of 40 or 90%) firms did not specify how they measure their purchased carbon emission allowances.

The UK (i.e. 9 of the 64 UK firms or 14.1%), Australian (i.e. 8 of the 46 Australian firms or 17.4%) and NZ firms (i.e. 3 of the 40 NZ firms or 7.5%) prefer to initially recognise the purchased emission allowances as intangible assets. This approach of treating purchased carbon emission allowances as intangible assets, is similar to the recommendation of IFRIC 3. Measuring purchased carbon emission allowances initially at cost, appears to be the most preferred approach of UK (i.e. 3 of 64 or 4.7%), Australian (i.e. 3 of 46 or 6.5%) and NZ (i.e. 2 of 40 or 5%) firms, and is also recommended by most of the prominent proposals and surveys on carbon financial accounting practice (i.e. Ernst & Young, 2008; KPMG, 2008; Lovell et al., 2010; Warwick and Ng, 2012).

Table 7-3: Recognition and measurement of 'purchased carbon allowances'

	Accounting Policies – Recognition of 'purchased carbon emission allowances'	Countries - UK, Australia and New Zealand									
		All firms		UK		Australia		New Zealand			
		Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent		
1	Unavailable information.	128	85.3	53	82.8	38	82.6	37	92.5		
2	Intangible assets include purchased emission rights. Government grants also include emissions.	1	0.7	1	1.6						
3	Emission rights held under national and international emission-rights systems for the settlement of obligations are reported as intangible assets.*	20	13.3	9	14.1	8	17.4	3	7.5		
4	Emission rights are classified as inventories, as they are consumed in the production process.	1	0.7	1	1.6						
	<b>Total</b>	<b>150</b>	<b>100.0</b>	<b>64</b>	<b>100.0</b>	<b>46</b>	<b>100.0</b>	<b>40</b>	<b>100.0</b>		

\*Preferred Carbon Financial Accounting Practice for 'All firms', 'UK firms', 'Australian firms' and 'New Zealand firms'.

Table 7-3 Recognition and Measurement of 'purchased carbon allowances'

Panel B: Measurement of purchased carbon emission allowances

	Accounting Policies – Measurement of 'purchased carbon emission allowances'	Countries - UK, Australia and New Zealand											
		All firms			UK			Australia			New Zealand		
		Frequency	Percent		Frequency	Percent		Frequency	Percent		Frequency	Percent	
1	Unavailable information.	125	83.3		49	76.6		40	87.0		36	90.0	
2	Initially at cost.*	8	5.3		3	4.7		3	6.5		2	5.0	
3	At fair value at the time of acquisition, or later at their fair value if less. Not amortised.	1	0.7		1	1.6							
4	At market value.	1	0.7		1	1.6							
5	At cost of the lower market price on the balance sheet date.	1	0.7		1	1.6							
6	At cost and subject to write down in the event of impairment.	1	0.7		1	1.6							
7	At cost and not amortised.	3	2.0		2	3.1					1	2.5	
8	At cost and not amortised - but impairment charge may be recognised, should the carrying value of allowances exceed the market or fair value.	1	0.7		1	1.6							
9	At acquisition cost.	2	1.3		2	3.1							
10	At nominal value (cost), not amortised but tested for impairment at least annually.	1	0.7		1	1.6							
11	At net of any negative difference between the amount of emissions and free allowances.	1	0.7		1	1.6							
12	At cost and not subsequently remeasured.	1	0.7		1	1.6							
13	At weighted average cost less impairment losses.	1	0.7					1	2.2				
14	At cost, unless an active market exists for the permits, in which case these could be carried at fair value.	1	0.7					1	2.2				
15	At fair value.	1	0.7					1	2.2				
16	At fair value - however, since no active market exists, recorded at cost.	1	0.7								1	2.5	
	<b>Total</b>	<b>150</b>	<b>100.0</b>		<b>64</b>	<b>100.0</b>		<b>46</b>	<b>100.0</b>		<b>40</b>	<b>100.0</b>	

\*Preferred Carbon Financial Accounting Practice for 'All firms', 'UK firms', 'Australian firms' and 'New Zealand firms'.

#### *7.3.4. Surrendered carbon emission allowances*

Table 7-4 (Panel A) shows that all of the NZ (100%) as well as most UK (57 of 64 or 89.1%) and Australian (43 of 46 or 93.5%) firms did not provide any information on how they are accounting for surrendered carbon emission allowances. Additionally, most UK (62 of the 64 or 96.9%), Australian (45 of 46 or 97.8%) and NZ (100%) firms did not provide any information on their measurement practice with respect to surrendered carbon emission allowances (Table 7-4 (Panel B)).

The UK firms (i.e. 4 of 64 or 6.2%) prefer to recognise surrendered carbon emission allowances as a reduction of the provision for carbon emissions, consistent with the recommendations of IFRIC 3. Australian firms (i.e. two of the 46 or 4.3%) classify carbon units on hand as financial assets, which when surrendered to the government, results in the (financial) asset along with the corresponding emissions liability being derecognised from the balance sheet. This is inconsistent with the recommendations or findings of the prominent proposals and surveys on carbon financial accounting practice (i.e. IFRIC 3; Lovell et al., 2010; Warwick & Ng, 2012).

With respect to measurement practice, UK firms prefer to measure the surrendered carbon emission allowances either at book value of the carbon allowances (1.6%), or at market value of the allowances required to meet the obligations at year end (1.6%). On the other hand, Australian firms (i.e. 1 of the 46 Australian firms or 2.2%) prefer to measure 'surrendered carbon emission allowances' at weighted average cost of carbon credit units.

Table 7-4: Recognition and measurement of 'surrendered carbon allowances'

	Accounting Policies – Recognition of 'surrendered carbon emission allowances'	Countries - UK, Australia and New Zealand											
		All firms			UK			Australia			New Zealand		
		Frequency	Percent		Frequency	Percent		Frequency	Percent		Frequency	Percent	
1	Unavailable information.	140	93.3	57	89.1	43	93.5	40	100.0				
2	Emission units are automatically surrendered to the Regulator as a remission of liability under the scheme and are recognised as a reduction of the provision for carbon emissions.*	5	3.3	4	6.2	1	2.2						
3	Emission allowances are intangible assets. The purchased emission allowance quotas recognised in intangible rights are derecognised as they have been offset against the obligation.	3	2.0	3	4.7								
4	Carbon Units on hand are classified as financial assets. When Carbon Units are surrendered to the Government, the asset along with the corresponding emissions liability is derecognised from the balance sheet.**	2	1.3			2	4.3						
	Total	150	100.0	64	100.0	46	100.0	40	100.0				

\*Preferred Carbon Financial Accounting Practice for 'All firms' and 'UK firms'.

\*\*Preferred Carbon Financial Accounting Practice for 'Australian firms'.

Panel B: Measurement of surrendered carbon emission allowances

	Accounting Policies – Measurement of 'surrendered carbon emission allowances'	Countries - UK, Australia and New Zealand											
		All firms			UK			Australia			New Zealand		
		Frequency	Percent		Frequency	Percent		Frequency	Percent		Frequency	Percent	
1	Unavailable information.	147	98.0	62	96.9	45	97.8	40	100.0				
2	At book value of the carbon allowances.*	1	0.7	1	1.6								
3	At market value of the allowances required to meet obligations at year end.*	1	0.7	1	1.6								
4	At weighted average cost of carbon credit units.**	1	0.7			1	2.2						
	Total	150	100.0	64	100.0	46	100.0	40	100.0				

\*Preferred Carbon Financial Accounting Practice for 'All firms' and 'UK firms'.

\*\*Preferred Carbon Financial Accounting Practice for 'All firms' and 'Australian firms'.

### *7.3.5. Inventoried carbon emission allowances*

Almost all firms did not provide any information on how they are financially accounting for 'inventoried' carbon emission allowances (Table 7-5 (Panel A and B)), except for a UK firm that preferred to recognise the unused and acquired carbon emission quotas, i.e. recognised the inventoried carbon emission allowances as intangible assets and measured the 'inventoried carbon emission allowances' at open market value with any gains or loss recorded in the income statement.

Table 7-5: Recognition and measurement of 'inventoried carbon allowances'

Panel A: Recognition of inventoried carbon emission allowances

	Accounting Policies – Recognition of 'inventoried carbon emission allowances'	Countries - UK, Australia and New Zealand									
		All firms		UK		Australia		New Zealand			
		Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent		
1	Unavailable information.	149	99.3	63	98.4	46	100.0	40	100.0		
2	Unused and acquired carbon emission quotas held at the balance sheet date are recognised as intangible assets.*	1	0.7	1	1.6						
	Total	150	100.0	64	100.0	46	100.0	40	100.0		

\*Preferred Carbon Financial Accounting Practice for 'All firms' and 'UK firms'.

Panel B: Measurement of inventoried carbon emission allowances

	Accounting Policies – Measurement of 'inventoried carbon emission allowances'	Countries - UK, Australia and New Zealand									
		All firms		UK		Australia		New Zealand			
		Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent		
1	Unavailable information.	149	99.3	63	98.4	46	100.0	40	100.0		
2	At open market value, with any gain/loss recorded in income statement.*	1	0.7	1	1.6						
	Total	150	100.0	64	100.0	46	100.0	40	100.0		

\*Preferred Carbon Financial Accounting Practice for 'All firms' and 'UK firms'.

### *7.3.6. Sold carbon emission allowances*

As can be observed from Table 7-6 (Panel A), the majority of the UK (55 of the 64 or 85.9%), Australian (43 of the 46 or 93.5%) and NZ (39 of the 40 or 97.5%) firms did not provide any information on their accounting policy for 'sold carbon emission allowances'. Similarly, almost all of the UK (62 of the 64 or 96.9%), Australian (100%) and NZ (100%) firms did not provide any information on how they measure 'sold carbon emission allowances', with the exception of two UK firms (Table 7-6 (Panel B)).

The UK (i.e. 3 of 64 or 4.7%) and Australian firms (i.e. 2 of 46 or 4.4%) mostly prefer to recognise proceeds from sale of carbon units from the relevant facility as income, whereas a NZ firm (i.e. one of the 40 or 2.5%), recognises the gain/loss made from sale of surplus carbon emission allowances on hand as 'other gains and losses'. With respect to measurement practice, one UK firm (1.6%) prefers to measure sold carbon emission allowances at time of sale at the transaction price, whereas other UK firms (1.6%) measure sold carbon emission allowances at weighted average cost. The Australian and NZ firms did not specify their preferred measurement practice for 'sold carbon emission allowances'.

Table 7-6: Recognition and measurement of 'sold carbon allowances'

Panel A: Recognition of sold carbon emission allowances

	Accounting Policies - Recognition of 'sold carbon emission allowances'	Countries - UK, Australia and New Zealand											
		All firms		UK		Australia		New Zealand					
		Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent				
1	Unavailable information.	137	91.3	55	85.9	43	93.5	39	97.5				
2	Where excess certificates are sold to third parties, the group recognises the consideration receivable in income statement.	2	1.3	2	3.1								
3	Income is recognised based on the sale of production output (carbon units) from the relevant facility.*	5	3.4	3	4.7	2	4.4						
4	Sales or annual restorations of emission rights consist of decreases in inventories recognised.	1	0.7	1	1.6								
5	Proceeds from the sale of emission rights are recorded as a reduction of "Cost of sales".	2	1.4	2	3.1								
6	The emission allowance quotas recognised in intangible rights are derecognised when the emission allowances are sold. Gains from the sale of excess allowances are recognised as other operating income in the statement of income.	1	0.7	1	1.6								
7	Any net gain resulting from the sale of permits is recognised in other expenses.	1	0.7			1	2.2						
8	If the number of allowances received exceeds actual consumption, the surplus is sold in the market. The gain/loss from the sale is presented as Other gains and losses.**	1	0.7					1	2.5				
	<b>Total</b>	<b>150</b>	<b>100.0</b>	<b>64</b>	<b>100.0</b>	<b>46</b>	<b>100.0</b>	<b>40</b>	<b>100.0</b>				

\*Preferred Carbon Financial Accounting Practice for 'All firms', 'UK firms' and 'Australian firms'.

\*\*Preferred Carbon Financial Accounting Practice for 'New Zealand firms'.

Table 7-6: Recognition and Measurement of 'sold carbon allowances'

Panel B: Measurement of sold carbon emission allowances

	Countries - UK, Australia and New Zealand									
	All firms		UK		Australia		New Zealand			
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent		
Accounting Policies - Measurement of 'sold carbon emission allowances'	148	98.7	62	96.9	46	100.0	40	100.0		
1 Unavailable information.	1	0.7	1	1.6						
2 At transaction price.*	1	0.7	1	1.6						
3 At weighted average cost.*										
Total	150	100.0	64	100.0	46	100.0	40	100.0		

\*Preferred Carbon Financial Accounting Practice for 'All firms' and 'UK firms'.

### *7.3.7. Unidentified stage of carbon emission allowances*

Recognition and measurement policy. Some of the UK firms also treated 'carbon emission allowances' as a forward contract, financial instrument or derivative. It was, however, not clear at what stage of the transaction, those firms treated the carbon emission allowances as a financial instrument or derivative. However, the carbon financial accounting policies in Table 7-7 indicate that some ETS affected firms are possibly using carbon emission allowances for 'trading purposes'. These firms may be acquiring (purchasing) additional carbon emission allowances with the intention of trading them on active markets, rather than with the intention of surrendering those emission allowances to the government at year end. Nevertheless, Table 7-7 provides details of the ways in which these UK firms were financially accounting for the 'unidentified stage' of carbon emission allowances.

Table 7-7: Unidentified stage of recognition and measurement of carbon emission allowances

	Accounting Policies – Recognition and measurement of 'unidentified stage of carbon emission allowances'	Countries - UK, Australia and New Zealand									
		All firms		UK		Australia		New Zealand			
		Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent		
1	Unavailable information.	140	93.3	56	87.5	45	97.8	39	97.5		
2	The fair value of energy price derivatives reflects carbon pricing to the extent that published price curves have been influenced by the carbon tax.*	1	.7			1	2.2				
3	Any income from the receipt or sale of the carbon compensation units is not taxable.**	1	.7					1	2.5		
4	Emission related derivatives are valued separately at their forward rates and prices as of the balance sheet date. Emission rights are also held for proprietary trading and reported under 'other operating assets' and measured at lower of cost or fair value.***	1	.7	1	1.6						
5	Emission rights purchased for trading are classified as 'inventory'.***	1	.7	1	1.6						
6	Negotiations of emission trading certificates are managed by parent company.***	1	.7	1	1.6						
7	The firm also enters into forward contracts for the future delivery of carbon allowances. Forward contracts are measured at fair value with gains and loss arising on remeasurement being recognised in the income statement. Under the renewable obligations certificates (ROCs) scheme, certificates obtained from own generation are awarded by a third party. Self-generated certificates are recorded at market value and purchased certificates are recognised at cost, both within intangible assets. The liability under the renewables obligations is recognised based on electricity supplied to customers, the percentages set by the third party and the prevailing market price. The intangible asset is surrendered at the end of the compliance period reflecting the consumption of economic benefit. As a result, no amortisation is recorded during the period.***	1	.7	1	1.6						
8	Forward contracts are recognised at the fair market value in the balance sheet. Changes in the fair value of such forward transactions are recognised in the statement of income.***	1	.7	1	1.6						

9	Emission rights acquired to hedge current carbon emission are recognised as intangible assets at cost, and amortised to cost of sales during the compliance period. In the case of forward purchases, assets are recognised upon physical reception of the emission certificates. In case of forward sale transactions, revenues are recognised upon physical delivery of the emission certificates. In the case of used emissions, provisions are recognised against cost of sales, net of any benefit obtained through swap transactions of emission rights for CERs. Certified emission reductions (CERs) are accounted for as intangible assets at their development cost, which are attributable mainly to legal expenses, incurred in the process of obtaining such CERs.***	1	.7	1	1.6					
10	Emission allowances are also treated as a derivative instrument.***	1	.7	1	1.6					
11	Emission rights traded on active markets are not depreciated, as the carrying value of these emission rights is considered to account for initial value.***	1	.7	1	1.6					
	Total	150	100.0	64	100.0	46	100.0	40	100.0	100.0

\*Preferred Carbon Financial Accounting Practice for 'All firms' and 'Australian firms'.

\*\*Preferred Carbon Financial Accounting Practice for 'All firms' and 'New Zealand firms'.

\*\*\*Preferred Carbon Financial Accounting Practice for 'All firms' and 'UK firms'.

## 7.4. Carbon disclosure practice of ETS affected firms

### 7.4.1. Carbon disclosure score for firms

Table 7-8 depicts the carbon disclosure score of the UK, Australian and NZ firms. The scores indicate that the overall minimum carbon disclosure is zero and the maximum carbon disclosure is 13. Further detailed examination of each country's carbon disclosure score indicates that the minimum carbon disclosure made by UK and NZ firms is of zero items and their maximum carbon disclosure score is 13. Australian firms on the other hand, have a minimum carbon disclosure score of 1 item and a maximum carbon disclosure score of 11 items. This contrasts with the findings of Bae Choi et al. (2013) (see Chapter 5), in which the maximum number of items disclosed by Australian companies was 10 (for year 2006), 14 (for year 2007), and 16 (for year 2008). It is also interesting to note that although the findings of Bae Choi et al. (2013) indicated that climate change and carbon related disclosure increased over a period of three years, as a result of the then upcoming NGER Act 2009, the findings of the present study show a decline in the same disclosure made by Australian companies. In line with the conclusion of Bae Choi et al. (2013), that disclosure was likely to increase due to the NGER Act, the maximum disclosure score for this study should have been more than 16 as this was the maximum score observed by Bae Choi et al. for their final year, 2008. Although the current study is based on the 2012-13 annual reports of the Australian companies, the maximum disclosure score is only 11.

Nevertheless, the minimum disclosure score of zero for UK and NZ firms and 1 item for Australian firms implies that some firms from the UK, Australia and NZ are less transparent and do not appear to consider disclosure of carbon information as essential. On the other hand, the maximum disclosure score of 13 items (for UK and NZ firms) and 11 items (for NZ firms) implies that some firms from the UK, Australia and NZ are trying to be more transparent and willing to provide as much information related to carbon as they can.

Table 7-8 indicates that UK firms (i.e. 11 or 17.2% of 64 UK firms) have a carbon disclosure score of 2 i.e. UK firms made a carbon disclosure of only 2 items out of 22 items in the carbon disclosure index. Similarly, the Australian firms (i.e. 8 or 17.4% of 46 firms) made a carbon disclosure of 2 and 4 items of the 22 from the carbon disclosure index. Finally, NZ firms made a carbon disclosure of only 1 of the 22 items (i.e. 13 or 32.5% of 40 firms) from the carbon disclosure index. This implies that the carbon disclosure is low for the UK, Australian and NZ firms and that these firms may not consider that providing carbon disclosure on as many as 18 to 20 items from the carbon disclosure checklist, is relevant or material.

