Carbon emission and climate change disclosures in the annual reports of Chinese power companies: An exploration

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List of Abbreviations

AICPA	-	American Institute of Certified Public Accountants
CDP	-	Carbon Disclosure Project
CDM	-	Clean Development Mechanism
CSR	-	Corporate Social Responsibilities
ETS	-	Emission Trading System
FTSE	-	Financial Times and the London Stock Exchange
GAAP	-	General Accepted Accounting Principles
GHGs	-	Green House Gases
ICAEW	-	Institute of Chartered Accountants of England and Wales
IFRS	-	International Financial Reporting Standards
NGOs	-	Non-Government Organizations
UNFCCC	-	United Nations Framework Convention on Climate Change

Abstract

This study explores the disclosure of carbon emissions and climate change-related information by seven major power businesses in China. More specifically, a content analysis method is employed to investigate the disclosure levels of carbon emissions and climate change reporting in annual reports from 2000 to 2009. The findings suggest that carbon emissions and climate change disclosure is booming in China both in terms of reporting length and of quality, however, most of the carbon emissions and climate change information revealed by businesses is descriptive. The results of this study also indicate the initiatives for businesses to disclose carbon emissions and climate change-related information are for internal risk control purpose and providing a positive corporate image to the public.

Declaration

I hereby declare that this paper is my own work, unless cited and appropriate referenced. No portion of the work has been previously submitted to apply for another degree or qualification of any university or other institution of learning.

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Chapter One Introduction

1.0 Chapter overview

This chapter outlines the background of the study, and then introduces the research objectives. A brief discussion of the proposed research method follows, and the structure of the whole dissertation is presented at the end of the chapter.

1.1 Background of the study

Businesses have been increasing environmental information disclosure to satisfy growing needs from external regulatory bodies, social groups and the general public (Carroll, 1999; Mason, 2008). Western literatures suggest that this environmental information disclosure is important not only to enable various stakeholders to make related decisions, but also for business risk control and competitive advantage development (Beekes & Brown, 2006; Margolick & Russell, 2004; Kolk & Pinkse, 2008). Among numerous environmental issues, climate change, in particular, has emerged following the recent global adoption of the *Kyoto Protocol* and national Emission Trading Schemes (ETS).

Weinhofer and Hoffmann (2010) assert that carbon emission is the prime reason for global warming and climate change. Thus, information related to carbon emissions, to a great extent, represents climate change information. This concept is expressed in the practical resolutions enacted to manage climate change risks. The *Kyoto Protocol* and ETS focus on climate change control by reducing carbon emissions. On the other hand, Deegan and Haque (2009) agree that while carbon emission is the core theme of climate change, information relevant to climate change should also include management approaches and other external factors related to climate change issues.

In contrast to the gradual recognition of climate change by businesses in the developed nations, China is believed from previous studies to be far behind western nations in terms of climate change issue recognition and disclosures (Hutchison, 2000; Managi & Kaneko, 2006; Nolan, 2005). However, some scholars argue that climate change issues have become increasingly noticed in China, and businesses have shown efforts and willingness to cooperate with stakeholders in managing and disclosing these issues.

1.2 Research objectives

The climate change literature developed in advanced nations provides a disclosure framework that can be employed to examine the environmental disclosure status in China. This study aims to investigate the development of climate change information disclosure by Chinese businesses and to explore the underlying reasons for this development.

The critical implications of this study will contribute to the environmental disclosure literature and, especially, fill the research gap on climate change disclosure in the Chinese instance. This study also provides a research direction that can be developed in future research.

1.3 Research questions and research methods

Two main research questions investigate the climate change disclosure by Chinese businesses. They are:

1. How, and to what extent, do Chinese power companies disclose carbon emissions and climate change information in their annual reports?
2. Why do (or don't) Chinese power companies disclose carbon emissions and climate change information in their annual report?