This finding is also interesting, as Australia, for example, appears to have mandatory carbon disclosure in the form of the NGER Act 2007 (see Chapter 4), but its carbon disclosure score is very low. Regulation does not appear to increase the carbon disclosure score for Australian firms. A possible explanation for the low carbon disclosure for most firms (including Australian firms), could be that the firms are making carbon disclosure in some other media (i.e. firm sustainability reports, participation in carbon disclosure projects or firm websites for example), rather than in their annual reports from which the carbon disclosure data was derived. It would be beneficial to do further research on the carbon disclosure practices of firms, observed from different sources of communication, such as sustainability reports, firm websites, and other pamphlets, to further examine if the carbon disclosure scores are different for information observed from different communication sources. If the carbon disclosure scores are indeed different, then what factors explain the ETS affected firms' choice to make more carbon disclosures in that particular source (i.e. annual reports, sustainability reports, websites, carbon disclosure projects, etc)?

Table 7-8: Carbon disclosure scores for all firms

Carbon disclosure score	Countries - UK, Australia and NZ							
	All firms		UK		Australia		New Zealand	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
0	4	2.7	3	4.7	0	0.0	1	2.5
1	21	14.0	3	4.7	5	10.9	13	32.5
2	25	16.7	11	17.2	8	17.4	6	15.0
3	20	13.3	9	14.1	6	13.0	5	12.5
4	20	13.3	6	9.4	8	17.4	6	15.0
5	12	8.0	4	6.3	4	8.7	4	10.0
6	7	4.7	3	4.7	3	6.5	1	2.5
7	9	6.0	4	6.3	5	10.9	0	0.0
8	7	4.7	3	4.7	3	6.5	1	2.5
9	6	4.0	3	4.7	3	6.5	0	0.0
10	7	4.7	6	9.4	0	0.0	1	2.5
11	6	4.0	5	7.8	1	2.2	0	0.0
12	2	1.3	1	1.6	0	0.0	1	2.5
13	4	2.7	3	4.7	0	0.0	1	2.5
Total	150	100.0	64	100.0	46	100.0	40	100.0

From the discussion above, it appears that there are few firms from the UK, Australia and NZ that are attempting to be transparent by disclosing information on as many as 11 to 13 items from the carbon disclosure checklist. Some firms still have a low carbon disclosure score of 2. This further indicates that ETS affected firms are less transparent and do not consider it material to disclose carbon related

information on as many as 18 to 20 items from the carbon disclosure checklist or possibly use some other communication source (instead of or apart from the annual report) to make carbon disclosures.

#### *7.4.2. Percentage distribution of carbon disclosure checklist items for firms*

As indicated in the previous chapter, the carbon disclosure checklist initially consisted of five categories, with a total of 18 items. Four new items were included in that checklist. The four items (i.e. GHG8, GHG9, GHG10 and GHG11) are specified under the GHG emissions accounting category (GHG) in Table 7-9, which also provides information on the distribution of carbon disclosure checklist items for firms.

Table 7-9: Percentage distribution of carbon disclosure checklist items for all firms

1	Disclosure categories	Disclosure items	All firms (150 firms)			UK (64 firms)			Australia (46 firms)			New Zealand (40 firms)						
			Disclosed		Did not disclose		Disclosed		Did not disclose		Disclosed		Did not disclose					
			Total	%	Total	%	Total	%	Total	%	Total	%	Total	%				
2	Climate change: risks and opportunities	CC1	86	57%	64	43%	42	66%	22	34%	30	65%	14	35%	26	65%		
		CC2	100	67%	50	33%	46	72%	18	28%	35	76%	11	24%	19	48%	21	53%
	GHG emissions accounting	GHG1	28	19%	122	81%	14	22%	50	78%	9	20%	37	80%	5	13%	35	88%
		GHG2	7	5%	143	95%	6	9%	58	91%	0	0%	46	100%	1	3%	39	98%
		GHG3	38	25%	112	75%	22	34%	42	66%	11	24%	35	76%	5	13%	35	88%
		GHG4	32	21%	118	79%	20	31%	44	69%	8	17%	38	83%	4	10%	36	90%
		GHG5	18	12%	132	88%	8	13%	56	88%	5	11%	41	89%	5	13%	35	88%
		GHG6	12	8%	138	92%	7	11%	57	89%	2	4%	44	96%	3	8%	37	93%
		GHG7	43	29%	107	71%	26	41%	38	59%	7	15%	39	85%	10	25%	30	75%
		GHG8	58	39%	92	61%	24	38%	40	63%	16	35%	30	65%	18	45%	22	55%
		GHG9	44	29%	106	71%	15	23%	49	77%	19	41%	27	59%	10	25%	30	75%
GHG10	20	13%	130	87%	9	14%	55	86%	8	17%	38	83%	3	8%	37	93%		
GHG11	25	17%	125	83%	11	17%	53	83%	4	9%	42	91%	10	25%	30	75%		

3	Energy consumption accounting	EC1	total energy consumed (e.g. tera-joules or peta-joules)	0	0%	150	100%	0	0%	64	100%	0	0%	46	100%	0	0%	40	100%
		EC2	quantification of energy used from renewable sources	0	0%	150	100%	0	0%	64	100%	0	0%	46	100%	0	0%	40	100%
		EC3	disclosure by type, facility or segment	0	0%	150	100%	0	0%	64	100%	0	0%	46	100%	0	0%	40	100%
4	GHG reduction and cost	RC1	detail of plans or strategies to reduce GHG emissions	73	49%	77	51%	30	47%	34	53%	26	57%	20	44%	17	43%	23	58%
		RC2	specification of GHG emissions reduction target level and target year	55	37%	95	63%	37	58%	27	42%	10	22%	36	78%	8	20%	32	80%
		RC3	emissions reductions and associated costs or savings achieved to date as a result of the reduction plan	33	22%	117	78%	24	38%	40	63%	9	20%	37	80%	0	0%	40	100%
		RC4	cost of future emissions factored into capital expenditure planning	13	9%	137	91%	10	16%	54	84%	3	7%	43	94%	0	0%	40	100%
5	Carbon emission accountability	ACC1	indication of which board committee (or other executive body) has overall responsibility for actions related to climate change	6	4%	144	96%	4	6%	60	94%	1	2%	45	98%	1	0%	39	100%
		ACC2	description of the mechanism by which the board (or other executive body) reviews the company's progress regarding climate change	7	5%	143	95%	4	6%	60	94%	3	7%	43	94%	0	0%	40	100%

The most disclosed category appears to be Climate change: risks and opportunities (CC) (see Table 7-9), with a maximum of 71.9% UK firms, 76.10% Australian firms and 47.5% NZ firms providing disclosure on the 'implications and opportunities from climate change' (CC2) item. Overall, this category is the most disclosed category, with 66.7% of the total 150 firms providing disclosure on the CC2 item.

The GHG reduction and cost (RC) category appears to be the second most disclosed for UK and Australian firms, with a maximum of 57.8% UK firms and 56.5% Australian firms providing disclosure on their GHG emission reduction target level and year (RC2), as well as on the strategies implemented to reduce GHG emissions (RC1). The second most disclosed category for NZ, on the other hand, is the GHG emissions accounting (GHG) category, in which a maximum of 45% firms are providing disclosure on their carbon emission financial accounting policies (GHG8). Overall, GHG reduction and cost (RC) is the second most disclosed category, with 48.7% of the total 150 firms providing disclosure on the RC1 item.

The third most disclosed category for UK and Australian firms is GHG emissions accounting (GHG), with at least 40.6% of the UK firms providing a comparison of GHG emissions with previous years (GHG7). Most Australian firms (41.3%) on the other hand, are providing disclosures on the carbon tax/carbon liability/carbon credits in \$ financial figures (GHG9). In contrast, for most NZ firms, the GHG reduction and cost (RC) category is the third most disclosed, with 42.5% NZ firms providing disclosure on their plans and strategies implemented for reducing GHG emissions (RC1). Overall, GHG emissions accounting (GHG) is the third most disclosed category with at least 38.7% of the total 150 firms providing disclosure on their carbon financial accounting policy (GHG8).

Finally, Carbon emission accountability (ACC) category, is the fourth most preferred category for all countries and overall, followed by the Energy consumption accounting (EC) category, in which no disclosure was made by any firms from the UK, Australia or NZ.

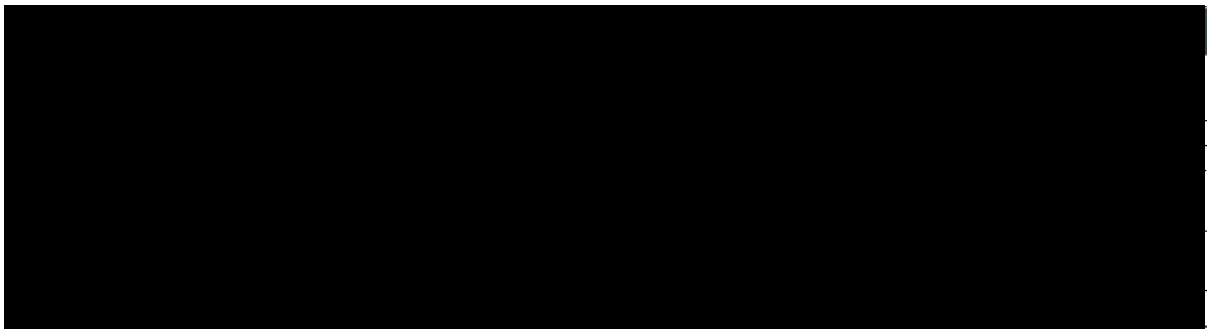
Thus, from the above discussion it appears that most ETS affected firms are willing to provide carbon disclosure on items in the Climate change: risks and opportunities (CC) category, followed by items in the GHG reduction and cost (RC), GHG emissions accounting (GHG), Carbon emission accounting (ACC), and Energy consumption accounting categories. The discussion also suggests that the Carbon emission accountability (ACC) and Energy consumption accounting (EC) categories are the main areas in which the least or no disclosure is made by the ETS firms, which may also further suggest that the ETS affected firms may not be providing all the information considered as essential for decision making by stakeholders. Overall, the findings on the carbon disclosure practices of the ETS firms in Table 7-9 also suggest diversity in carbon disclosure practices, thus providing support to prior studies in the

carbon disclosure area (Freedman & Jaggi, 2005; Kolk et al., 2008; Stanny & Ely, 2008; Doran & Quinn, 2009; Prado-Lorenzo, 2009; Peters & Romi, 2009; Andrew & Cortese, 2011; Berthelot & Robert, 2011 Rankin et al., 2011; Cotter & Najah, 2012; Bae Choi et al., 2013; Stanny, 2013).

#### *7.4.3. Examples of carbon disclosure practice (or reporting on carbon)*

The most common ways in which the items from the carbon disclosure checklist (used for content analysis) were reported by all the firms were in the format of tables, narratives and graphs. Figures 7-3 to 7-5 present some examples of these three forms of carbon disclosure from the annual reports of the firms.

Figure 7-3: Example of carbon disclosure item GHG3 and GHG4 (in table format)



Source: Norske Skog Tasman Ltd (New Zealand firm) Annual Report 2013, p. 27.

Figure 7-4: Example of carbon disclosure item CC2 (in narrative format)



Source: ENI (UK firm, Installation name: Polimeri Europa UK Ltd) Annual Report 2013, p. 187.

Figure 7-5: Example of carbon disclosure items GHG7, RC2 and RC3 (in graph format)



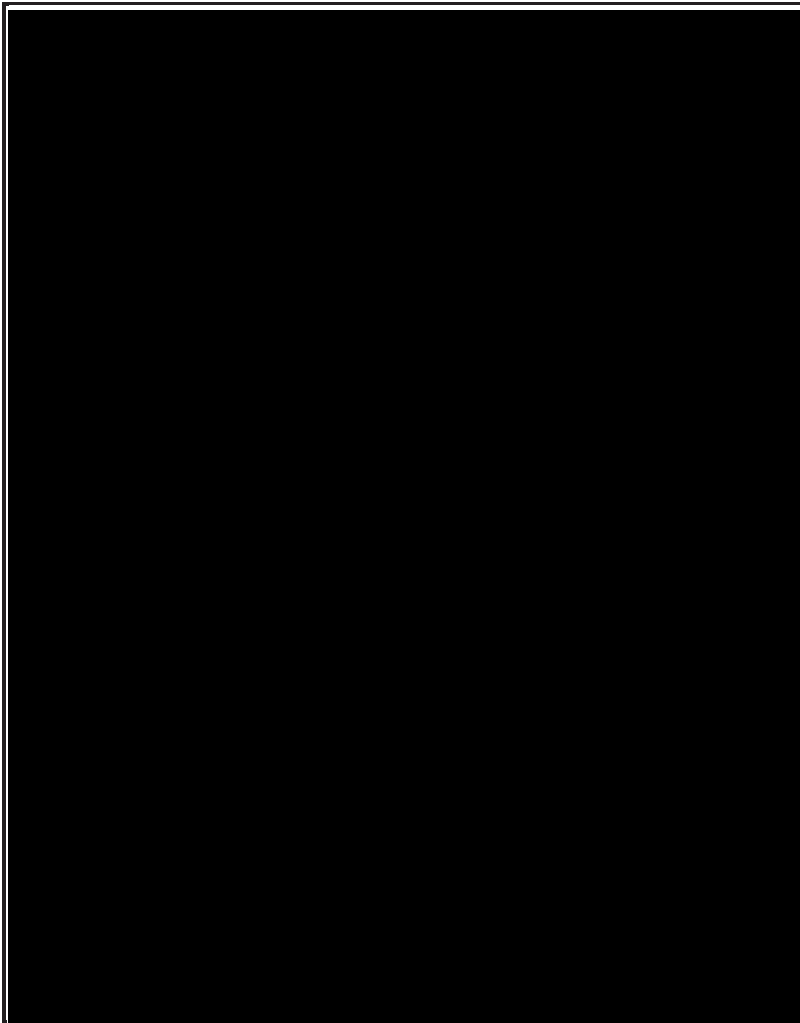
Source: National Grid plc (UK firm, Installation name: Aberdeen Compressor Station) Annual Report 2012-2013, p. 45.

In order to examine if there was any similarity or difference in the formats used to disclose carbon related information, a comparison was also made between the carbon disclosure practice adopted by firms with low carbon disclosure and firms with high carbon disclosure. Figures 7-6 to 7-8 and Figures 7-9 to 7-11 present examples of the ways in which carbon related information was reported by firms with a low carbon disclosure score and firms with a high carbon disclosure score. Firms with a carbon disclosure score of 4 items (from Table 7-8) were considered to be firms with a low carbon disclosure score. As observed from Table 7-8, a total of six UK firms, eight Australian firms and six NZ firms, all had a carbon disclosure score of 4, considered to be low. On the other hand, firms with the highest score from the checklist were considered to be firms with a high carbon disclosure score. Again, as observed from Table 7-8, a carbon disclosure score of 13 items was the highest for three UK firms and

one NZ firm, whereas a carbon disclosure score of 11 items was the highest for one Australian firm. Thus, these firms too, were considered. However, all these firms with low and high carbon disclosure scores, were further shortlisted and finalised to a total of only two firms (one firm with a low carbon disclosure score and one firm with a high carbon disclosure score) per country, on the basis of four carbon disclosure items commonly reported by all of them. This was done to enable comparison between the carbon disclosure practice style of the firms with both low and high carbon disclosure scores. CC1 was the most commonly reported item by these firms. Figures 7-6 to 7-8 and Figures 7-9 to 7-11 present examples of carbon disclosure item CC1 as reported and presented in the firms' annual reports.

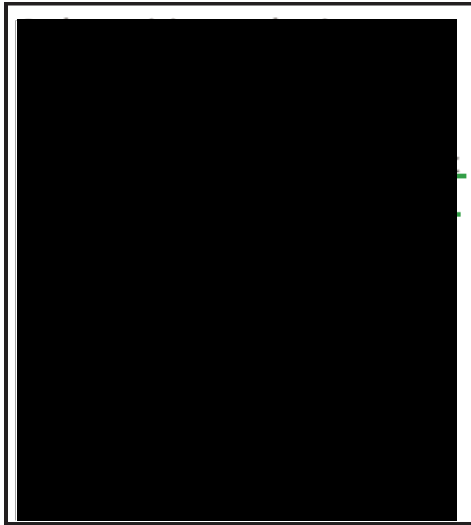
Figures 7-6 to 7-8 and Figures 7-9 to 7-11 also indicate that, irrespective of the country to which the firm belongs, and irrespective of whether the firm had a high carbon disclosure score or a low carbon disclosure score, their format and style of reporting carbon information was similar i.e. a narrative format was used to provide disclosure on items CC1, CC2 and RC1. This indicates that the extent of the carbon disclosure may not really affect the way (or the format) in which the information for a particular (carbon disclosure) item from the checklist is disclosed.

Figure 7-6: Example of the carbon disclosure format used by UK firm (with high carbon disclosure score) for disclosure of item CC1 from CDP index



Source: GDF SUEZ (Installation name: Case New Holland Boilerhouse) Annual Report 2012-2013, p. 58

Figure 7-7: Example of the format used by Australian firm (with high carbon disclosure score) for disclosure of item CC1 from CDP index



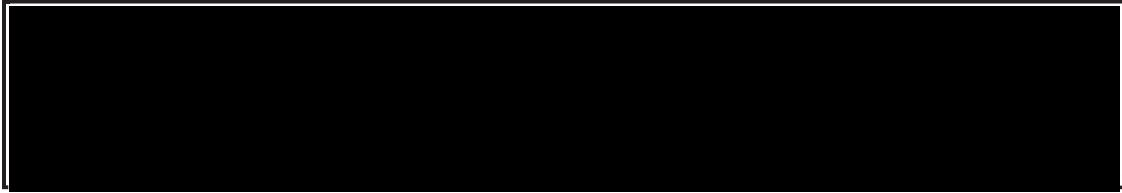
Source: Melbourne Water Corporation Annual Report 2012-2013, p. 41

Figure 7-8: Example of the format used by New Zealand firm (with high carbon disclosure score) for disclosure of item CC1 from CDP index



Source: Norske Skog Tasman Ltd Annual Report 2012-2013, p. 21

Figure 7-9: Example of the format used by UK firms (with low carbon disclosure score) for disclosure of item CC1 from CDP index



Source: PPG Industries (UK) Limited (Installation name: PPG Industries (UK) Limited) Annual Report 2012-2013, p. 13

Figure 7-10: Example of the format used by Australian firm (with low carbon disclosure score) for disclosure of item CC1 from CDP index



Source: ERM Power Generation Pty Ltd Annual Report 2012-2013, p. 4

Figure 7-11: Example of the format used by New Zealand firm (with low carbon disclosure score) for disclosure of item CC1 from CDP index



Source: Landcorp Farming Limited Annual Report 2012-2013, p. 66

## 7.5. Determinants of ETS affected firms' carbon financial accounting and carbon disclosure practice

### 7.5.1. *Descriptive Analysis*

Table 7-10 (Panel A to Panel D) presents the descriptive statistics for the dependent variables i.e. the adoption of carbon financial accounting practice (*CACCP*) as well as the extent of carbon disclosure (*CDISCP*) and the independent variables of regulation, firm size, leverage, listing status of the firm and auditors (i.e. REG, SIZE, LEV, LIST and AUD). Table 7-10 (Panel A) presents the descriptive statistics for the complete sample of 150 firms, and Panels B, C and D present the descriptive statistics for the UK (64 firms), Australia (46 firms) and NZ (40 firms) respectively.

#### 7.5.1.1. *Descriptive analysis for overall firms*

Overall, the mean of *CACCP* is 0.37, indicating 37% (55 of 150) of the sample firms have a high adoption of carbon financial accounting practice. Likewise, the mean of *CDISCP* is 0.53, indicating that for 53% (80 of 150) of the sample firms, the extent of carbon disclosure is high. This information indicates that the adoption of carbon financial accounting practice and the extent of carbon disclosure is low for the 150 sample firms (47% and 63% respectively). Thus, on the basis of this information, the adoption of carbon financial accounting practice for the majority of the firms is low whereas the extent of carbon disclosure is high for almost half of the overall firms.

The minimum regulation (REG) for the 150 sample firms is 2, with the maximum being 7. A high variation in the size of the overall firms can also be observed in the natural logarithm of total assets, ranging from 0.4353 to 8.3930. This implies that the size of the overall firms varies to a great extent. With the mean of the size for overall firms as 4.996369, it appears that on average the firms are medium to large sized firms. With respect to leverage, there appears to be a high variation in the debt to equity ratio of the overall firms, ranging from 0.1033 to 114.0782. With the leverage mean of 3.683435, it appears that on average the firms are low leverage firms. Finally, the means for 'listing status' and 'auditors' were 0.69 and 0.87 respectively, which implies that 69% and 87% of the overall firms were listed firms and had Big4 auditors.

#### 7.5.1.2. *Descriptive analysis for the UK, Australian and NZ firms*

For the UK, Australian and NZ firms, the mean of *CACCP* is 0.42 (Table 7-10, Panel B), 0.28 (Table 7-10, Panel C) and 0.38 (Table 7-10, Panel D). This indicates that adoption of carbon financial accounting practice is higher for 42% (27 of 64) of the UK firms, 28% (13 of 46) of the Australian firms, and 38%

(15 of 40) of the NZ firms. The carbon financial accounting practice is low for 58% of the UK firms, 72% of the Australian firms and 62% of the NZ firms. Likewise, the mean of CDISCP for the UK, Australian and NZ firms is 0.50 (Table 7-10, Panel B), 0.46 (Table 7-10, Panel C), and 0.50 (Table 7-10, Panel D), thus indicating that the extent of carbon disclosure is high for 50% (32 of 64) of the UK firms, 46% (21 of 46) of the Australian firms, and 50% (20 of 40) of the NZ firms. This information indicates that the extent of carbon disclosure is low for the remaining 50% of the UK firms, 54% of the Australian firms and 50% of the NZ firms. Thus, given these findings, the adoption of carbon financial accounting practice is low for the majority of the UK, Australian and NZ firms, whereas the extent of carbon disclosure appears neither high nor low for the firms from these countries.

The minimum regulation (REG) score for UK firms is 3, with the maximum being 4 (Table 7-10, Panel B). The minimum regulation score for Australian firms is 4, with the maximum being 7. New Zealand firms on the other hand, have both the minimum and maximum regulation as 2. This indicates that the Australian firms are faced with more stringent regulations, followed by the UK firms, whereas NZ firms have less regulation in comparison to Australian and UK firms. With respect to SIZE, a high variation in the size of the UK, Australian and NZ firms can be observed in their natural logarithm of total assets, ranging from 2.3878 to 7.4327 (UK firms), from 3.2536 to 7.2057 (Australian firms), and from 0.4353 to 8.3930 (NZ firms). This implies that the size range of the UK and Australian firms are similar to each other, however, in comparison to NZ firms, their size range is different. Also, within each country, the SIZE of the firms varies to a great extent. The size mean was 4.778283 (UK firms), 5.126711 (Australian firms) and 5.195413 (NZ firms), thus implying that on average the UK, Australian and NZ firms are medium to large sized firms. For Leverage too, there appears to be a high variation in the debt to equity ratio of the UK, Australian and NZ firms, with their debt to equity ratio ranging from 0.3298 to 114.0782 (UK firms), from 0.1680 to 20.0882 (Australian firms), and from 0.1033 to 8.3799 (NZ firms). With the leverage mean of 6.346824 (UK firms), 1.984857 (Australian firms) and 1.375378 (NZ firms), it appears that on average the firms within UK, Australia and NZ, are all low leverage firms. The means for 'listing status' were 0.86 (UK firms), 0.61 (Australian firms) and 0.53 (NZ firms), respectively (Table 7-10, Panel B to Panel D). This further implies that 86%, 61% and 53% of the UK, Australian and NZ firms were listed. Finally, Table 7-10 (Panel B to Panel D) also indicates that the means for 'auditors' were 0.97 (UK firms), 0.76 (Australian firms) and 0.83 (NZ firms), thus implying that 97% of the UK firms, 76% of the Australian firms and 83% of the NZ firms had Big4 auditors.

Table 7-10: Descriptive Statistics

<b>Panel A: Descriptive Analysis of complete sample i.e. all firms (N = 150 firms)</b>					
	Mean	Median	Std. Deviation	Minimum	Maximum
Adoption of Carbon Financial Accounting Practice	.37	0.00	.484	0	1
Extent of Carbon Disclosure	.53	1.00	.501	0	1
Regulation	3.61	3.00	1.474	2	7
Firm Size	4.996369	4.942538	1.1883647	.4353	8.3930
Leverage	3.683435	1.279543	11.4516924	.1033	114.0782
Listing Status	.69	1.00	.463	0	1
Auditors	.87	1.00	.341	0	1
<b>Panel B: Descriptive Analysis of UK firms (N = 64 firms)</b>					
	Mean	Median	Std. Deviation	Minimum	Maximum
Adoption of Carbon Financial Accounting Practice	.42	0.00	.498	0	1
Extent of Carbon Disclosure	.50	.50	.504	0	1
Regulation	3.28	3.00	.453	3	4
Firm Size	4.778283	4.807679	.9831709	2.3878	7.4327
Leverage	6.346824	1.610206	17.0176987	.3298	114.0782
Listing Status	.86	1.00	.350	0	1
Auditors	.97	1.00	.175	0	1
<b>Panel C: Descriptive Analysis of Australian firms (N = 46 firms)</b>					
	Mean	Median	Std. Deviation	Minimum	Maximum
Adoption of Carbon Financial Accounting Practice	.28	0.00	.455	0	1
Extent of Carbon Disclosure	.46	0.00	.504	0	1
Regulation	5.46	5.50	.982	4	7
Firm Size	5.126711	5.161970	1.1070068	3.2536	7.2057
Leverage	1.984857	1.424216	2.8895623	.1680	20.0882
Listing Status	.61	1.00	.493	0	1
Auditors	.76	1.00	.431	0	1
<b>Panel D: Descriptive Analysis of New Zealand firms (N = 40 firms)</b>					
	Mean	Median	Std. Deviation	Minimum	Maximum
Adoption of Carbon Financial Accounting Practice	.38	0.00	.490	0	1
Extent of Carbon Disclosure	.50	.50	.506	0	1
Regulation	2.00	2.00	0.000	2	2
Firm Size	5.195413	5.482576	1.5103570	.4353	8.3930
Leverage	1.375378	.872485	1.7511235	.1033	8.3799
Listing Status	.53	1.00	.506	0	1
Auditors	.83	1.00	.385	0	1

The proxies and measures used for each of the independent variables (i.e. Regulation, Firm Size, Leverage, Listing status and Auditors) are presented in Table 6-4 (see Chapter 6).

### 7.5.2. Independent t-test (Mean difference test)

A T-test was conducted to further evaluate the significance of differences between the adoption of carbon financial accounting practice and the extent of carbon disclosures. Table 7-11 (Panel A to Panel D) presents the results of t-tests for all firms, as well as UK, Australian and NZ firms, and also provides the descriptive statistics for the effects of institutional pressure variables (Regulations, Firm Size, Leverage, Listing Status and Auditors) on the adoption of carbon financial accounting practice and the extent of carbon disclosure.

Table 7-11: Results of t-tests and descriptive statistics for the effects of institutional pressures on the adoption of carbon financial accounting practice and extent of carbon disclosure

<b>Panel A: Overall Firms (N = 150 firms)</b>										
	Adoption of Carbon Financial Accounting practice					Extent of Carbon Disclosure				
	Adoption of Carbon Financial Accounting Practice is low		Adoption of Carbon Financial Accounting Practice is high		t-statistic	Extent of Carbon Disclosure is low		Extent of Carbon Disclosure is high		t-statistic
	N	Mean	N	Mean		N	Mean	N	Mean	
Regulation	95	3.65	55	3.53	.501	70	3.33	80	3.85	-2.189**
Firm Size	95	5.12	55	4.78	1.677**	70	5.18	80	4.83	1.803**
Leverage	95	4.34	55	2.55	.923	70	2.34	80	4.86	-1.427
Listing Status	95	.72	55	.65	.780	70	.69	80	.70	-.188
Auditors	95	.85	55	.89	-.661	70	.81	80	.91	-1.736**
<b>Panel B: UK Firms (N = 64 firms)</b>										
	Adoption of Carbon Financial Accounting Practice					Extent of Carbon Disclosure				
	Adoption of Carbon Financial Accounting Practice is low		Adoption of Carbon Financial Accounting Practice is high		t-statistic	Extent of Carbon Disclosure is low		Extent of Carbon Disclosure is high		t-statistic
	N	Mean	N	Mean		N	Mean	N	Mean	
Regulation	37	3.32	27	3.22	.889	32	3.22	32	3.34	-1.105
Firm Size	37	4.72	27	4.86	-.569	32	4.85	32	4.71	.585
Leverage	37	8.26	27	3.73	1.051	32	5.31	32	7.38	-.484
Listing Status	37	.84	27	.89	-.573	32	.91	32	.81	1.072
Auditors	37	.97	27	.96	.224	32	.94	32	1.00	-1.438
<b>Panel C: Australian Firms (N = 46 firms)</b>										

	Adoption of Carbon Financial Accounting Practice					Extent of Carbon Disclosure				
	Adoption of Carbon Financial Accounting Practice is low		Adoption of Carbon Financial Accounting Practice is high		t-statistic	Extent of Carbon Disclosure is low		Extent of Carbon Disclosure is high		t-statistic
	N	Mean	N	Mean		N	Mean	N	Mean	
Regulation	33	5.27	13	5.92	-1.805**	25	5.40	21	5.52	-.422
Firm Size	33	5.32	13	4.63	1.953**	25	5.09	21	5.17	-.249
Leverage	33	2.33	13	1.12	1.281	25	1.67	21	2.37	-.815
Listing Status	33	.61	13	.62	-.057	25	.56	21	.67	-.726
Auditors	33	.73	13	.85	-.839	25	.72	21	.81	-.697

**Panel D: New Zealand Firms (N = 40 firms)**

	Adoption of Carbon Financial Accounting Practice					Extent of Carbon Disclosure				
	Adoption of Carbon Financial Accounting Practice is low		Adoption of Carbon Financial Accounting Practice is high		t-statistic	Extent of Carbon Disclosure is low		Extent of Carbon Disclosure is high		t-statistic
	N	Mean	N	Mean		N	Mean	N	Mean	
Regulation	25	2.00	15	2.00		20	2.00	20	2.00	
Firm Size	25	5.45	15	4.78	1.377	20	5.28	20	5.11	.336
Leverage	25	1.21	15	1.66	-.638	20	0.93	20	1.82	-1.658
Listing Status	25	.68	15	.27	2.696**	20	.65	20	.40	1.594
Auditors	25	.84	15	.80	.315	20	.80	20	.85	-.406

\*\*Significant at 0.05 level

*7.5.2.1. T-test and descriptive statistics - Overall firms*

There are statistically significant differences (at the .05 level of significance) between firms where the adoption of carbon financial accounting practice is high and firms where the adoption of carbon financial accounting practice is low, in Firm Size, but not in Regulation, Leverage, Listing status and Auditors (Table 7-11, Panel A – Overall firms). Results show that *on average*, as compared to firms for which the adoption of carbon financial accounting practice is high (size mean = 4.78), the mean scores reflect that firm size is more associated with firms for which the adoption of carbon financial accounting practice is low (mean = 5.12). On average, the adoption of carbon financial accounting practices is low for large size firms as compared to the adoption of carbon financial accounting practice which is higher.

Additionally, no statistical difference exists between firms whose adoption of carbon financial accounting practice is higher and firms whose adoption of carbon financial accounting practice is lower, in terms of Regulation, Leverage, Listing status and Auditors.

With respect to the extent of carbon disclosure of the overall firms, there are statistically significant differences (at the .05 level of significance), between firms for which the extent of carbon disclosure is high and firms for which the extent of carbon disclosure is low, in Regulation, Firm Size and Auditors but not in Leverage and Listing status (Table 7-11, Panel A – Overall firms). Results show that *on average*, as compared to the firms for which the extent of carbon disclosure is low, the mean scores reflect that Regulation (mean = 3.85) and Auditors (mean = 0.91) are more associated to firms for which the extent of carbon disclosure is high. This implies that on average, the extent of carbon disclosure is high for firms with stringent regulations and Big4 auditors as compared to firms for which the extent of carbon disclosure is low. However, results also show that *on average*, as compared to the firms' for which the extent of carbon disclosure is high, the mean scores reflect that Firm Size (mean = 5.18) is more associated to firms for which the extent of carbon disclosure is low. The results also suggest that on average, the extent of carbon disclosure is low for large size firms. Additionally, no statistical difference exists between firms for which the extent of carbon disclosure is high and for which the extent of carbon disclosure is low, in terms of Leverage and Listing status.

#### *7.5.2.2. T- test and descriptive statistics - UK firms*

No statistical difference appears to exist between UK firms for which the adoption of carbon financial accounting practice is high and UK firms for which the adoption of carbon financial accounting practice is low, in terms of Regulation, Firm Size, Leverage, Listing status and Auditors (Table 7-11, Panel B – UK firms). Likewise, no statistical difference exists between UK firms for which the extent of carbon disclosure is high and firms for which the extent of carbon disclosure is low, in terms of Regulation, Firm Size, Leverage, Listing status and Auditors (Table 7-11, Panel B – UK firms).

#### *7.5.2.3. T-test and descriptive statistics - Australian firms*

There are statistically significant differences (at the .05 level of significance), between Australian firms for which the adoption of carbon financial accounting practice is high and Australian firms for which the adoption of carbon financial accounting practice is low, in Regulation and Firm Size, but not in Leverage, Listing status and Auditors (Table 7-11, Panel C – Australian firms). Results show that *on average*, as compared to the Australian firms for which the adoption of carbon financial accounting practice is high (size mean = 4.63), the mean scores reflect that firm size is more associated with firms for which the adoption of carbon financial accounting practice is low (mean = 5.32). This suggests that on average, the adoption of carbon financial accounting practice is low, rather than high, for large size firms. However, results also show that, *on average*, as compared to the firms for which the adoption of carbon financial accounting practice is low, the mean scores for Regulation (mean = 5.92) reflect that it

is more associated with firms for which the adoption of carbon financial accounting practice is high. Thus, on average, Australian firms with stringent regulations are adopting higher carbon financial accounting practices. Additionally, no statistical difference exists between firms for which the adoption of carbon financial accounting practice is high and firms for which the adoption of carbon financial accounting practice is low, in terms of Leverage, Listing status and Auditors (Table 7-11, Panel C – Australian firms).

Similarly, no statistical difference exists between Australian firms for which the extent of carbon disclosure is high and firms for which the extent of carbon disclosure is low, in terms of Regulation, Firm Size, Leverage, Listing status and Auditors (Table 7-11, Panel C – Australian firms).

#### *7.5.2.4. T-test and descriptive statistics - New Zealand firms*

There are statistically significant differences (at the .05 level of significance) between NZ firms for which the adoption of carbon financial accounting practice is high and NZ firms for which the adoption of carbon financial accounting practice is low, in Listing status, but not with Regulation, Firm Size, Leverage and Auditors (Table 7-11, Panel D – New Zealand firms). Results show that on average, as compared to NZ firms for which the adoption of carbon financial accounting practice is high (listing status mean = .27), the mean scores reflect that listing status is more associated to firms for which the adoption of carbon financial accounting practice is low (mean = .68). This indicates that on average, the adoption of carbon financial accounting practices is low, rather than high, for the NZ firms that are listed on the stock exchange. Additionally, no statistical difference exists between firms for which the adoption of carbon financial accounting practice is high and firms for which the adoption of carbon financial accounting practice is low, in terms of Regulation, Firm Size, Leverage and Auditors (Table 7-11, Panel D – New Zealand firms).

Similarly, no statistical difference exists between NZ firms' extent of carbon disclosure in terms of Regulation, Firm Size, Leverage, Listing status and Auditors (Table 7-11, Panel D – New Zealand firms).

#### **7.5.3. Correlation matrix results**

A Pearson correlation was used in this study to explore the relationship between the dependent and the independent variables. The results for the Pearson correlation matrix for both independent and dependent variables are presented in Table 7-12. There appears to be no indication of the presence of an unacceptable level of multicollinearity between the independent and control variables. The highest correlation coefficient is -0.623 for the variables 'Manufacturing and Industrial process' sector and

'Energy and Utilities' sector. However, as this coefficient is below the maximum threshold of  $\pm 0.8$  or  $\pm 0.9$ , it is not considered as a threat to multicollinearity (Chithambo & Tauringana, 2014; Luo & Tang, 2014; Field, 2009; Liu & Anbumozhi, 2009).