In order to research climate change disclosure by Chinese businesses, annual reports are investigated, as they are the main routes for business environmental and social information disclosure (Guthrie & Abeysekera, 2006; O'Donovan, 2002). In addition, seven major power companies are targeted, not only because power businesses are particularly affected by climate change issues (Pacca, 2009), but also because these seven companies provide both English and Chinese versions of their annual report, which makes the accompanying information more reliable. Content analysis is employed to count the page proportions of both carbon emissions and climate change information disclosed in annual reports of the seven Chinese power businesses from 2000 to 2009. Recording categories are developed from studies undertaken by Deegan and Haque (2009) and Weinhofer and Hoffmann (2010). Modifications are made to ensure the recording categories apply in the Chinese situation. In addition to the page proportions, the nature of carbon emissions and climate change information disclosed is also recorded during the research: such as whether the disclosure is qualitative or quantitative; whether the information has a good or bad effect on business operations; and whether the carbon emissions and climate change information being disclosed in the annual report is auditable.

1.4 Organization of the dissertation

The structure of the remainder of this dissertation is as follows:

Chapter two is a literature review, and introduces the development of climate change disclosure in developed nations as well as the disclosure status in China from previous studies. The details of driving forces promoting climate change disclosure are discussed in the chapter. A research gap is then identified, along with an explanation of the purpose of this research.

In chapter three, details of the methodology adopted in this study are presented. These include the choice of content analysis, research sources, sample population, development of research categories, and research units.

Following the research methodology chapter, chapter four presents findings and analysis by using methodology developed in the previous chapter. Findings in this research are analyzed by phases, categories, other disclosure media, and the quality of information disclosed.

Chapter five summarizes the findings from the previous chapter to answer the two research questions. Limitations of this research are discussed at the end of the dissertation, and suggestions for future study are provided.

Chapter Two Literature review

2.0 Introduction

Following the introductory chapter discussing the research objectives and presentation schedule, this chapter reviews previous studies on the climate change disclosure topic. More specifically, the chapter examines the concept and content of climate change disclosure from existing studies, and then analyzes various driving forces promoting climate change disclosures. It also discusses the climate change disclosure status in developed nations and in China. Accordingly, the chapter is organized as follows. Section 2.1 explains what climate change disclosure is. Section 2.2 details the driving forces promoting climate change disclosure. Section 2.3 presents global awareness of climate change disclosure. Section 2.4 looks at the environmental and climate change disclosure status in China. Section 2.5 then concludes the chapter.

2.1 What is climate change disclosure?

2.1.1 The concept of climate change disclosure

There has been growing interest from the public, regulatory bodies and various social groups in the role business plays in society and the environment (Carroll, 1999; Mason, 2008; OECD, 2007; Ranchhod & Park, 2004). Therefore, businesses are under increasing public and regulatory pressure to disclose the impacts of business conduct on the environment and on society (Betsill & Corell, 2001; Shying & Wong, 2007; Simnett, Nugent & Huggins, 2009). Climate change disclosure is the part of the corporate response specifically related to climate change issues. In recent years, global warming and climate change have caused significant damage to the global economy and ecological system (Stern, 2009), and climate change has become one of the most important topics in the corporate social and environmental disclosure field (Kolk & Pinkse, 2007; Stern, 2006).

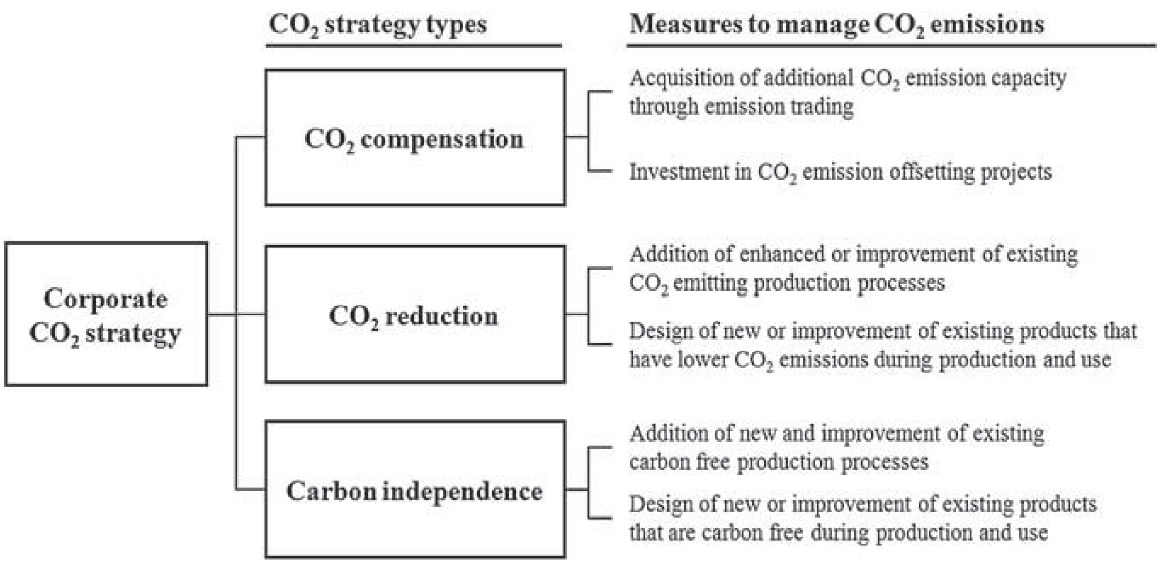
From a business point of view, corporate attitudes towards climate change issues have changed significantly in the last two decades (Kolk, Levy & Pinkse 2008). In the early 1990s, businesses were often found to cover up or ignore climate change issues (Deegan & Haque, 2009). Over time, the goal of business has changed from an emphasis on shareholder satisfaction alone (Friedman, 1962; Carroll, 1979) towards mutual benefits for business and societies (Freeman, 1984; Jones, 1995). Therefore, more and more climate change issues and corporate strategies dealing with those issues have been revealed by businesses (Kolk et al., 2008; Kolk & Pinkse, 2008). Climate change disclosure has also been well recognized as a management approach for disclosure and control of climate change risks (Jeswani et al., 2008; Kolk & Pinkse, 2005).

In general, the concept of climate change disclosure both reflects the public corporate response to climate change and indicates the business effort applied to managing climate change risks. Whereas there is agreement on the concept of climate change disclosure, differences emerge when deciding what should be included in climate change disclosures.

2.1.2 The content of climate change disclosure

On the one hand, Reid and Toffel (2009) suggest that climate change issues are no different from carbon emission issues. Therefore, carbon emission to a great extent represents climate change issues. Current global responses to climate change threats focus on reducing carbon dioxide emission, which is believed to be the main factor causing global warming and climate change (Sterman & Sweeney, 2002). This is evident from the *Kyoto Protocol* and Emission Trading Scheme (ETS) adopted globally. Both the *Kyoto* Protocol and ETS aim to control climate change issues via carbon reduction projects (Europa, 2007; UNFCCC, 2010). In other words, business strategies regarding carbon reduction are represented by the climate change information disclosed by a business (Weinhofer and Hoffmann, 2010). Figure 2.1 shows the emission reduction strategies used in Weinhofer and Hoffmann's (2010) study for measuring climate change responses. Some other studies are consistent with Weinhofer and Hoffmann's (2010), in viewing the prime concern in climate change disclosure as the reporting of information related to emission management (Dunn,2002; Boiral,2006)