For the dependent variable CACCP, the correlation matrix result indicates SIZE to be significantly but negatively associated (coefficient -0.137, significant at 0.05 level), thus suggesting that large size firms do not appear to adopt carbon financial accounting practices for all stages of carbon emission allowances lifecycle. REG, LEV, LIST and ENERGY sector are also negatively related to CACCP, but not significant. Similarly, MANF, PRIM and AUD are all positively associated with CACCP, but not significant. With respect to the other dependent variable CDISCP, three independent variables were found to be significantly associated. Whilst REG (coefficient 0.177, significant at 0.05 level) and AUD (coefficient 0.144, significant at 0.05 level) are positively associated, SIZE (coefficient -0.147, significant at 0.05 level) is negatively associated with CDISCP. This implies that the extent of carbon disclosure is high for firms with stringent regulations and Big4 auditors, whereas the extent of carbon disclosure is low for firms that are large in size. Other than these three independent variables (i.e. REG, SIZE and AUD), almost all of the remaining independent variables, are not significantly associated with CDISCP.

The fact that most independent variables are not significantly associated with both the dependent variables, implies that these variables might not be capturing the level of mimetic and normative institutional pressure, or maybe that the adoption of carbon financial accounting and the extent of carbon disclosure are not considered that essential by the firms due to the absence of uniform carbon financial accounting guidance, even at this stage.

Table 7-12: Correlation

Pearson correlation coefficients - Adoption of Carbon Financial Accounting practice and the extent of Carbon Disclosure (All firms)

	CACCP	CDISCP	REG	SIZE	LEV	LIST	INDENERGY	INDMANF	INDPRI	AUD
CACCP	1									
CDISCP	.268**	1								
REG	-.041	.177*	1							
SIZE	-.137*	-.147*	-.031	1						
LEV	-.076	.110	-.018	-.070	1					
LIST	-.064	.015	.196**	-.160*	-.113	1				
INDENERGY	-.120	.089	.068	.096	.163*	.044	1			
INDMANF	.034	-.070	.260**	-.181*	-.084	.188*	-.623**	1		
INDPRI	.110	-.035	-.359**	.075	-.110	-.254**	-.557**	-.303**	1	
AUD	.054	.144*	-.025	-.253**	.073	.335**	.026	.048	-.083	1

**Notes:**

\* \*\*Significant at 0.10 and 0.05 levels respectively. CACCP is the adoption of carbon financial accounting practice and CDISCP is the extent of carbon disclosure. REG is Regulation, SIZE is Firm size, LEV is Leverage, LIST is Listing Status, INDENERGY is Energy and Utilities industry, INDMANF is Manufacturing and Industrial Process industry, INDPRI is Primary Industry and AUD is Auditors. Both CACCP and CDISCP were coded as 0 where the score for the adoption of carbon financial accounting practice as well as for the carbon disclosure, was lower for the ETS affected firms. Similarly, the CACCP and CDISCP were coded as 1 where the score for the adoption of carbon financial accounting practice as well as for the carbon disclosure, was higher for the ETS affected firms. All the recommended, withdrawn and mandatory carbon financial accounting and carbon disclosure related regulations were used as a proxy for REG. Natural logarithm of total assets were used as a proxy for SIZE. Debt Equity ratio was used as a proxy for LEV. Debt equity ratio was calculated as (total liabilities of firms in NZ \$ / total equity of firms in NZ \$). Firm's listing status was used as a proxy for LIST. Listed firms were coded as 1 and firms not listed or whose listing status was not specified, were coded as 0. Each of the industry sectors were coded as 1 if a firm was a member of that sector and as 0 if the firm did not belong to that sector. Big4 and NonBig4 Auditors were used as a proxy for AUD. Firms with Big4 as auditors were coded as 1 and with non-Big4 were coded as 0.

#### 7.5.4. Regression results

##### *7.5.4.1. Logistic Regression models and goodness of fit tests*

Two logistic regression models (equations) were used in the study to examine the determinants of carbon financial accounting and carbon disclosure practice for the firms affected under ETSS. Table 7-13 (Panel A and Panel B) presents the results obtained from using these logistic regression models. This analysis was performed on the overall sample of 150 firms as well as on the sample of UK, Australian and NZ firms respectively. Column 1 (Table 7-13, both Panel A and Panel B) presents the regression results pertaining to the overall firms, whereas columns 2 to 4 (Table 7-13, both Panel A and Panel B) present the regression results pertaining to the UK, Australian and NZ firms respectively. The logistic regression model 1 (Panel A, Table 7-13) was used to examine the determinants behind adoption of carbon financial accounting practice by the firms affected under ETSS, whereas model 2 (Panel B, Table 7-13) was used to examine the determinants of the extent of carbon disclosure of the ETS affected firms.

Goodness of fit tests were also conducted to determine if the models significantly predicted the likelihood of the institutional pressure related dependent variables being the driving force behind the ETS affected firms' carbon financial accounting and carbon disclosure practices. The pseudo (Nagelkerke)  $R^2$  for the first logistic model, for overall firms, was 0.068. For the UK, Australian and NZ firms, the first model's pseudo  $R^2$  values were 0.063, 0.766 and 0.297, respectively. With respect to the second model, the goodness of fit tests indicate the pseudo  $R^2$  values are 0.078 (overall firms), 0.56 (UK firms), 0.33 (Australian firms) and 0.87 (NZ firms), respectively.

Although the results from the Pearson correlation matrix (discussed in the previous section) in Table 7-12 do not depict very high correlations among the independent variables, the collinearity assumption for logistic regression was also further tested using the collinearity diagnosis. Both the tolerance values and VIF values (not tabulated) that were observed for the logistic model, were found to be well within the acceptable ranges of greater than 0.10 and less than 10, respectively, thus indicating the absence of multicollinearity in the tested logistic models (Dewberry, 2004; Field, 2005; Rankin et al., 2011).

##### *7.5.4.2. Logistic regression results – Determinants of adoption of carbon financial accounting practice (Model 1)*

Regression results for overall firms:

In model 1, for the overall firms, the estimated coefficient of firm size is significantly negative (-0.262, significant at  $p < 0.10$  level), thus indicating that the adoption of carbon financial accounting practice is low for large size firms. This finding does not support H2a that the adoption of carbon financial accounting practice is high for large size firms. On the other hand, the coefficient estimates for the coercive, the remaining mimetic and normative pressures are positive, but insignificant. These results therefore reject H1a, H3a, H4a, H5a and H6a and indicate that institutional pressures such as regulation, leverage, listing status and auditors, do not determine the adoption of carbon financial accounting practice of the overall firms affected under ETSSs.

For the UK firms, using model 1 for cross country analysis, it was observed that none of the institutional pressure related variables were significant as determinants of carbon financial accounting practice. These findings reject H1a, H2a, H3a, H4a, H5a and H6a.

With respect to the Australian firms, however, the variables of regulation (12.687,  $p < 0.05$ ), leverage (2.587,  $p < 0.10$ ), listing status (26.517,  $p < 0.05$ ) and manufacturing industry firms (8.392,  $p < 0.10$ ) were found to have positive coefficients and were significantly associated with the adoption of carbon financial accounting practice. H1a, H3a, H4a and H5a were supported by these findings. Firm size on the other hand, was found to be negatively associated (-3.448,  $p < 0.05$ ) and was also significant. This implied that whilst the adoption of carbon financial accounting practice is high for Australian firms with stringent regulation, high leverage, listing on stock exchange, and belonging to the manufacturing industry, the adoption of carbon financial accounting practice was low for large size Australian firms, thus not supporting H2a.

Finally, for the NZ firms, Listing status was found to be the only determinant of the adoption of carbon financial accounting practice, with the positive coefficient of 1.922 (significant at  $p < 0.05$ ).

#### *7.5.4.3. Logistic regression results – Determinants of the extent of carbon disclosure (Model 2)*

Using model 2, for the overall firms, Regulation was found to be positively and significantly associated (0.346,  $p < 0.01$ ) with the extent of carbon disclosure for the overall firms affected under ETSSs. Firm size was found to be negatively and significantly associated (-0.252,  $p < 0.10$ ) with the extent of carbon disclosure for the overall firms. This implies that while the extent of carbon disclosure may be high for firms with stringent regulations, the same may not be the case with respect to the large size firms. This finding supports H1b, but does not support H2b. Apart from this, the coefficient estimates for the remaining mimetic and normative pressure variables are positive but insignificant. These results therefore reject H3b, H4b, H5b and H6b and indicate that the institutional pressures like leverage,

listing status, industry and auditors, do not determine the extent of carbon disclosure of the overall firms affected under ETSs.

Using model 2 for cross country analysis, it was observed that none of the institutional pressure related variables were significant as determinants of the extent of carbon disclosure for UK firms. These findings reject H1b, H2b, H3b, H4b, H5b and H6b. Likewise, the institutional pressure related variables were not found to be significant determinants of the extent of carbon disclosure for Australian firms. However, for the NZ firms, Listing status was found to be positively and significantly associated (2.720,  $p < 0.05$ ) with the extent of carbon disclosure, thus supporting H4b.

Table 7-13: Determinants of carbon financial accounting and carbon disclosure practice

Variables	Hypothesis	Expected Sign	PANEL A				PANEL B			
			MODEL 1: Dependent Variable - Adoption of Carbon Financial Accounting Practice (CACCP)				MODEL 2: Dependent Variable – Extent of Carbon Disclosure (CDISCP)			
			COLUMN 1 (All firms)	COLUMN 2 (UK firms)	COLUMN 3 (Australian firms)	COLUMN 4 (New Zealand firms)	COLUMN 1 (All firms)	COLUMN 2 (UK firms)	COLUMN 3 (Australian firms)	COLUMN 4 (New Zealand firms)
<b>Coercive pressure</b>	H1a & H1b	+	0.004 (0.001)	0.494 (0.579)	12.687** (4.248)		0.346*** (6.572)	0.957 (2.019)	-0.342 (0.392)	
<b>Mimetic pressure</b>	H2a & H2b H3a & H3b	+	-0.262*(2.762) 0.020 (0.827)	0.157 (0.315) -0.019 (0.590)	-3.448** (3.669) 2.587* (3.517)	-0.460 (1.565) 0.017 (0.004)	-0.252*(2.564) 0.023 (0.830)	-0.036 (0.017) 0.003 (0.033)	0.250 (0.559) 0.111 (0.517)	0.270 (0.460) 1.952 (1.614)
<b>Industry</b>	H4a & H4b H5a & H5b	+	0.473 (1.254)	-0.245 (0.075)	26.517** (4.166)	1.922** (4.802)	0.275 (0.428)	1.103 (1.1414)	-1.075 (0.807)	2.720** (3.844)
<b>Energy and Utilities (INDENERGY)</b>		+/-	0.550 (1.374)	0.573 (0.411)	-6.972 (2.467)	0.396 (0.144)	0.149 (0.098)	0.505 (0.314)	1.455 (1.120)	-0.451 (0.156)
<b>Manufacturing and Industrial Process (INDIMAN)</b>			0.302 (0.297)	0.681 (0.503)	8.392* (2.835)	0.263 (0.049)	0.815 (2.021)	0.700 (0.523)	1.275 (0.794)	22.999 (0.000)
<b>Normative pressure</b>	H6a & H6b	+	-0.434 (0.558) 0.217 (0.038)	0.346 (0.054) -0.045 (0.000)	-2.599 (1.374) -52.866** (3.918)	-0.102 (0.010) 0.269 (0.013)	-0.885 (2.428) -0.566 (0.246)	-21.262 (0.000) -3.746 (1.470)	-0.493 (0.325) -0.719 (0.047)	-1.324 (1.378) -26.606 (0.999)
Observations			150	64	46	40	150	64	46	40
Pseudo R <sup>2</sup> (Nagelkerke R Square)			0.068	0.063	0.766	0.297	0.131	0.136	0.091	0.517

Notes: Logistic regression model is used in the study to examine the determinants of carbon financial accounting and carbon disclosure practice of ETS affected firms.

\*, \*\*, \*\*\* Significant at 0.10, 0.05 and 0.01 levels respectively. Wald Statistics are reported in parentheses. CACCP is the adoption of carbon financial accounting practice and CDISCP is the level of carbon disclosure. REG is Regulation, SIZE is Firm size, LEV is Leverage, LIST is Listing Status, INDENERGY is Energy and Utilities industry, INDIMAN is Manufacturing and Industrial Process industry and AUD is Auditors. Both CACCP and CDISCP were coded as 0 where the score for the adoption of carbon financial accounting practice as well as for the carbon disclosure, was lower for the ETS affected firms. Similarly, the CACCP and CDISCP were coded as 1 where the score for the adoption of carbon financial accounting practice as well as for the carbon disclosure, was higher for the ETS affected firms. All the recommended, withdrawn and mandatory carbon financial accounting and carbon disclosure related regulations were used as a proxy for REG. Natural logarithm of total assets were used as a proxy for SIZE. Debt Equity ratio was used as a proxy for LEV. Debt equity ratio was calculated as (total liabilities of firms in NZ \$ / total equity of firms in NZ \$). Firm's listing status was used as a proxy for LIST. Listed firms were coded as 1 and firms not listed or whose listing status was not specified, were coded as 0. Each of the industry sectors were coded as 1 if a firm was a member of that sector and as 0 if the firm did not belong to that sector. Big4 and NonBig4 Auditors were used as a proxy for AUD. Firms with Big4 as auditors were coded as 1 and with non-Big4 were coded as 0.

#### *7.5.4.4. Regression results discussion - Institutional theory perspective*

Prior studies in the financial accounting and carbon disclosure area indicate that firm characteristics and market features such as regulations, firm size, leverage and industry, are some of the main determinants of a firm's financial accounting and carbon disclosure practice (see Chapter 5 for further information). This study extends prior studies by taking an institutional theory perspective and asserts that to increase legitimacy and survival prospects, the three institutional pressures, namely coercive, mimetic and normative, drive the ETS affected firms' adoption of carbon financial accounting practice and their extent of carbon disclosure, in the absence of uniform and mandatory guidance. Using two additional variables (listing status and auditor), the study classifies the aforementioned variables for firm characteristics and market features used by prior studies, into each of the three institutional pressures. Regulation is classified as a coercive pressure, firm size, leverage, listing status and industry are classified as mimetic pressures, and finally, auditor is classified as a normative pressure.

The study does find some evidence of the institutional pressures influencing the ETS affected firms' carbon financial accounting and carbon disclosure practices. More specifically, the results of the study suggest that coercive and mimetic pressures are the main driving forces of the ETS affected firms' carbon financial accounting and carbon disclosure practices. Mimetic pressure seems to be the driving factor of the ETS affected firms' carbon financial accounting practices, whereas, consistent with the findings of prior studies in the carbon disclosure literature that used institutional theory (Rankin et al., 2011; Tang & Luo, 2011), carbon disclosure practices are being driven by both coercive and mimetic pressures i.e. regulation and firm size.

Coercive pressure as one of the institutional determinants of the carbon disclosure practice of the ETS affected firms, is evident in 'regulation' having a significant and positive relationship with the extent of carbon disclosure. This finding is also consistent with the majority of prior carbon disclosure studies that found a significant and positive relationship between regulation and the carbon disclosure (Freedman & Jaggi, 2005; Reid & Toffel, 2009; Brouhle & Harrington, 2010; Freedman & Jaggi, 2011; Kim & Lyon, 2011; Tang & Luo, 2011; Luo, Lan & Tang, 2012; Jira & Toffel, 2013; Luo, Tang & Lan, 2013; Stanny, 2013). Coercive pressure suggests that, in order to increase their legitimacy in the eyes of the public, the ETS firms are being coerced into having similar and homogeneous carbon disclosure practices and therefore the extent of carbon disclosure is greater for ETS firms with more stringent regulations and less for ETS firms with less stringent regulations.

Similarly, mimetic pressure, being another determinant of the carbon financial accounting and carbon disclosure practices of the ETS firms, is evident in firm size having a significant but negative association with both the adoption of carbon financial accounting practice and the extent of carbon disclosure of ETS affected firms. This is contrary to most prior studies in the financial accounting and carbon disclosure area that found a significant but positive association between firm size as well as financial accounting and carbon disclosure (Freedman & Jaggi, 2005; Liu & Anbumozhi, 2009; Prado-Lorenzo et al., 2009; Reid & Toffel, 2009; Berthelot & Robert, 2011; Freedman & Jaggi, 2011; Kim & Lyon, 2011; Rankin et al., 2011; Tang & Luo, 2011; Cotter & Najah, 2012; Luo et al., 2012; Bae Choi et al., 2013; Borghei-Ghomi & Leung, 2013; Ieng Chu et al., 2013; Luo et al., 2013; Stanny, 2013; Wegener et al., 2013; Eleftheriadis & Anagnostopoulou, 2014; Peng, Sun & Luo, 2015; Gonzalez-Gonzalez & Zamora Ramirez, 2016).

This indicates that while size is one of the significant determinants of ETS affected firms' carbon financial accounting and carbon disclosure practice, an increase in the size of the ETS firms lowers the adoption of those firms' carbon financial accounting practices and their extent of carbon disclosure, further indicating that the adoption of carbon financial accounting practice and the extent of carbon disclosure is higher for small size firms. This could be due to the fact that large size firms are likely to have more public visibility due to their emission levels and therefore may not be keen to financially account for carbon and provide carbon disclosure to avoid political, regulatory or social costs and therefore increase their survival prospects. This is also supported by Jensen and Meckling (1976) and Alsaeed (2006), who argue that large size firms might have an incentive to withhold value relevant information (in this case, financial and non-financial information related to carbon emission allowances), to avoid political costs in terms of further tight regulations and increasing social obligations (i.e. expectations to reduce emission levels). Small size firms, on the other hand, might benefit from financially accounting for carbon and providing more carbon related disclosure as it may give them increased transparency in the eyes of their stakeholders and therefore give them a competitive advantage and better survival prospects. Thus, from an institutional theory perspective, the large size ETS firms are mimicking other large size ETS firms' carbon financial accounting and carbon disclosure practices, and therefore their adoption of carbon financial accounting practice and their extent of carbon disclosure is low, to avoid political costs and increase their survival prospects. Similarly, the small size ETS firms are choosing to model themselves after other small size ETS firms and therefore their adoption of carbon financial accounting practice and their extent of carbon disclosure is higher.