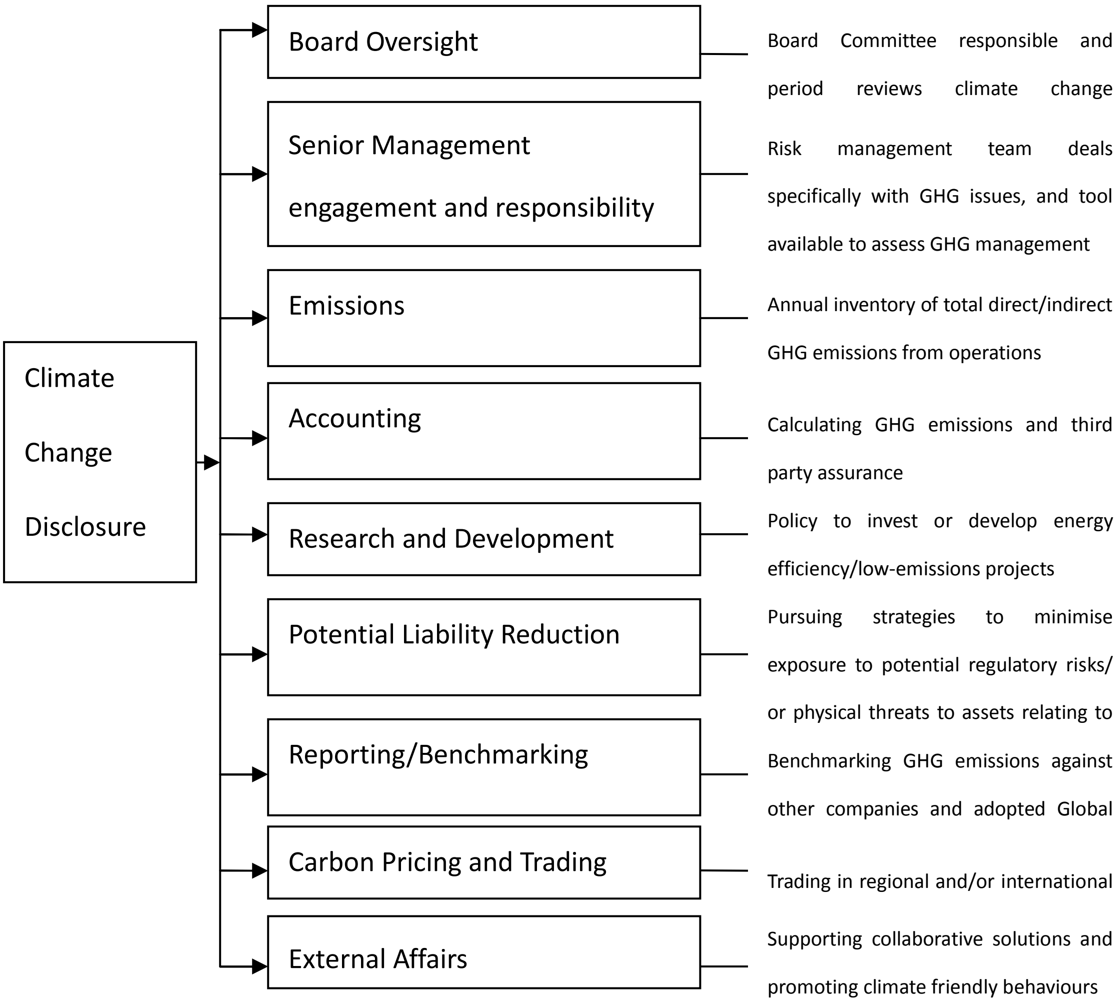
Figure 2.1 Climate change themes measured by carbon emission categories



Source: Adapted from Weinhofer and Hoffmann's (2010) study.

On the other hand, scholars like Kolk and Pinkse (2004), Deegan and Haque (2009) and Langrock (2006) suggest that since the *Kyoto Protocol* has raised public attention and regulatory concern on climate change issues, then the climate change information disclosed by firms should reflect the increasing demand for climate change information from these stakeholders. In other words, the disclosure should place the emphasis on providing climate change information of interest to or related to external users. For example, the regulatory bodies are interested in the accounting methods and reporting standards adopted by businesses to account for and disclose climate change information; the public are interested in the effort made by businesses to promote climate friendly activities; various Non-government organizations (NGOs) are interested in the effort made by businesses to minimise climate change issues, etc. Figure 2.2 presents the categories that were adopted by Deegan and Haque (2009) to measure climate change information disclosed by firms.