The study did not find any evidence of the normative institutional pressure (auditor) being a determinant of the carbon financial accounting or carbon disclosure practice. An insignificant negative association

was found between auditors and the adoption of carbon financial accounting practice as well as the extent of carbon disclosure. It could be due to the auditor's role being restricted to the boundaries of mandatory information, as a result of which the auditors in general do not require their clients to financially account for or report data in excess of the (carbon financial) accounting (or carbon disclosure) standard requirements (Alsaeed, 2006).

Thus, the results for the overall firms are consistent with institutional theory in that coercive and mimetic pressures appear to drive the ETS affected firms' carbon financial accounting and carbon disclosure practices. The results for the overall firms are also consistent with prior studies in financial accounting and carbon disclosure and indicate that regulation and firm size drive carbon financial accounting and carbon disclosure practice, whereas the rest of the factors like leverage, listing status, industry and auditors, do not appear to be significant determinants.

At the country level, there appears to be some evidence of institutional pressures being the determinants of the UK, Australian and NZ firms' carbon financial accounting and carbon disclosure practices. Coercive (Regulation) and mimetic (Leverage and Listing status) pressures were found to be positively associated with the adoption of carbon financial accounting practice for Australian firms, whereas Firm size was found to be negatively associated. This implies that the adoption of carbon financial accounting practice is higher for firms that are governed by stringent regulations, high leverage firms, and firms that are listed on the stock exchange. Additionally, the results also imply that the adoption of carbon financial accounting practice for Australian firms lowers with an increase in firm size. Listing status was found to have a positive association with NZ firms' adoption of carbon financial accounting practice and their extent of carbon disclosure. This implies that the adoption of carbon financial accounting practice and the extent of carbon disclosure for NZ firms is higher if the firms are listed on a stock exchange. Listed companies have public accountability as 'listing status' places them in the spotlight. As such, the firms with listing status mimic the carbon financial accounting and carbon disclosure practices of similar listed firms to increase their legitimacy and survival prospects. Surprisingly, the findings do not appear to provide evidence of the institutional pressures associated with UK firms' carbon financial accounting and carbon disclosure practices. This could imply that the variables selected as proxies for the UK institutional pressures, might not be capturing the level of coercive, mimetic and normative institutional pressures fully, or maybe that the adoption of carbon financial accounting practices and the extent of carbon disclosure are not considered essential by the firms due to the absence of uniform carbon financial accounting guidance.

#### *7.5.4.5. Robustness tests*

The robustness of results was obtained by transforming some of the independent variables used in the study. The logistic model was rerun using different measures for size, leverage and industry as prior research proxied these variables with different measures. Before using logarithm of total assets in the study, the 'total assets (NZD)' was used as a measure for size. The results (not tabulated) showed a minor change in that the size became positively associated but insignificant. Likewise, as a proxy for Leverage, liabilities to assets ratio was used instead of debt to equity ratio, as some prior studies used the liabilities to assets ratio (Brammer & Pavelin, 2008; Clarkson et al., 2008; Stanny & Ely, 2008). The result (not tabulated) on using this measure, was slightly different in that it became negatively associated but was insignificant. Additionally, the industry variable was also tested for robustness. The industry classification for the main model was done using the database (i.e. carbonmarketdata (for UK firms), NZ emission unit registry (for NZ firms)) from which the sample firms were selected. Australian firms were initially classified into their respective industry using the SIC classification. These firms were then classified into 13 industries, but these were further grouped and reclassified into a total of three dummy industry variables (i.e. Energy and Utilities, Manufacturing and Industrial as well as Primary) that were finally used in the main model. They were coded as 0 or 1 depending on whether the firms belonged to these industries. However, as per Chitambo and Tauringana (2014) as well as Cho, Freedman and Patten (2012), variations in industry classifications can affect the outcome and therefore careful scrutiny as to how industry variables are included in the model, becomes essential. As such, the firms were further reclassified into a single dummy industry variable and coded from 1 to 3, (i.e. 1 if the firm belonged to 'Energy/Utilities industry sector', 2 if the firm belonged to 'Manufacturing and Industrial sector', and 3 if the firm belonged to 'Primary industry/sector'). The results from the rerun of the main model using this measure of industry indicated a minor change to the results (not tabulated) in that the industry dummy was negative but significant for the CACCP, but insignificant for the CDISCP. 'Emission level' data was accessible for Australian firms although not for UK and NZ firms, and was added as another independent variable to the logistic regression models used for Australian firms. However, the results were insignificant (not tabulated).

#### **7.6. Chapter Summary**

In summary, most ETS affected firms did not provide information on their carbon financial accounting practice, and where they did, inconsistencies were observed in the recognition and measurement aspect of the carbon financial accounting practice. One of the reasons why the carbon financial

accounting practice information was unavailable for most firms could be the lack of uniform carbon financial accounting guidance. In the absence of guidance, these firms may not have been clear on the carbon financial accounting approach they should follow and therefore preferred not to financially account for carbon in order to avoid any measurement mismatch - an issue that also led to the withdrawal of the IFRIC 3 standard (discussed in Chapter 3). A second reason could be that most of these firms might not have received any free carbon emission allowances from the government, had made no additional purchases of carbon emission allowances, or had no excess allowance to sell or inventorise, as a result of which they had nothing to report in these areas. Immateriality of the amount spent or received due to the carbon emission allowances could be another reason why these ETS firms did not provide any information on their carbon financial accounting practice. Nevertheless, the overall findings on carbon financial accounting practices suggest that there are likely to be issues with comparability of these firms' financial statements. Additionally, these findings also show inconsistencies between the carbon financial accounting practices of the ETS affected firms and between the recommended carbon financial accounting practices stated in the prominent proposals that were summarised in the IFRIC 3 template (Table 3-1) in Chapter 3. As a result, these findings help provide empirical evidence on the inconsistencies in the ETS affected firms' carbon financial accounting practices, thus supporting the findings of prior studies (Warwick & Ng; 2012; Black, 2013) which were discussed in Chapter 3. Additionally, the findings also support the demand for uniform carbon financial accounting guidance (Elfrink & Ellison; 2009).

Lack of transparency in carbon disclosure also implies that the ETS affected firms may not be meeting the information needs of their stakeholders. A possible explanation could be that these firms are using some other communication source (instead of or apart from the annual report) to provide carbon disclosures and this may be resulting in a low carbon disclosure score for these firms. Nevertheless, with the annual report being an important source of communication between the firms and the stakeholders (Alsaeed, 2006; Song et al., 2015), the low carbon disclosure score is quite surprising. This also indicates a strong need for regulation requiring all the ETS affected firms to provide their carbon related disclosure in a specific communication document (i.e. annual report) in a consistent and transparent manner, so as to increase transparency and help stakeholders make informed decisions. The findings further indicate that the Carbon emission accountability (ACC) and the Energy consumption accounting (EC) carbon disclosure categories in the CDP index, are the main areas in which little or no disclosure is made by the ETS firms. This also highlights the areas of carbon disclosure in which the information needs of stakeholders are not being met, given that the carbon disclosure practices of the ETS firms were assessed against the CDP checklist that lists the

stakeholders' expectations for carbon disclosure information. Nevertheless, an overall diversity in the carbon disclosure practices of the ETS affected firms is reported in these findings, suggesting that uniform mandatory disclosure guidance should be introduced to ensure uniformity and consistency in these practices for stakeholders and investors.

Finally, with respect to the determinants of carbon financial accounting practices and the extent of carbon disclosure, the results for the overall firms indicate that coercive (regulation) and mimetic (firm size) pressures definitely drive carbon financial accounting and carbon disclosure practice. While regulation has a positive association with the extent of carbon disclosure, firm size is negatively associated with both the adoption of carbon financial accounting practice and the extent of carbon disclosure. This implies that the extent of carbon disclosure is greater for firms with more stringent regulation and less for large size firms. Additionally, it also implies that the adoption of carbon financial accounting practice is lower for large size firms. On disaggregation of the overall firms into UK, Australian and NZ firms and performing logistic regression again, the results suggest that the determinants that drive the carbon financial accounting practice and the extent of carbon disclosure of the Australian and NZ firms are different from the determinants that drive these practices for overall firms. Additionally, the results do not appear to provide evidence of the institutional pressures associated with the UK firms' adoption of carbon financial accounting practices and the extent of their carbon disclosure, thus implying that the variables selected as proxies for the UK institutional pressures might not be fully capturing the level of coercive, mimetic and normative institutional pressures. Further, it may be that the adoption of carbon financial accounting practice and the extent of carbon disclosure are not considered as essential by the firms due to the absence of uniform carbon financial accounting guidance. Future research could examine if other proxies of institutional pressures determine UK firms' carbon financial accounting and carbon disclosure practices.

The study's findings add to the current literature by using institutional theory and provide some evidence to explain the adoption of carbon financial accounting practice and the extent of carbon disclosure of firms affected under ETSS, in the absence of uniform carbon financial accounting guidance. Additionally, the study also adds to the carbon financial accounting literature by being one of the first to investigate the adoption of carbon financial accounting practices of ETS affected firms in the UK, Australia and NZ, and the factors that are driving those practices. Finally, the study also adds to the carbon literature by examining both the carbon financial accounting and carbon disclosure practices of ETS affected firms.

## Chapter 8: Summary, Future Research and Conclusion

### 8.1. Summary and contribution of research

This study investigated the carbon financial accounting and carbon disclosure practices of ETS affected firms in the absence of uniform carbon financial accounting and reporting guidance. The study also investigated whether institutional pressures such as coercive pressure, mimetic pressure and normative pressure, play a role in determining ETS affected firms' carbon financial accounting and carbon disclosure practices. More specifically, the study investigated whether firm characteristics and market features (such as regulation (coercive pressure), size, leverage, listing status and industry (mimetic pressure) and auditors (normative pressure)) drive the carbon financial accounting and carbon disclosure practices of ETS affected firms.

A total of 150 annual reports (for the year 2013) of UK (64 firms), Australian (46 firms) and New Zealand (40 firms) companies affected under the EU ETS, Australian Carbon Tax and New Zealand ETS were used. The affected companies were selected from Carbonmarketdata Database (for UK companies), Liable Entities Public Information Database (LEPID) (for Australian companies) and New Zealand Emission Unit Registry Database (NZ EUR) (for New Zealand companies). Content analysis was implemented for the purpose of data collection from the annual reports. The IFRIC 3 template was used to identify the recognition, measurement and reporting practices of the affected companies for carbon emission allowances by six stages of the carbon emission allowances transactions, namely when these carbon emission allowances are (1) received for free, (2) used, (3) purchased, (4) surrendered, (5) inventoried, and (6) sold. To record the manner in which carbon accounting disclosures are made, a disclosure content analysis template adapted from a recent study undertaken in the carbon disclosure area (Bae Choi et al., 2013) was used. Since studies in carbon accounting are few, prior studies on carbon disclosure were also relied upon. To examine the determinants of the carbon financial accounting and carbon disclosure practices of the ETS affected firms, the data was analysed using logistic regression analysis to derive appropriate results.

The findings of this study will assist accounting policy makers in understanding *how* and *why* ETS affected firms are financially accounting for and disclosing their carbon emission allowances. An understanding of both '*how*' and '*why*' is essential as it can help accounting policy makers in developing uniform carbon financial accounting and disclosure guidance, especially when the IASB is yet to issue any draft guidance on the financial accounting of carbon and given that most carbon disclosure is still

voluntary. Furthermore, given that carbon emission allowances are now a product with a cost attached, they are likely to be major transactional items for all the ETS affected firms and as such, are likely to be financially material. Thus, it is essential that both the accountancy profession and policy makers like the IASB issue detailed carbon disclosure and carbon financial accounting guidance, which will assist the firms to provide carbon related disclosure in a transparent and consistent manner. In addition, professional guidance can assist in financially accounting for carbon emission allowances consistently and uniformly by correctly recognising and measuring carbon, especially when carbon emission allowances are: received for free from the government; used (or emitted); purchased from a third party; surrendered; inventorised; sold; and, traded. This will also help ensure consistency and comparability of financial and non-financial information pertaining to carbon emission allowances. Additionally, the findings presented in this study will be useful for establishing guidelines for auditors to help affected companies financially account for and disclose carbon allowances and other carbon emission related information. Given the scant amount of studies in the field of carbon financial accounting under ETS, this research will also give meaningful insights to academics and researchers.

Another contribution of the study is that it summarises and presents all the carbon financial accounting and carbon disclosure practices (using carbon disclosure checklist template) of the firms affected under the EU ETS, Australian Carbon Tax and NZ ETS. The summaries of these practices are presented in comprehensive tables, and these are likely to be particularly useful to the education sector once the financial accounting and disclosure of carbon is incorporated into the accounting curriculum.

## 8.2. Summary of the main results

With respect to the first research question, although 150 firms were selected for the study, carbon financial accounting practice information was unavailable for most firms and not all of these firms elaborated on their carbon financial accounting practices. In some cases (i.e. the unidentified stage of carbon emission allowances), it also appears that firms are acquiring carbon emission allowances with the intention of 'trading' them on an active market, and are therefore also financially accounting for them quite apart from the six stages mentioned earlier. Additionally, the carbon financial accounting policies appear to be incomplete in the sense that some firms did not specify how they are 'recognising' carbon emission allowances and in some cases, how they are 'measuring' carbon emission allowances. A summary of the preferred carbon financial accounting practices by most ETS affected firms for each stage of carbon emission allowances is presented in Table 8-1. In comparison with the IFRIC 3 template (developed in Chapter 3), variations in the carbon financial accounting practices (both

recognition and measurement) were observed, and in some cases similarities in the carbon financial accounting practices were observed between firms of different countries. This implies that there could be issues with comparability of the financial statements between the ETS affected firms due to inconsistencies in their carbon financial accounting practices, and this further emphasises the need for uniform carbon financial accounting guidance.

Apart from indicating a lack of transparency, the findings for the second research question reveal diversity in carbon disclosure practices. With the annual report being an important source of communication between the firms and the stakeholders (Alsaeed, 2006; Song et al., 2015), the low carbon disclosure score provides evidence of a strong need for mandatory regulation requiring all ETS affected firms to provide their carbon related disclosure in a specific communication document, and in a consistent and transparent manner so as to help stakeholders make informed decisions.

Finally, with respect to the third research question, i.e. the determinants of the carbon financial accounting and carbon disclosure practice, the results are mostly consistent with prior studies in carbon disclosure and find an association between coercive and mimetic institutional pressures and the ETS firms' adoption of (carbon) financial accounting practices and their extent of carbon disclosure. These results provide evidence that institutional coercive and mimetic pressures, in particular the pressure to increase legitimacy and survival prospects, drive the ETS affected firms' carbon financial accounting and carbon disclosure practices.

### **8.3. Research limitations**

One of the limitations encountered in this study is the lack of accessibility to emission levels data for UK and NZ firms, as a result of which emission levels data could not be tested as one of the independent variables (mimetic institutional pressure) affecting the carbon financial accounting and carbon disclosure practices of these firms. The emission levels data for Australian firms could, however, be accessed and some observations based on general analysis were presented in the findings (robustness test). Another limitation of the study was the lack of accessibility to the firms' carbon certification status data, which could also not be tested as an independent variable (mimetic institutional pressure) affecting the carbon financial accounting and carbon disclosure practices of the firms. The inclusion of emission level data and carbon accreditation data for all the ETS firms would have made the results more robust. An additional limitation of this study is that it examines only UK, Australian and NZ firms that are affected under ETS and covers only one year's annual reports. The results therefore

can be generalised with caution. The study is further limited in that the list of the UK firms affected under the EU ETS is from the year 2010, as the updated list for the year 2013 was inaccessible. As a result, there is a possibility that a few UK firms that were added to Carbonmarketdata in 2013, might not have been covered in the sample.

Additionally, both the identification of the accounting practice and stage of carbon emission allowances (i.e. when received for free, when purchased etc), for which the firms are providing information, were drawn from inferences made on the disclosure of that information in annual reports, rather than a single concise statement. Due to a lack of clear and specific information, it was not possible to draw inferences regarding the stage of carbon emission allowances for which the disclosure was made for some carbon financial accounting practices, and therefore the data on these practices could not be included in the main results. Instead, the data was presented in a separate table under the heading 'unidentified stage'. Similarly, the identification of carbon disclosure practice was also based on the inferences made on the disclosure of the information in the annual reports. Also, all the data on the carbon financial and disclosure practices has been derived from only one source document: the firms' annual reports. Thus, there is also a possibility that not all data pertaining to the carbon financial accounting and carbon disclosure practices might have been captured for the study. Nevertheless, the study still provides some initial evidence, especially on carbon financial accounting practices and the determinants of those practices. This will be of use to standard setters, accounting policy makers and firms that are currently affected under ETSs and seeking guidance on carbon financial accounting and disclosure practice.

#### 8.4. Future research suggestions

As future research, the study could be replicated with other ETS affected firms, for example, China and other EU ETS affected firms. This could extend the current study to include a larger sample of ETS affected firms from other countries. With China being one of the highest emitters in the world, it would be interesting to examine if any inconsistencies and lack of transparency can be observed in its carbon financial accounting and carbon disclosure practices. It would also be interesting to do further research on the carbon disclosure practices of firms, as observed from different sources of communication such as sustainability reports or firm websites, etc., and to further examine if the carbon disclosure practice levels of the ETS affected firms are different. If the carbon disclosure levels are indeed different, then it would be beneficial to explore the factors influencing the firms' choice to make more carbon disclosures in that particular source (i.e. sustainability reports, websites, carbon disclosure projects, etc). Finally,

future research could also examine if other proxies of institutional pressures, such as emission levels, carbon certification, profitability, previous disclosures, etc, determine firms' carbon financial accounting practice and extent of carbon disclosure.

## 8.5. Conclusion

Firms affected by ETSs are increasingly engaging in carbon financial accounting and carbon disclosure practices (Haque & Deegan, 2010; Warwick & Ng, 2012), given that ETSs are now important mechanisms for reducing emissions. The ETSs have implications for financial accounting, such as whether emission allowances are assets, how should they be valued and classified, how they affect the profit and loss statement, and how and when liabilities pertaining to emission allowances are recognised (Elfrink & Ellison, 2009). Furthermore, the accounting implications may be material in nature and financial amount, and therefore research on the way in which the firms affected under ETSs are financially accounting for the impact of pricing carbon, can help provide useful information to accountants, auditors, accounting standard setters, investors, financial report preparers, researchers, government, regulators and other stakeholders (Warwick & Ng, 2012). Additionally, accounting firms and professional accounting bodies have voiced concerns that various stakeholders require information about climate change, more specifically, the disclosure of information pertaining to GHG emissions and governance policies adopted for reducing the emission levels to desired targets, as well as any regulatory, financial or physical risks associated with climate change (and ETSs). The Carbon Disclosure Project (CDP) (KPMG, 2008; Haque & Deegan, 2010) is an example of a response to stakeholder demands.