Figure 2.2 Climate change themes measured by Deegan and Haque (2009)



Source: Adapted from Deegan and Haque's (2009) study.

In summary, the differences between the two groups of scholars indicate different users of climate change information. Leading with Weinhofer and Hoffmann (2010), the disclosure of carbon emission-related information reflects the functioning of internal management, i.e. how businesses review and manage climate change risks in using the carbon emission-related information disclosed. On the other hand, Deegan and Haque (2009) and others place the emphasis on how businesses endeavour to satisfy external stakeholders by disclosing climate change information along with business strategies dealing with climate change issues of interest to those stakeholders. In reality, the willingness and growing tendency for firms to release information related to climate change reflects demands from both the internal management perspective and external stakeholders (Carroll, 1999; Campbell, Craven & Shrives, 2003; Jones & Oldroyd, 2009). Therefore, climate change disclosure should contain information related to both carbon emission management and organizational responses to external information users (Aguiar & Fearfull, 2010). Consequently, the term 'carbon emissions and climate change disclosure' is used from this point.

2.2 Forces promoting carbon emissions and climate change disclosures

Kolk et al., (2008) suggest that businesses are disclosing more carbon emissions and climate change-related information than ever before. Forces leading the development of carbon emissions and climate change disclosures can be categorised into three camps: public awareness, government intervention and changes in attitude towards corporate governance.

2.2.1 Public awareness

Public awareness is one of the leading forces promoting carbon emissions and climate change disclosures. The public here comprises the general public, international communities and professional accounting bodies.

Since carbon emissions and climate change issues have become of significant concern to the world (Stern, 2006), there has been increasing awareness from the general public of global warming and climate change issues (IPCC, 2007; OECD, 2007) . The general public hold businesses to account for environmental and climate changes, therefore forcing businesses to manage and disclose carbon emissions and climate change related issues.

Various non-government organizations (NGOs) and international communities, like banks and investment groups, also lobby in favour of carbon emissions and climate change disclosures (Potoski & Prakash, 2005; Vormedal, 2008). Various NGOs are persuading investors to consider carbon emissions and climate change risks in valuing a business (Hassel, et al., 2005; Kolk et al, 2008; Leahy, 2008). Barnea et al. (2005) study finds that green investors take both financial and ethical considerations into account when they make investment decisions, and they have the ability to influence the weight of investment in the economy. Moreover, environmental groups are also believed to play an influential role in environmental disclosure negotiations with corporations, as well as in assessing governmental policies and then providing feedback to the regulatory bodies (Betsill & Corell, 2001).

As a result of the general public awareness and lobbying from NGOs on climate change issues, multinational entities have started to work with those non-governmental organizations and communities to develop an approach to carbon emissions disclosures and management. For instance, the Carbon Disclosure Project (CDP) is one of the most well-known NGOs working on building up a GHG emission database for individual corporations global wide, and represents 534 institutional investors, managing $US 64 trillion of funds (Carbon Disclosure Project[a], 2010). Cooperating with Accenture, Microsoft and SAP, CDP, established in 2002, upgraded the reporting system, and requests GHG emission and climate change information from over 4,500 companies globally in 2010 (Carbon Disclosure Project[b], 2010). The number of firms responding to the CDP request is increasing each year, which indicates the actual attention firms pay to carbon emissions and climate change issues, as well as their willingness to work with the environmental organizations to disclose this information. In 2009, 65% of firms in the FTSE 350 (and 95% of the FTSE 100 firms) actually responded to the CDP survey, which reported 390 million tonnes of carbon dioxide being emitted (Hargreaves, 2010).

In addition to the carbon emission information collected, CDP also enables businesses to provide climate change-related corporate strategy for the public (Bebbington et al., 2007). A KPMG (2008) study indicates that stakeholders are interested not only in the GHG emission information disclosed by enterprises, but also in corporate governance and climate change-related strategies. Developed together with PriceWaterhouse Coopers, a Carbon Disclosure Leadership Index assessing the quality of disclosure for responding companies is issued by CDP (Carbon Disclosure Project[c], 2010). Apart from that, accounting professionals like the Institute of Chartered Accountants of England and Wales (ICAEW) has started to recognize the value of research from NGOs on carbon emission and disclosure topics (American Institute of Certified Public Accountants (AICPA), 2005; Institute of Chartered Accountants of England and Wales (ICAEW), 2004).