The study therefore investigated the carbon financial accounting and carbon disclosure practices of ETS affected firms in the absence of uniform carbon financial accounting and reporting guidance. On the basis of the sample of 150 firms from the UK, Australia and New Zealand, the overall findings suggest that there is a lack of uniformity, consistency and transparency in the carbon financial accounting and carbon disclosure practices of most ETS affected firms, which leads to difficulties for stakeholders and investors in the comparability of financial statements and other carbon related information.

This might be caused by the absence of a uniform accounting standard that could guide the ETS affected firms on how they could financially account for carbon emission allowances. Furthermore, in the absence of uniform carbon financial accounting guidance, the ETS affected firms are adopting IAS

8 which allows them to have their own carbon financial accounting practice. Additionally, whilst there are a few mandatory carbon disclosure requirements like the NGER Act 2007 that guide the ETS affected firms on the disclosure of carbon related information, they are very limited in their scope as they require disclosure only on specific carbon related items, such as a firm's scope 1 and scope 2 emissions (in tonnes). These mandatory carbon disclosure requirements are further limited in the sense that they are different for every country; some countries (i.e. Australia) are required to disclose more information on carbon, other countries (i.e. NZ) have fewer requirements. There is currently no internationally accepted carbon reporting standard for ETS affected firms (Luo et al., 2012).

In the absence of guidance for both uniform carbon financial accounting and carbon disclosure, there have been several prominent voluntary proposals and recommendations on how a firm could financially account for and provide disclosure on carbon emission allowances. However, these proposals were either withdrawn (i.e. IFRIC 3), did not provide recommendations on how to financially account for *all* stages (or lifecycle) associated with carbon emission allowances, or did not include disclosure of the carbon financial accounting practice in their recommendations. Due to lack of guidance, the ETS affected firms are likely to have inconsistent carbon financial accounting and carbon disclosure practices leading to difficulties for investors and stakeholders in the comparability of their financial statements. The findings of the study also support this argument and indicate inconsistencies and variations in the carbon financial accounting and carbon disclosure practices of the ETS affected firms, and strongly emphasise the need for uniform carbon financial accounting and carbon disclosure guidance. The study thus adds to the carbon financial accounting and carbon disclosure literature by providing empirical evidence on the inconsistencies in carbon financial accounting practices and a lack of transparency in the carbon disclosure practices of ETS affected firms.

In addition to the knowledge of how the affected companies are financially accounting for and disclosing information on carbon emission allowances, it is also necessary to know why the affected companies are financially accounting for carbon or disclosing carbon related information, or what institutional pressures (i.e. coercive pressures, mimetic pressures and normative pressures) could be driving the ETS affected firms' carbon financial accounting and disclosure practices in the absence of uniform guidance. This is because an understanding of how the ETS affected firms interpret and respond to the three institutional pressures is essential to establishing a regulatory and cultural framework for a low carbon environment (Luo et al., 2012). Since there have also been discussions of enhancing climate change related corporate disclosures and accounting practices (Eleftheriadis & Anagnostopoulou, 2014), a contribution can be made to this discussion by outlining the firm

characteristics and market features that are most likely to have a positive effect on carbon financial accounting and disclosure practices.

The findings of the study provide evidence of institutional pressures acting as determinants of the carbon financial accounting practice and carbon disclosure level of the ETS affected firms. Table 8-1 provides a summary of the overall findings on the determinants of the carbon financial accounting practices and the extent of carbon disclosure of the ETS affected firms. The results for the overall firms indicate that coercive (i.e. regulation) and mimetic pressures (i.e. firm size) are influencing their adoption of carbon financial accounting practices and the extent of their carbon disclosure, in an attempt to increase legitimacy and survival prospects. Whilst regulation has a positive association with the extent of carbon disclosure, size on the other hand, is negatively associated with both the adoption of carbon financial accounting practice and the extent of carbon disclosure. This suggests that the extent of carbon disclosure will be greater for the ETS affected firms with more stringent regulations and for those that are smaller in size. This is because, the greater the regulation, the more the firms are likely to be under public scrutiny and they will therefore provide more carbon related disclosures due to the coercive pressure related to legitimacy of the firm. Similarly, with respect to mimetic pressures, the small size firms are keener to financially account for carbon and provide more carbon disclosure as compared to large size firms because financially accounting for carbon and providing carbon disclosure will give them increased transparency in the eyes of the stakeholders and further provide them with a competitive advantage. Large size firms on the other hand, may not want to financially account for carbon and might be withholding valuable carbon related information as they have an incentive to increase their survival prospects and avoid further political costs in the form of more regulation. They may also be endeavouring to avoid social obligations (i.e. expectations to further reduce their emission levels etc). Both the small and large size firms therefore chose to model (or mimic) their carbon financial accounting and carbon disclosure practices on those of similar sized ETS firms.

The results of further cross country comparison of the Australian and NZ firms suggest that the determinants that drive the carbon financial accounting and disclosure practices of the Australian and NZ firms are different from the determinants that drive these practices for overall firms. The results of a cross country comparison suggest that institutional pressures do determine carbon financial accounting practice and the extent of carbon disclosure for Australian and NZ firms. However, the results do not appear to provide evidence of the institutional pressures associated with UK firms' carbon financial accounting practice and the extent of their carbon disclosure, thus implying that the variables selected as proxies for the UK institutional pressures might not be fully capturing the level of coercive, mimetic and normative institutional pressures. It is also possible that the adoption of carbon financial accounting

practice and the extent of carbon disclosure are not considered as essential by these firms due to the absence of uniform carbon financial accounting guidance.

## 8.6. Recommendations

As discussed earlier, uniformity in carbon financial accounting and carbon disclosure practices is essential as it will lead to consistency and it will therefore be easier for stakeholders and investors to compare financial statements. In the absence of a uniform carbon financial accounting standard and to ensure comparability of the ETS affected firms' financial statements, the study proposes the use of the practices preferred by 'all firms', as presented in Table 8-2, as the best indicator for carbon financial accounting guidance. These practices are also more comprehensive and detailed as both the recognition and measurement aspects of carbon financial accounting are covered and the practices have been presented for most stages in the lifecycle of carbon emission allowances (i.e. when carbon emission allowances are received for free, when they are used/emitted, when they are purchased, when they are surrendered, when they are inventoried, and when they are sold). The study proposes the use of the updated carbon disclosure index that lists 22 items, including not only non-financial but also financial related carbon disclosures, as the best practice indicator. Finally, the study also recommends that in their strategy to improve the uniformity and comparability of both the carbon financial accounting and carbon disclosure practices of the ETS affected firms, policy makers should also consider the institutional pressures that were found to be determinants of the ETS affected firms' adoption of carbon financial accounting practices and carbon disclosure levels (i.e. regulation, firm size and listing status).

Table 8-1: Summary of the results

Results: Determinants of carbon financial accounting and carbon disclosure practices of ETS affected firms											
PANEL A						PANEL B					
Institutional Pressures	Variables and Expected Sign	MODEL 1: Adoption of Carbon Financial Accounting Practices			MODEL 2: Extent of Carbon Disclosure			All firms	UK	Australia	NZ
		All firms	UK	Australia	NZ	All firms	UK				
Coercive Pressures	Regulation	+	No (correct sign)	No (correct sign)	Yes** (correct sign)	No (correct sign)	Yes*** (correct sign)	No (correct sign)	No (wrong sign)	No (wrong sign)	No (wrong sign)
	Firm Size	+	No* (wrong sign)	No (correct sign)	No** (wrong sign)	No (correct sign)	No* (wrong sign)	No (correct sign)	No (correct sign)	No (correct sign)	No (correct sign)
Mimetic Pressures	Leverage	+	No (correct sign)	No (correct sign)	Yes* (correct sign)	No (correct sign)	No (correct sign)	No (correct sign)	No (correct sign)	No (correct sign)	No (correct sign)
	Listing Status	+	No (correct sign)	No (wrong sign)	Yes** (correct sign)	Yes** (correct sign)	No (correct sign)	No (correct sign)	No (wrong sign)	No (wrong sign)	Yes** (correct sign)
Normative Pressures	Industry	+/-	No (correct sign)	No (correct sign)	Yes (correct sign)	No (correct sign)	No (correct sign)	No (correct sign)	No (correct sign)	No (correct sign)	No (correct sign)
	Auditors	+	No (correct sign)	No (correct sign)	No (correct sign)	No (wrong sign)	No (wrong sign)	No (wrong sign)	No (wrong sign)	No (wrong sign)	No (wrong sign)

Note:

Yes = Confirmation of hypothesis. No = Rejection of hypothesis.

\*, \*\*, \*\*\*Significant at 0.10, 0.05 and 0.01 levels respectively. The associations between adoption of carbon financial accounting practices and institutional pressures related firm characteristics (H1a to H6a) was more frequent for Australian firms than for UK and NZ firms. The associations between carbon disclosure practices and institutional pressures related firm characteristics (H1b to H6b) was more frequent for New Zealand firms than for UK and Australian firms. The test power of Model 2 (Pseudo R<sup>2</sup> = 0.131) is higher than that of Model 1 (Pseudo R<sup>2</sup> = 0.068) suggesting that institutional pressures have an extra effect on the ETS affected firms' extent of carbon disclosure than their adoption of carbon financial accounting practices.

Table 8-2: Summary of the results

Summary of most preferred Carbon Financial Accounting practices by ETS affected firms

Stages of Carbon Emission allowances		Most preferred Carbon Financial Accounting practices: UK, Australia and New Zealand			
		All firms	UK	Australia	New Zealand
<b>Carbon Emission Allowances: When received for free for the government:</b>					
<i>Recognition</i>	Emission rights received from governments free of charge are initially recognised as intangible assets	Emission rights received from governments free of charge are initially recognised as intangible assets	Received allowances are recognised in the balance sheet as intangible assets. The difference between fair value and the nominal amount paid for the rights is recognised in the balance as a government grant (deferred income)	Emission rights received from governments free of charge are initially recognised as intangible assets	
<i>Measurement</i>	At nil (zero) value or cost	At nil (zero) value or cost	At nil (zero) value or cost	At market value	
<b>Carbon Emission Allowances: When emitted and used:</b>					
<i>Recognition</i>	To the extent that it is expected that the number of allowances needed to settle the carbon emissions exceeds the number of emission allowances owned, a provision is recognised.	To the extent that it is expected that the number of allowances needed to settle the carbon emissions exceeds the number of emission allowances owned, a provision is recognised.	(1) The emissions realised are expensed under other operating costs and expenses in the income statement and presented as a provision in the balance sheet <b>OR</b> (2) To the extent that it is expected that the number of allowances needed to settle the carbon emissions exceeds the number of emission allowances owned, a provision is recognised.	Nil	
<i>Measurement</i>	(1) At the estimated amount of expenditure required to settle the obligation <b>OR</b> (2) At cost of purchase, up to the level of allowances held, the liability is measured at cost of purchase. When the liability exceeds the allowances held, the net liability is measured at market value selling price <b>OR</b> (3) At fair value at the end of reporting period <b>OR</b> (4) At the carrying amount of emission rights held	At the carrying amount of emission rights held	At the estimated amount of expenditure required to settle the obligation	Nil	
<b>Carbon Emission Allowances: When purchased from third party or from government:</b>					

<i>Recognition</i>	Emission rights held under national and international emission-rights systems for the settlement of obligations are reported as intangible assets.	Emission rights held under national and international emission-rights systems for the settlement of obligations are reported as intangible assets.	Emission rights held under national and international emission-rights systems for the settlement of obligations are reported as intangible assets.	Emission rights held under national and international emission-rights systems for the settlement of obligations are reported as intangible assets.
<i>Measurement</i>	Initially at cost	Initially at cost	Initially at cost	Initially at cost
<b>Carbon Emission Allowances: When surrendered to government at year end:</b>				
<i>Recognition</i>	Emission units are automatically surrendered to the Regulator as a remission of liability under the scheme and are recognised as a reduction of the provision for carbon emissions.	Emission units are automatically surrendered to the Regulator as a remission of liability under the scheme and are recognised as a reduction of the provision for carbon emissions.	Carbon Units on hand are classified as financial assets. When Carbon Units are surrendered to the Government, the asset along with the corresponding emissions liability is derecognised from the balance sheet	Nil
<i>Measurement</i>	(1) At book value of the carbon allowances <b>OR</b> (2) At market value of the allowances required to meet obligations at year end <b>OR</b> (3) At weighted average cost of carbon credit units	(1) At book value of the carbon allowances <b>OR</b> (2) At market value of the allowances required to meet obligations at year end	Nil	Nil
<b>Carbon Emission Allowances: When inventoried for future use:</b>				
<i>Recognition</i>	Unused and acquired carbon emission quotas held at the Balance Sheet date are recognised as intangible assets	Unused and acquired carbon emission quotas held at the Balance Sheet date are recognised as intangible assets	Nil	Nil
<i>Measurement</i>	At open market value, with any gain/loss recorded in income statement	At open market value, with any gain/loss recorded in income statement	Nil	Nil
<b>Carbon Emission Allowances: When sold to third party:</b>				
<i>Recognition</i>	Income is recognised based on the sale of production output (carbon units) from the relevant facility	Income is recognised based on the sale of production output (carbon units) from the relevant facility	Income is recognised based on the sale of production output (carbon units) from the relevant facility	If the number of allowances received exceeds actual consumption, the surplus is sold in the market. The gain/loss from the sale is presented as Other gains and losses
<i>Measurement</i>	(1) At transaction price <b>OR</b> (2) At weighted average cost	(1) At transaction price <b>OR</b> (2) At weighted average cost	Nil	Nil

## APPENDICES

Appendix A: Literature review – Summary of studies on determinants of voluntary financial accounting and carbon disclosure practices:

Literature Review – Studies on determinants of voluntary financial accounting and carbon disclosure practices						
Financial accounting studies	Year	Purpose	Target Firms	Theoretical Perspective	Method	Findings
1 Rahman, Perera & Ganesh	2002	to analyse the factors that are associated with accounting practice harmony	Australian and NZ firms	Positive accounting theory	Data collected by perusing the 1993 Annual reports of the top 100 firms according to market capitalization of Australia and NZ. Data collected in an instrument from prior study. Jaccard coefficient used	Accounting practice harmony is associated with both accounting regulation harmony and firm characteristics
2 Astami & Tower	2006	to provide evidence using costly contracting theory on the cross sectional relationship between firm specific variables and management's choice of accounting policies by examining four key accounting policy disclosures	2000-2001 Annual reports of 442 listed companies in Asia Pacific Region (Australia, Hong Kong, Indonesia, Singapore and Malaysia)	Costly contracting theory	Data extracted from 2000/2001 Annual reports. Multiple Regression analysis used	Firms that pursue income increasing accounting techniques are characterized by lower financial leverage, lower level of ownership concentration and higher investment opportunity
3 Waweru, Prot Ntui & Mangena	2011	to examine the factors that determine the choice of multiple accounting methods in Tanzania	Panel data covering 60 years from 15 firms listed on the Dar es Salaam Stock Exchange	Positive accounting theory	Data extracted from annual reports, possible determinants of the choice of accounting methods were identified based on positive accounting theory. Multiple regression analysis used.	Size, internal financing, proportion of non-executive directors and labour force are significant factors
Carbon disclosure studies						
1 Freedman & Jaggi	2005	to evaluate disclosures on pollution and greenhouse gases by firms domiciled in countries that have ratified Kyoto Protocol compared to others	120 of the largest (in terms of revenue) public firms from the chemical, oil and gas, energy, and motor vehicles and casualty insurance industries	Stakeholder theory, Legitimacy theory and Cost benefit theory	Evaluation was based on disclosures made in Annual Reports, Environmental reports and Websites	Firms from countries that ratified the Kyoto Protocol have higher disclosures from firms in other countries. Larger firms disclose more information.

Appendix A: Literature review – Summary of studies on determinants of voluntary financial accounting and carbon disclosure practices (Cont'd):

Carbon disclosure studies	Year	Purpose	Target Firms	Theoretical Perspective	Method	Findings
2 Stanny & Ely	2008	to examine factors associated with the US S&P 500 firms' decision to disclose information about the current and projected effects of climate change to institutional investors	S&P 500 firms that were sent to the CDP5 questionnaire	Legitimacy theory and Cost benefit theory	Size, FT500 membership, previous CDP disclosures, foreign sales, institutional ownership, industry, asset age, capital expenditures, leverage, Tobin's Q and profitability were the variables considered. Binary logit regression used.	Size, FT500 membership, previous disclosures and foreign sales are related to whether firms disclose information about climate change requested by institutional investors through CDP.
3 Prado-Lorenzo, Rodriguez-Dominguez, Gallego-Alvarez & Garcia-Sanchez	2009	to analyse different factors behind the disclosures of corporate information on issues related to greenhouse gas emission and climate change world wide	Firms from different countries worldwide (the USA, Australia, Canada and the European Union), and sought to represent both countries that have not ratified, approved, adhered to or accepted the Kyoto Protocol, and countries that have, from Fortune 500	Legitimacy theory , Cost benefit theory and Stakeholder theory	Empirical Analysis performed in two stages i.e. through analysis of the data obtained through content analysis and analysis of factors that influence the disclosures of greenhouse gas emissions and climate change using a dependency model, a multiple regression model	Size, market capitalization have positive association with disclosure. ROE has negative association.
4 Liu & Anbumozhi	2009	to understand the environmental disclosure mechanism from a corporate perspective, the paper identifies the determinant factors affecting the disclosure level of corporate environmental information	Chinese listed firms	Stakeholder theory	Ordinary least squares regression was performed on the government power (environmental sensitivity) and size, age, place, learning capacity and ROE variables are tested	Firms with environmental sensitivity and size are the major significant factors influencing the environmental information disclosure. Economic performance (ROE) not significant.
5 Peters & Romi	2009	to investigate whether cross country differences influence the level of environmental disclosure	CDP disclosure firms from 63 different countries	Stakeholder theory and Legitimacy theory	Firm responses to CDP questionnaire from 2002-2006 were examined. Logistic regression used.	Level of disclosure is related to environmental regulatory stringency, environmental responsiveness of private sector, and market structure of each country.

Appendix A: Literature review – Summary of studies on determinants of voluntary financial accounting and carbon disclosure practices (Cont'd):

Carbon disclosure studies	Year	Purpose	Target Firms	Theoretical Perspective	Method	Findings
6 Reid & Toffel	2009	to deepen understanding of the relationship between social movements and firms by exploring how private and public politics associated with the climate change movement influence firms' greenhouse gas emissions disclosure practices	524 firms listed in the S&P 500 index		Logistic regression model used. Variables like shareholder resolution target	Firms are likely to engage in practices consistent with the aims of a social movement if they or other firms in the industry have been targeted by a shareholder resolution on a related issue. Political context also affects the success of a social movement in that the firms under threat of regulation related to the social movement are more likely to agree to engage in practices consistent with the aims of the movement.
7 Brouhle & Harrington	2010	to examine the decision of firms to participate in the voluntary challenge and registry (VCR), the extent of their involvement, and ask if greenhouse gas emissions are related to past VCR participation and to understand the factors that motivate firms to participate in the VCR over its 10 year existence	Firms required to report to environment Canada's mandatory greenhouse gases reporting program in 2004.		Least squares regression used. Firm specific, location specific and industry specific variables considered	Firms participate in VCR to signal their environmental responsibility to the regulators to the regulators and to some extent investors. Past involvement in VCR is a significant determinant of involvement in the registry (past disclosure). GHG emissions are lower for firms that are smaller, emit fewer toxic releases, use more renewable energy sources, are intermediate good producers and located in Quebec, Ontario, and Manitoba.
8 Berthelot & Robert	2011	to examine (1) to what extent Canadian Oil and Gas firms have adhered to the Canadian Institute of Chartered Accountant proposed guidelines respecting climate change disclosures in their annual reports, and (2) whether the disclosures of these firms can be influenced by their media visibility, the presence and operating characteristics of an environmental committee within the board of directors, their ownership structure, their audit firms and their political exposure	Annual report of Canadian public oil and gas corporations (emitters) in 2007	Legitimacy theory, Stakeholder theory and Cost benefit (economic) theory	Variables like audit firms, board of directors, political exposure, media visibility and ownership structure were considered	Audit firm had no significant association with the disclosures, whereas the rest of the variables were found to have significant positive association

Appendix A: Literature review – Summary of studies on determinants of voluntary financial accounting and carbon disclosure practices (Cont'd):

Carbon disclosure studies	Year	Purpose	Target Firms	Theoretical Perspective	Method	Findings
9 Dawkins & Fras	2011	to examine the relation between corporate environmental performance and the level of voluntary environmental disclosure	S&P 500 firms	Cost benefit theory (i.e. defensive cost benefit strategy), Legitimacy theory and Stakeholder theory	Ordinal regression was used	Size, environmental performance, financial performance and visibility did not have any association with the level of environmental disclosure.
10 Freedman & Jaggi	2011	to investigate if firms from Kyoto Protocol setting countries are associated with higher greenhouse gas disclosures compared with firms in the US, which has not ratified the Protocol	212 US, 148 EU, 106 Japanese, 28 Canadian and 16 Indian firms on the 2005 list from different industries	Stakeholder theory, Legitimacy theory and Political economy theory	Disclosures made in the CDP and the websites for a period from January 2007 through the beginning of March 2008 examined. Disclosure index was developed to facilitate content analysis of reports	GHG disclosures are greater for Canadian and Japanese firms compared with firms from the EU countries and they differ across EU firms. Ratification of Kyoto Protocol and limits on emissions improve pollution disclosures.
11 Kim & Lyon	2011	to examine motivations for and impacts of firm's strategic disclosure of greenhouse gas reductions to the US government	98 investor owned electric utilities (10US) over the period 1995-2003.		Data from Department of Energy's voluntary GHG registry to compare reported reductions to actual emissions was used and variables like emissions, revenue and political pressures (regulations or enforcement) were considered.	Regulation and Revenue are significantly and positively associated with disclosure of greenhouse gas information. Emission level is not significantly associated.
12 Rankin, Windsor & Wahyuni	2011	to explain voluntary corporate greenhouse gas (GHG) reporting in the context of a market governance system in the absence of climate change public policy	187 ASX 300 firms. EU ETS also included	Institutional governance theory	A 2 stage method is used. Initial model examines whether firm's GHG disclosures are associated with internal organisation systems factors. Determinants of the extent and credibility of GHG disclosure is examined in the second stage where an index is constructed from the GHG reporting standard for a sub sample of 80 disclosing firms as the dependent variable.	Environmental management systems (EMS), corporate governance quality, previous disclosure, size and industry have positive association with the GHG reporting.

Appendix A: Literature review – Summary of studies on determinants of voluntary financial accounting and carbon disclosure practices (Cont'd):

Carbon disclosure studies	Year	Purpose	Target Firms	Theoretical Perspective	Method	Findings
13 Scholtens & Kleinsmann	2011	to investigate the incentive for subcontractors of a transport and logistics company to report their carbon emissions and to implement carbon emissions reducing technologies	Couriers in the Netherlands and the UK		Variables like existing regulation compliance, energy costs, and implementation costs were tested as incentives. Interviews were conducted by phone based on a questionnaire. Sample T-test was performed.	Energy costs were positively associated with the firm's decision to report on their carbon emissions, whereas implementation costs, improving reputation, strengthening relations, environmental awareness and regulations were significantly associated.
14 Tang & Luo	2011	to examine the effectiveness of the CDP and the determinants of the transparency of carbon disclosure.	Global 500 firms	Stakeholder theory and Institutional theory	Degree of transparency assessed using the carbon disclosure transparency score (CDTS) adopted from CDP reports.	Firm size, leverage, industry membership, ETS and stringency of regulations were found to have positive association with the transparency of carbon disclosure.
15 Cotter & Najah	2012	to investigate whether the influence of the powerful stakeholders is positively associated with climate change disclosure, via corporate communication channels	Largest 340 firms in the FTSE Global equity index series (G500) as of June 2009	Stakeholder engagement perspective theory	Carbon disclosure leaders index (CDLI) 2009 method used to calculate the disclosure score. Regression analysis was performed.	Size and country variables were positively associated with the climate change disclosures, whereas leverage and industry were significantly associated. No association was observed between profitability and climate change disclosures.
16 Gallego-Alvarez & Vicente-Villardón	2012	to analyse to what extent different international firms disclose indicators on greenhouse gas emissions.	Firms from developing and developed countries, both that have not ratified, approved, adhered to, or accepted Kyoto Protocol and that have ratified, were selected	Legitimacy theory	Logistic biplot technique was used. Disclosure index was developed and used to collect disclosure data.	Firms from developed countries show more disclosure. Firms from Kyoto Protocol ratifying countries show more disclosure than those that did not ratify.
17 Hrasky	2012	to assess whether Australian firms have adjusted their footprint related disclosure responses	Large listed Australian firms (ASX 50)	Legitimacy theory	Content analysis of sustainability and annual reports was undertaken to compare the carbon footprint related disclosures in 2008 and 2005.	More carbon intensive sectors, disclose more.

Appendix A: Literature review – Summary of studies on determinants of voluntary financial accounting and carbon disclosure practices (Cont'd):

	Carbon disclosure studies	Year	Purpose	Target Firms	Theoretical Perspective	Method	Findings
18	Luo, Lan & Tang	2012	to investigate how the global 500 firms respond to the challenge of climate change with regard to their carbon disclosure strategies	291 global 500 firms participating in the carbon disclosure project (CDP) in 9 sectors	Legitimacy theory and Stakeholder theory	The paper considers the impact of social, financial market, economic, regulatory and institutional factors on the motivation to voluntarily participate in the 2009 Carbon disclosure project.	Economic pressure (ETs), GHG intensive sectors, social pressures (Big4 auditors) and Regulatory and institutional factors (legal system) were found to be positively associated with carbon disclosure strategies, whereas financing market (leverage) did not have any association.
19	Yu & Ting	2012	to investigate whether the relationship between financial development, investor protection and corporate commitment to sustainability is related to social contagion, neighbourhood effect, and community effect.	369 large firms listed on the FTSE Global 500 covering 11 industries, located in 31 countries were selected		Correlation analysis was performed and regression analysis was used. Three country level variables, financial development index, shareholder rights index, strength of investor protection and five corporate commitment to sustainability measures were selected	There was a significant association between financial development, investor protection and corporate commitment to sustainability is associated with social contagion, neighbourhood effect, and community effect. Firms are more willing to commit to carbon disclosure for countries with higher financial development. Firms place less strategic importance on climate change issues if their community countries protect investors better, notwithstanding their relatively low level of other indirect GHG emissions.
20	Borghai-Ghomi & Leung	2013	to investigate determinants of greenhouse gas emission (GHG) voluntary disclosure of non GHG registered firms	ASX firms not subject to NGER Act 2007 and which disclose a level of GHG information in their annual reports voluntarily	Stakeholder theory, Agency theory and Legitimacy theory	Content analysis was performed for the period of 2009 to 2011.	Firm size, Corporate governance had positive association with the GHG disclosure, whereas listing status and superior GHG performance were significantly associated. Industry and leverage did not have any association with the GHG disclosures.

Appendix A: Literature review – Summary of studies on determinants of voluntary financial accounting and carbon disclosure practices (Cont'd):

Carbon disclosure studies	Year	Purpose	Target Firms	Theoretical Perspective	Method	Findings
21 Bae Choi, Lee & Psaros	2013	to report the extent of voluntary carbon emission disclosures by major Australian firms during the years 2006 to 2008 and to determine the variables that explain the extent of carbon disclosures	Largest 100 firms listed on the Australian securities exchange as of June 2009 are selected based on their market capitalisation	Legitimacy theory	The carbon disclosure score was measured directly from individual firms' annual reports. A checklist was established to determine the breadth and depth of the information related to climate change and carbon emissions incorporated in these publicly available reports. Regression analysis was performed.	Legislation of the NGER Act 2007 may have enhanced the disclosures in 2008. Emission level, size, Industry and corporate governance were positively associated with the extent of carbon disclosure, whereas leverage and ROA did not have any association.
22 Jing Chu, Chatterjee & Brown	2013	to investigate the factors driving greenhouse gas reporting by Chinese firms	Top 100 A-share firms listed on Shanghai stock exchange	Legitimacy theory	Content analysis of annual reports and corporate social responsibility (CSR) reports for the year 2010 was conducted and multiple regression analysis was performed.	Large firms, highly emission intensive industries and state ownership were found to have positive association with the greenhouse gas reporting whereas profitability (ROA) and listing did not have any association with the reporting.
23 Haque, Deegan & Inglis	2013	to provide insights into the gap between what information stakeholders expect and what Australian firms disclose	110 experts from different stakeholder groups	Stakeholder theory	Survey of climate change experts in different stakeholder groups and interviews with corporate climate change managers were undertaken.	Low level of disclosure by Australian firms could be due to a potential expectation gap, absence of pressure from powerful stakeholders, a concern for stakeholder information overload, the cost of providing information, limited perceived accountability for climate change and preferring other media for disclosure.
24 Jira & Toffel	2013	to theorize and empirically identify factors associated with suppliers being especially willing to share the information about their vulnerability to climate change and their strategies to reduce greenhouse gas emissions	Supplier firms	Cost Benefit theory	Data from CDP's supply chain program was considered. Logistic Regression was used.	Supplier firms are more willing to share the information about their vulnerability when request from buyers are more prevalent, when buyers appear committed to using the information and when suppliers are located in countries with greenhouse gas regulations.

Appendix A: Literature review – Summary of studies on determinants of voluntary financial accounting and carbon disclosure practices (Cont'd):

Carbon disclosure studies	Year	Purpose	Target Firms	Theoretical Perspective	Method	Findings
25 Luo, Tang & Lan	2013	to investigate differences in voluntary carbon disclosure between developing and developed countries and the role of resource availability in explaining these differences	2045 large firms from 15 countries and representing divergent industries that released CDP reports in 2009, were considered.	Resource constraint theory (i.e. cost benefit theory)	Profitability, leverage and growth were used as proxies for the degree of resource availability and the firms' participation in the CDP was used as a proxy for carbon disclosure propensity. Developing country variable, carbon emission, size, legal system and ETS were also considered. Logistic model was used.	Emission level, size and legal systems were positively associated with the carbon disclosure. Leverage, growth, developing country and asset newness were negatively associated, whereas ROA was not significant.
26 Stanny	2013	to examine voluntary disclosures about greenhouse gas emissions by the US S&P 500 firms to the CDP	US S&P 500 firms responding to the CDP	Legitimacy theory	Trends in three disclosures were examined from 2006 to 2008	Previous disclosures, regulation, large size and sales were positively associated whereas volatility was negatively associated.
27 Wegener, Elayan, Felton & Li	2013	to examine firm characteristics associated with firm's decision to disclose carbon related information via the CDP	319 Canadian firms over a four year period		Logistic model was used. Firms' decision to disclose via CDP and its association with shareholder activism, litigation risk, and the opportunity for low cost positive publicity once requested by the 'signatory investors' were examined.	Domestic investors was positively associated, whereas emission intensive industry and litigation risk were negatively associated. ROA was not significant.
28 Eleftheriadis & Anagnostopoulou	2014	To examine the relationship between environmental information disclosure and additional firm factors	Firms listed in the Athens Stock Exchange		Empirical analysis of the relationship between the corporate climate change disclosure practices of firms and firm factors such as size, profitability, leverage and activity sector	Significant positive relationship between size and environmental disclosures regarding climate change was observed. There was no significant relationship between leverage, profitability and climate change disclosures.

Appendix A: Literature review – Summary of studies on determinants of voluntary financial accounting and carbon disclosure practices (Cont'd):

	Carbon disclosure studies	Year	Purpose	Target Firms	Theoretical Perspective	Method	Findings
29	Peng, Sun & Luo	2015	to investigate what would motivate the Chinese firms to voluntarily release carbon emission information and what may influence the quality of their Carbon information disclosures (CIDs).	Listed non-financial firms in China from the period 2008 through 2012 of both Shenzhen and Shanghai stock exchanges	Socio political theory	CID related information from annual corporate social responsibility (CSR) reports were extracted. The collected information was scored pursuant to ISO 14064-1	High emission industries, higher peer pressures and size were positively associated with the disclosures whereas leverage was negatively associated. Corporate governance, image and foreign owned shares were not significant.
30	Gonzalez-Gonzalez & Zamora Ramirez	2016	to identify and analyse the factors contributing to the decision of organisations to disclose carbon information, as well as its transparency level.	Spanish firms that were invited in 2012 to respond to the Carbon Disclosure Project (CDP) questionnaire	Legitimacy and Stakeholder theories	Tobit regression was used to analyze the results	Size, financial risk, listing status and ownership concentration were positively associated with the decision to disclose carbon information and its transparency level.
31	Guenther, Guenther, Schiemann & Weber	2016	to provide empirical evidence about the role of stakeholders in firm's carbon disclosure	CDP, Global 500, S&P 500 and FTSE 350 reports from 2008 to 2011, resulting in a total of 1120 firms with 3631 firm year observations	Stakeholder theory	Tobit regression used	Government, general public, media and employees were found to have positive association with the carbon disclosures.

Appendix B: List of UK firms:

UK Installations Name		Regulations (Total Regulations)	Size (Natural log of assets)	Leverage (Debt equity ratio)	Listing Status* (Listed v/s Not Listed)	Industry** (Sectors)	Auditor*** (Big 4 v/s Non Big 4)
1	Minteq UK Ltd	3	3.264	1.3018	0	3	1
2	Cemex UK Cement Limited	4	4.9368	1.4039	1	3	1
3	Lafarge Cement UK Plc	3	4.8304	1.1666	1	3	1
4	O-I Manufacturing UK Ltd	4	3.4237	6.7497	1	2	1
5	PPG Industries (UK) Ltd	4	4.6707	4.758	1	2	1
6	Pilkington United Kingdom Limited	3	4.9482	1.4667	0	1	1
7	Rockwool Bridgend	3	6.8563	2.1836	1	1	1
8	Saint-Gobain Glass UK Ltd	4	4.7396	2.6591	1	2	1
9	Superglass Insulation Ltd	3	5.2615	1.249	1	2	0
10	Blockleys Brick Ltd	3	5.1774	0.8192	1	2	1
11	Wienerberger Limited	3	5.5938	0.6869	1	1	1
12	Hanson Building Products Ltd	4	3.3699	2.2027	1	1	1
13	Imerys Minerals Ltd	3	5.9726	13.5369	0	1	1
14	Aarhus United UK Ltd	4	4.776	2.0933	1	1	1
15	National Grid Gas Plc	3	4.4719	1.2397	1	1	1
16	RWE Npower Plc	3	5.4948	6.6353	1	2	1
17	AstraZeneca UK Limited	3	4.6898	1.0363	1	1	1
18	Archer Daniels Midland Erith Ltd	4	6.0067	38.0002	1	1	1
19	BAE Systems (Munitions & Ordnance) Limited	4	5.0008	4.3874	1	2	1
20	Bayer CropScience Limited	3	5.2587	60.4201	0	2	1
21	BGE (UK) Ltd	3	3.7794	2.3168	0	2	1
22	Rolls Royce Power Development Limited	3	5.2866	0.8778	1	2	1
23	Britannia Operator Limited	3	5.2907	0.6953	1	2	1
24	Nexen Petroleum UK Limited	4	5.3297	0.9172	1	3	1

Appendix B: List of UK firms (Cont'd):

	UK Installations Name	Regulations (Total Regulations)	Size (Natural log of assets)	Leverage (Debt equity ratio)	Listing Status* (Listed v/s Not Listed)	Industry** (Sectors)	Auditor*** (Big 4 v/s Non Big 4)
25	Chevron Texaco Upstream Europe	3	3.6905	114.0782	0	1	1
26	Elyo Industrial Ltd	3	2.3878	2.8681	1	1	1
27	Dairycrest Limited	4	5.7427	0.9736	1	1	1
28	WS Atkins Plc	4	3.8218	1.6902	1	2	1
29	Derby Hospitals NHS Foundations Trust	4	4.8961	2.0721	1	1	1
30	Diageo Great Britain Limited	4	5.1147	43.4579	1	2	1
31	DSM Nutritional Products (UK) Ltd	3	5.1471	5.6836	1	1	1
32	Marathonoil UK Ltd	3	5.441	1.9839	1	1	1
33	E.ON UK Plc	3	4.3178	0.9706	1	2	1
34	Talisman Energy (UK) Limited	3	4.7609	1.698	1	1	1
35	Ford Motor company Limited	3	5.3543	2.5928	1	2	1
36	Gallaher Ltd	3	4.2511	0.5835	1	1	1
37	GE Plastics ABS Ltd	3	5.3407	1.019	1	1	1
38	Glaxo Smithkline R&D Ltd	3	5.3781	1.2573	0	3	1
39	Hydro Polymers Ltd	4	4.6905	2.7118	1	3	1
40	Inbev UK Ltd	4	4.1535	2.2836	1	2	1
41	Gassco AS	3	5.4773	1.316	0	2	1
42	Marstons' Plc	3	7.4327	14.9627	1	2	1
43	Cofely Limited	3	3.2299	4.6125	0	1	1
44	Novartis Grimsby Limited	3	6.2749	0.3924	1	2	1
45	BHP Billiton Petroleum Limited	3	4.6609	2.345	1	1	1
46	Polimeri Europa UK Ltd	3	4.7849	1.1635	1	1	1
47	Premier Foods Group Limited	3	4.1147	4.252	1	1	1

Appendix B: List of UK firms (Cont'd):

UK Installations Name		Regulations (Total Regulations)	Size (Natural log of assets)	Leverage (Debt equity ratio)	Listing Status* (Listed v/s Not Listed)	Industry** (Sectors)	Auditor*** (Big 4 v/s Non Big 4)
48	Shasun Pharma Solutions Ltd	3	4.3898	2.0518	1	1	1
49	Shell UK Ltd	3	4.0512	5.1051	1	1	1
50	Slough Heat and Power limited	3	3.5066	0.4464	1	1	1
51	Smurfit Kappa UK Ltd	4	4.9485	0.5824	1	1	1
52	Solutia UK Limited	3	4.8981	1.5588	1	1	1
53	The Cheese Company Ltd	4	5.1585	0.3298	1	1	0
54	T&L Sugars Limited	3	6.8624	0.8683	1	1	1
55	The University of Birmingham	3	4.6672	1.1353	1	1	1
56	Total E&P UK Plc	3	3.9258	1.145	1	1	1
57	Unilever UK Limited	3	4.1836	3.6658	1	1	1
58	Murco Petroleum Milford Haven Refinery	3	3.6474	1.4488	1	1	1
59	Nynas UK AB	3	3.5688	1.6617	1	1	1
60	Petroplus Refining and Marketing Ltd	3	3.5596	1.4682	1	1	1
61	M-real New Thames Ltd (now D S Smith Paper Ltd)	3	4.4023	0.9583	1	1	1
62	Sonoco Cores and Paper Ltd	4	3.024	7.6652	1	1	1
63	The Procter & Gamble Company	3	6.7892	1.307	1	2	1
64	UPM-Kymmene (UK) Limited	3	5.3333	1.0269	1	2	1

Note: \*Listed firms = 1, Not listed firms = 0, \*\*Energy and Utilities Sector = 1, Manufacturing and Industrial Sector = 2, Primary Sector = 3, \*\*\*Big 4 Auditors = 1, Non Big 4 Auditors = 0.