Banks represent another type of international community who have an important role in demanding disclosure of carbon emissions and climate change-related information from enterprises. For instance, Norway's Sovereign Wealth Fund, which is the biggest stock owner in Europe, seeks disclosure of GHG emissions and climate change risks from the companies it invests in ("Fund Pushes Emissions Disclosure", 2009). Earlier studies have found that climate change has been increasingly recognized as a serious business risk by most of the banks, and many of them provide climate-specific funds or similar products in accordance with the climate change information disclosed by firms (Leahy, 2008; Crawford & Williams, 2010). The power of banks comes from their ability to provide capital to business based on their environmental and social performances (Crawford & Williams, 2010). Therefore, the social and environmental information disclosed by businesses will be assessed by banks before they make investment decisions. The attitude adopted by banks indicates the concern from investors towards possible future regulatory or physical losses from carbon emissions and climate change risks. As a result, they add pressure on businesses to disclose carbon emissions and climate change information before making investment decisions (Crawford & Williams, 2010).

Professional accounting bodies and accounting standards setters have also contributed significantly to promoting carbon emissions and climate change disclosure (Deegan & Haque, 2009). Previously, various shareholders and stakeholders were likely to make commercial decisions based on the monetary performance of the businesses, and then evaluate the decisions through the financial accounting framework. However, Ratnatunga (2007) argues that the financial accounting framework fails to measure, count or present non-financial characteristics of businesses like climate change information, which has become one of the most significant concerns nowadays (Stern, 2006). As supported by Ernst & Young (2009), there are actually few specific accounting principles or standards under either IFRS or US GAAP for dealing with the GHG emission. The EITF03-14 proposed by FASB, and IFRIC 3 lodged by IASB, represent trial guidelines introduced by the accounting profession to regulate reporting standards for carbon emission and climate change. However, those reporting guidelines failed to be implemented owing to the difficulties of measurement and the high cost of compliance (Ernst & Young, 2009). Regardless of those setbacks, both IASB and FASB are working on a joint project to develop accounting guidelines on carbon reporting and trading (IFRS, 2010). Furthermore, efforts have also been made from professional accounting bodies like the ICAEW which call for a single set of standards for climate change reporting (ICAEW, 2009).

2.2.2 Government intention

Government intervention is another driving force promoting corporate disclosure on carbon emissions and climate change topics (Lees, 2010). The initiatives behind this are likely to include a national commitment to the global reduction of greenhouse gas emissions. By 2009, 187 countries had signed the Kyoto Protocol, which aims to reduce GHG emissions 15% less than the emission level in 1990 by 2012 (UNFCCC, 20010). In order to ratify the Kyoto Protocol, various Emission Trading Schemes are carried out by governments around the world (UK Emissions Trading Scheme in 2002, EU Emission Trading Scheme in 2005, New South Wales Greenhouse Gas Reduction Scheme in 2003, NZ Emission Trading Scheme in 2010, etc.). The study conducted by Kolk et al. (2008) suggests that carbon trading is an effective carbon regulation tool used by regulatory bodies to measure, assess, manage and report the greenhouse gas emission and associated impacts. Furthermore, carbon trading also prevents negative political consequences from adding taxes onto affected businesses directly (Kolk et al., 2008). The disclosure of carbon emissions and climate change information, especially quantified in the corporate annual reports and verified by auditors, helps to assess the contribution made by the business to carbon reduction. In a way, carbon emissions and climate change disclosures make the climate change information available to enable regulatory bodies to monitor the obligations of firms and assess environmental policies (Yapa, Harvey & Ellis, 2005). Since standard–setters, like professional accounting bodies, have failed to enact carbon emissions and climate change reporting standards and guidelines (Ernst & Young, 2009， governments are keen to participate in the development of carbon trading schemes and regulate reporting standards (Lees, 2010). Moreover, previous research indicates that firms are actually providing better qualitative disclosure on carbon emissions and climate change information with the higher regulatory pressures (Crawford & Williams, 2010). Scholars are suggesting that carbon accounting and disclosure will move from voluntary reporting to legislative compliance, and governments are likely to regulate the relevant reporting standards (Keyes & Schilmoeller, 2009; Simnett, Green & Huggins, 2009; Lees, 2010).

2.2.3 Change in corporate attitude

An increasing number of firms now tend to treat spending on low-carbon projects, and disclosing carbon emissions and climate change-related information, as opportunities, rather than burdens (Margolick & Russell, 2004). Benefits to firms from disclosing carbon emissions and climate change-related information (United Nations Economic Commission, 2004; Cogan, 2006) are, for example:

- Increased reputation of the firm attracts investment;
- Retained customer loyalty and expanded market share;
- Awareness and managment of carbon emission and climate change-related risks.

Studies suggest that firms are now encouraged to disclose carbon emissions and climate change information to attract investments (Heinkel, Kraus & Zechner, 2001; Barnea et al., 2005). Furthermore, disclosing climate change risks, and corporate strategy dealing with those carbon emissions and climate change issues, helps businesses to develop firm-specific advantages (Kolk & Pinkse, 2008) like customer loyalty and brand-name recognition. Kolk and Pinkse (2008) suggest that those strategies have been well recognized by firms as keys to growth, profitability and survival. Moreover, Korosec and Horvat (2005) find that firms are faced by the growing needs, pressures and demands to disclose risks and corporate strategies in annual reports. This is verified by Beekes and Brown (2006). Their study suggests that corporations with better corporate governance disclose more environmental and social information. Other studies also suggest that the incentives for businesses to invest in green technology and disclose carbon emissions and climate change-related information include obtaining advantages from carbon trading, increasing operational efficiency and avoiding environmental and regulatory obligations (Griffith, 1992; Korosec & Horvat, 2005; Kolk et al. 2008). Therefore, businesses are promoting carbon emissions and climate change disclosure in order to manage risks and benefit from climate change issues.

In summary, the forces leading the development of carbon emissions and climate change disclosure are both external stakeholders; like the general public, investment groups, NGOs, regulatory bodies, professional accounting bodies, etc.; and businesses themselves. The growing awareness of carbon emissions and climate change issues among external stakeholders drives business practice in this area, forcing businesses to enact climate change responsibilities and disclose associated carbon emissions and climate change information. Moreover, the growing number of entities participating in carbon emissions and climate change information disclosure also suggests a change in business views on climate change issues. Businesses start to recognize that they can build competitive advantages by developing climate change-related corporate strategies.

2.3 Global awareness of carbon emissions and climate change disclosures

In recent years, global warming and climate change has caused serious damage to the whole world (Stern, 2006). Not only are island countries threatened by rising sea levels but, as scientific research also indicates, an increase of four degrees Celsius average in temperature will bring significant losses to the global economy, and unrecoverable damage to the ecological system (Stern, 2009). Therefore, carbon emissions and climate change issues have become one of the most significant concerns to the world (Stern, 2006). The public and governments have become aware of global warming and climate change risks and efforts are being made by nations globally to disclose and manage carbon emissions and climate change issues, like the Kyoto Protocol and Copenhagen Summit (Denmark, 2010; UNFCCC, 2010). The EU and Australia are believed to be leaders in the development of carbon emissions and climate change disclosures.

2.3.1 Carbon emissions and climate change disclosures in Europe

The European Union (EU) is believed to be leading the world in climate change negotiations with other industrialized nations (Schreurs & Tiberghien, 2007). The EU has demonstrated a greater willingness to cooperate with regulatory bodies and various non-governmental environmental groups in managing and disclosing carbon emissions and climate change information (Schreurs & Tiberghien, 2007; Oberthur, 2007). The leadership of the European Union on climate change disclosure started with the establishment of the European Union Emissions Trading Scheme (EU ETS), which was first introduced in 2002. The significance of EU ETS is that profit and loss from carbon trading can be presented in financial reports. Carbon emissions and climate change information is then available to both external and internal users of businesses (Ellerman & Buchner, 2007).