Appendix C: List of Australian firms:

Australian Firm Name		Regulations	Size	Leverage	Listing Status*	Industry**	Auditor***
		(Total Regulations)	(Natural log of assets)	(Debt equity ratio)	(Listed v/s Not Listed)	(Sectors)	(Big 4 v/s Non Big 4)
1	Actew Distribution Ltd	7	3.2536	0.6037	1	2	1
2	Adelaide Brighton Management Ltd	6	3.9306	0.8209	1	2	1
3	AETV Pty Ltd	5	6.0003	2.0378	0	2	0
4	AGL Power Generation Pty Ltd	7	6.7763	1.4938	1	3	1
5	Alcoa Australia Rolled Products Pty Ltd	7	3.8455	0.8613	1	3	1
6	Allgas Energy Pty Ltd	6	3.9102	0.3741	1	3	1
7	Anglo Coal (Capcoal Management) Pty Ltd	6	5.8713	0.3148	1	3	1
8	APA Facilities Management Pty Limited	6	5.3981	4.6252	1	3	1
9	Apache Energy Limited	4	6.3042	2.2729	0	3	1
10	Australian Energy Market Operator Limited	5	5.383	1.2267	0	3	1
11	Australian Power And GAS Pty Ltd	4	3.5551	2.8452	0	3	1
12	BHP Billiton Minerals Pty Ltd	5	6.7545	1.8571	0	3	0
13	Birla Nifty Pty Ltd	4	3.9306	0.8209	0	3	1
14	Bluescope Steel Limited	5	6.5081	1.5812	0	3	0
15	Boral Limited	4	7.2057	2.3196	0	3	0
16	BP Australia Investments Pty Ltd	6	4.618	20.0882	1	3	1
17	Brickworks Building Products Pty Ltd	5	4.2439	2.201	1	3	1
18	Caltex Australia Limited	4	3.7823	2.0158	0	3	1
19	Dyno Nobel Moranbah Pty Ltd	6	3.9797	1.154	1	3	1
20	Electricity Generation Corporation	7	3.6057	0.8116	1	3	1
21	Energex Limited	7	4.68	0.6584	1	3	1
22	ENI Australia B.V.	7	4.5655	0.4895	1	3	1
23	Envestra Limited	6	6.1641	0.168	1	3	0
24	ERM Power Generation Pty Ltd	4	4.171	0.8212	0	3	1

Appendix C: List of Australian firms (Cont'd):

Australian Firm Name		Regulations	Size	Leverage	Listing Status*	Industry**	Auditor***
		(Total Regulations)	(Natural log of assets)	(Debt equity ratio)	(Listed v/s Not Listed)	(Sectors)	(Big 4 v/s Non Big 4)
25	Esso Australia Resources Pty Ltd	5	4.649	1.4317	1	3	0
26	H C Extractions Pty Limited	4	6.9314	2.0645	0	1	1
27	Hydro-Electric Corporation	5	5.0891	0.8126	1	2	1
28	Incitec Pivot Limited	5	6.9314	2.0645	0	1	1
29	Mackay Sugar Limited	5	5.4007	2.9097	0	1	0
30	Macquarie Generation	6	5.3297	0.9172	1	2	1
31	Melbourne Water Corporation	6	5.5303	1.3441	1	1	1
32	Midwest Vanadium Pty Ltd	7	6.4199	3.6181	1	2	1
33	Millenium Coal Pty Ltd	4	4.1209	2.5691	0	1	0
34	Murray Goulburn Co-Operative Co. Limited	6	6.0263	2.5599	1	1	1
35	Newcrest Mining Limited	5	5.7953	1.0169	0	3	0
36	Nyrstar Hobart Pty Ltd	5	6.2649	1.4167	0	3	1
37	Orica Australia Pty Ltd	6	4.2802	0.704	1	2	1
38	Peabody (Bowen) Pty Ltd	4	6.4269	3.0468	0	2	0
39	Power And Water Corporation	6	5.2349	1.0752	1	2	1
40	Rio Tinto Aluminium (Bell Bay) Limited	6	4.0487	1.9381	1	1	1
41	SPI Networks (Gas) Pty Ltd	5	6.018	2.808	0	2	0
42	State Transit Authority Of NSW	5	4.0593	1.858	1	1	1
43	Transalta Energy (Australia) Pty Ltd	6	4.8349	0.7415	1	1	1
44	Transpacific Industries Pty. Ltd.	6	4.2439	2.201	1	1	1
45	Wesfarmers Curragh Pty Ltd	5	4.171	0.8212	1	1	1
46	Woodside Burrup Pty Ltd	6	5.5851	0.9214	1	1	1

Note: \*Listed firms = 1, Not listed firms = 0, \*\*Energy and Utilities Sector = 1, Manufacturing and Industrial Sector = 2, Primary Sector = 3, \*\*\*Big 4 Auditors = 1, Non Big 4 Auditors = 0.

Appendix D: List of New Zealand firms:

NZ Firm Name		Regulations (Total Regulations)	Size (Natural log of assets)	Leverage (Debt equity ratio)	Listing Status* (Listed v/s Not Listed)	Industry** (Sectors)	Auditor*** (Big 4 v/s Non Big 4)
1	Fletcher Concrete and Infrastructure Limited	2	3.8514	0.9986	1	1	0
2	Genesis Energy Limited	2	6.5742	0.924	1	1	1
3	Solid Energy New Zealand Limited	2	2.9341	8.3799	0	1	1
4	Bathurst Coal Limited	2	5.6958	1.4758	1	1	1
5	Origin Energy Resources (Kupe) Limited	2	4.5161	0.9999	1	1	1
6	Shell Exploration NZ Limited	2	5.7427	0.9736	1	1	1
7	Cheal Petroleum Limited	2	8.393	0.1033	1	1	0
8	AWE New Zealand Pty Limited	2	6.1167	0.3269	1	1	1
9	OMV New Zealand Limited	2	7.7402	1.1853	1	1	1
10	Norske Skog Tasman Ltd	2	0.4353	5.6364	1	1	1
11	Ngatamariki Geothermal Limited	2	5.5505	1.4972	0	1	1
12	Fonterra Limited	2	4.1575	1.13	1	1	1
13	Mighty River Power Limited	2	6.7636	0.8235	1	1	1
14	DuPont (New Zealand) Limited	2	4.9012	2.1622	1	2	1
15	BOC Limited	2	4.7532	1.4105	0	2	1
16	Meridian Energy Ltd	2	3.8866	0.6505	0	2	1
17	Vector Limited	2	3.7594	1.0468	1	2	1
18	Transpower New Zealand Limited	2	3.7359	2.8599	1	2	1
19	Landcorp Farming Limited	2	6.2291	0.2866	0	3	1
20	Western Bay of Plenty District Council	2	6.0693	0.1999	0	3	0
21	New Zealand Forest Research Institute Limited	2	4.6182	0.4208	0	3	1
22	Fonterra Limited	2	4.1575	1.13	1	3	1
23	Mighty River Power Limited	2	6.7636	0.8235	1	3	1
24	Chevron New Zealand	2	5.5938	0.6869	1	3	1

Appendix D: List of New Zealand firms (Cont'd):

NZ Firm Name		Regulations	Size	Leverage	Listing Status*	Industry**	Auditor***
		(Total Regulations)	(Natural log of assets)	(Debt equity ratio)	(Listed v/s Not Listed)	(Sectors)	(Big 4 v/s Non Big 4)
25	Mobil Oil New Zealand Limited	2	5.7295	0.9214	1	3	1
26	Z Energy Limited	2	3.2226	4.7996	0	3	0
27	Methanex New Zealand Ltd	2	6.6142	1.1589	0	3	1
28	City Forests Limited	2	5.1708	0.6157	0	3	0
29	Landcorp Farming Limited	2	6.2291	0.2866	0	3	1
30	Watercare Services Limited	2	6.9159	0.4287	0	3	1
31	Li New Zealand Limited	2	4.7607	0.3999	0	3	1
32	Norske Skog Tasman Ltd	2	3.4358	5.72	1	3	1
33	Lochlomond	2	7.1589	0.5824	0	3	0
34	AgResearch Limited	2	5.4147	0.2188	0	3	1
35	University of Canterbury	2	5.8851	0.2703	0	3	0
36	Meridian Energy Ltd	2	3.8886	0.6505	0	3	1
37	Ballance Agri-Nutrients (Kapuni) Limited	2	5.754	0.4038	0	3	1
38	PGG Wrightson Limited	2	5.792	1.419	1	3	1
39	Goodman Fielder New Zealand Limited	2	3.4886	0.7888	1	3	1
40	AgResearch Limited	2	5.4147	0.2188	0	3	1

Note: \*Listed firms = 1, Not listed firms = 0, \*\*Energy and Utilities Sector = 1, Manufacturing and Industrial Sector = 2, Primary Sector = 3, \*\*\*Big 4 Auditors = 1, Non Big 4 Auditors = 0.

Appendix E : Overall carbon financial accounting policies (Recognition of Carbon emission allowances) extracted from Annual Reports and their codes:

FREE CARBON EMISSION ALLOWANCES											
Accounting Policies	Asset Recognition		Revenue Recognition		Liabilities Recognition		Expense Recognition		Equity Recognition		Code used
	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	
No information											0
Received allowances are recognised in the balance sheet as intangible assets at the market value on the date the rights are granted. The difference between fair value and the nominal amount paid for the rights is recognised in the balance as a government grant (deferred income)	Intangible Assets			Government Grant							1
Emission rights received from governments free of charge are initially recognised as intangible assets	Intangible Assets*										2
CO2 emission allowances are accounted for as other assets	Other Assets*										3
Emission rights allocated for free are booked in inventories	Inventories*										4
Emission rights granted by governments are not recorded in the consolidated statement of financial position, as they have a cost equivalent to zero	Not Recognised										5
When emission rights are received, they are recognised as current intangible assets under other receivables in the balance sheet and as grants received on the liabilities side.	Current Intangible Assets			Government Grant							6
Emission allowances are recorded as intangible assets within current assets. Where emission allowances are granted by relevant authorities, receipts of such grants are treated as deferred income.	Intangible Assets (under Current Assets)										7
Free Carbon Units are classified as financial assets with a corresponding entry to deferred income.	Financial Assets										8

Appendix E : Overall carbon financial accounting policies (Recognition of Carbon emission allowances) extracted from Annual Reports and their codes (Cont'd) :

FREE CARBON EMISSION ALLOWANCES (Cont'd)											
Accounting Policies	Asset Recognition		Revenue Recognition		Liabilities Recognition		Expense Recognition		Equity Recognition		Code used
	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	
The allocation is recognised as deferred income and recognised in profit or loss on a systematic basis over the period to which the grant relates.				Deferred Income**							9
The compensation units received from government for deforestation restriction under ETS, are valued as intangible assets and recognised as income in the financial statements.	Intangible Assets			Income							10
USED CARBON EMISSION ALLOWANCES***											
Accounting Policies	Asset Recognition		Revenue Recognition		Liabilities Recognition		Expense Recognition		Equity Recognition		Code used
	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	
No Information											0
The emissions realised are expensed under other operating costs and expenses in the income statement and presented as a provision in the balance sheet						Provision		Emission Expense			1
Emission charges are recognised in the income statement in the period in which emissions are made								Emission Expense			2
To the extent that it is expected that the number of allowances needed to settle the CO2 emissions exceeds the number of emission allowances owned, a provision is recognised.						Provision					3
Because emission rights are not depleted as part of the production process, they are reported as intangible assets. A provision is recognised for emissions produced. The expenses incurred for the recognition of the provision are reported under cost of materials	Intangible Assets					Provision		Emission Expense (Cost of materials)			4

Appendix E: Overall carbon financial accounting policies (Recognition of Carbon emission allowances) extracted from Annual Reports and their codes (Cont'd):

USED CARBON EMISSION ALLOWANCES*** (Cont'd)											
Accounting Policies	Asset Recognition		Revenue Recognition		Liabilities Recognition		Expense Recognition		Equity Recognition		Code used
	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	
A current liability is recognised based on the level of emissions recorded.						Current Liability					5
The emissions produced are recognised as cost and as liability together with the corresponding government grant as income both based on the value at the date of initial recognition. So rights consumed that are within the original range have no positive or negative effect on profit for the period.			Government Grant	Income	Liability to deliver allowances		Emission Expense (cost)				6
Carbon emission liabilities are recognised when the emissions are generated. Carbon expense and deferred income from free carbon permits are recorded as part of the cost of inventory.			Government Grant		Liability to deliver allowances		Emission Expense				7
PURCHASED CARBON EMISSION ALLOWANCES											
Accounting Policies	Asset Recognition		Revenue Recognition		Liabilities Recognition		Expense Recognition		Equity Recognition		Code used
	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	
No Information											0
Intangible assets include purchased emission rights. Government grants also include emissions.	Intangible Assets			Government Grant							1
Emission rights held under national and international emission-rights systems for the settlement of obligations are reported as intangible assets.	Intangible Assets*										2
Emission rights are classified as inventories, as they are consumed in the production process	Inventories*										3

Appendix E: Overall carbon financial accounting policies (Recognition of Carbon emission allowances) extracted from Annual Reports and their codes (Cont'd):

SURRENDERED CARBON EMISSION ALLOWANCES											
Accounting Policies	Asset Recognition		Revenue Recognition		Liabilities Recognition		Expense Recognition		Equity Recognition		Code used
	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	
No Information											0
Emission units are automatically surrendered to the Regulator as a remission of liability under the scheme and are recognised as a reduction of the provision for carbon emissions.						Provision (remission of liability)*					1
Emission allowances are intangible assets. The purchased emission allowance quotas recognised in intangible rights are derecognised as they have been offset against the obligation		Intangible Assets**									2
Carbon Units on hand are classified as financial assets. When Carbon Units are surrendered to the Government, the asset along with the corresponding emissions liability is derecognised from the balance sheet.		Financial Assets				Liability to deliver allowances					3
INVENTORIED CARBON EMISSION ALLOWANCES											
Accounting Policies	Asset Recognition		Revenue Recognition		Liabilities Recognition		Expense Recognition		Equity Recognition		Code used
	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	
No Information											0
Unused and acquired carbon emission quotas held at the Balance Sheet date are recognised as intangible assets.		Intangible Assets*									1
SOLD CARBON EMISSION ALLOWANCES											
Accounting Policies	Asset Recognition		Revenue Recognition		Liabilities Recognition		Expense Recognition		Equity Recognition		Code used
	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	
No Information											0

Appendix E: Overall carbon financial accounting policies (Recognition of Carbon emission allowances) extracted from Annual Reports and their codes (Cont'd):

SOLD CARBON EMISSION ALLOWANCES (Cont'd)											
Accounting Policies	Asset Recognition		Revenue Recognition		Liabilities Recognition		Expense Recognition		Equity Recognition		Code used
	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	
Where excess certificates are sold to third parties, the group recognises the consideration receivable in profit and loss				Profit**							1
Income is recognised based on the sale of production output (carbon units) from the relevant facility.				Revenue (Income)**							2
Sales or annual restorations of emission rights consist of decreases in inventories recognised		Inventories**									3
Revenues from the sale of any surplus of emission rights are recognised by decreasing cost of sales				Revenue			Cost of goods sold				4
Proceeds from the sale of emission rights are recorded as a reduction to "Cost of sales"							Cost of goods sold*				5
The emission allowance quotas recognised in intangible rights are derecognised when the emission allowances are sold. Gains from the sale of excess allowances are recognised as other operating income in the statement of income.		Intangible Assets**		Other operating income							6
Revenues related to emission quotas are recognised when they are realized through a sale transaction. In case of sale, if applicable, the acquired emission rights are considered as the first to be sold. Monetary receivables granted as a substitution of emission rights awarded free of charge are recognised as an offset to item "Other income" of the profit and loss account.	A/c Receivable			Other Income							7
Any net gain resulting from the sale of permits is recognised in other expenses							Other expenses*				8
If the number of allowances received exceeds actual consumption, the surplus is sold in the market. The gain/loss from the sale is presented as Other gains and losses.				Other gains*							9

Note: \*credit entry not clear or information missing, \*\*debit entry not clear or information missing, \*\*\*incomplete information provided

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