The EU ETS, which commenced in 2005 is recognized as the first and largest carbon trading system in the world (Metz, Davidson, Bosch, Dave & Meyer, 2007). It involves nearly 12,000 participating businesses across its 27 member states (Europa, 2007). Another three non-EU members include Norway, Iceland and Liechtenstein, which have also joined the EU ETS, taking the total participating to 30 countries (Europa, 2007). The establishment of the EU ETS is not coincidental, but enforced by various interested parties. Convery (2009) suggests the impetus includes the European Union's commitment under the Kyoto protocol, pressure from various NGOs and the public, as well as lobbying of the European Parliament and Commission. Some scholars believe that the essential driving force derives from those members of the European Union (including Germany, France, Austria, Sweden, Netherlands, Denmark and UK), who can benefit from a carbon trading system (Bohringer, 2002; Schreurs & Tiberghien, 2007).

The contribution that EU ETS made to the development of carbon emissions and climate change disclosure is indicated by how the scheme works. The principle of EU ETS, interpreted by Skjaerseth and Wettestad (2009), is that an enterprise can either pay a fine or purchase an emission surplus from another firm to the amount disclosed as being in excess of the allowance allocated. As illustrated by Kolk et al. (2008), businesses need to accurately count and disclose emissions information in order to measure their trading profit or loss for the year, as well as budget for the purchase (or sale) of emission credits in the coming financial period. Therefore, businesses under EU ETS are both encouraged and enforced to make carbon emissions and climate change disclosures. The early results on implementing EU ETS indicate a decreasing trend in carbon emission and positive responses related to climate change disclosures for participating businesses (Ellerman & Buchner, 2008). Some studies, however, argue that the downturn in carbon emission may result from the global recession (Chevallier, 2009; Spies Butcher & Stilwell, 2009). Nevertheless, it cannot be denied that the EU ETS is so far our most significant achievement in managing and disclosing climate change and global warming risk (Ellerman & Buchner, 2007; Egenhofer, 2007; Clo, 2009). The EU ETS has by now developed 8 platforms for carbon exchange and trading which include Blue Next in Paris, Climex in the Netherlands, Energy Exchange in Austria (EXAA), Italian Power Exchange (IPEX), European Climate Exchange (ECX), London Energy Brokers Association (LEBA), European Energy Exchange (EEX), and Nord Pool (World Bank, 2010). Labatt and White's (2007) study suggests that carbon trading helps in the management and disclosure of carbon emissions and climate change issues. The establishment of EU ETS and various trading platforms reflects the increasing global awareness of carbon emission and climate change issues, and also provides a model to other nations for how firms could disclose emission information and trade carbon units.

2.3.2 Carbon emissions and climate change disclosure in Australia

Another country that leads in promoting carbon emissions and climate change disclosures is Australia. With the highest per capita emissions in the world (Combet, 2009), Australia signed the Kyoto protocol in 1998 and started to implement it in 2008 (Deegan & Haque, 2009). The development of climate change-related corporate disclosure in Australia is consistent with the trend in carbon emissions and climate change disclosure developed in other parts of the world. Early in the 1990s, firms prepared environmental statements for internal management use, rather than for external users (Deegan & Haque, 2009). In contrast, environmental information including carbon emissions and climate change information is increasingly likely to be found in the corporate reports nowadays (Yapa et al., 2005; Simnett et al. 2009).

The major contribution Australia has made to the disclosure of carbon emissions and climate change information is in the regulation of reporting standards and their enforcement at a new assurance level (Yapa et al, 2005; Simnett & Nugent, 2007). The Yapa et al. (2005) report indicates that the environmental reports previously prepared by companies were for internal use only with little sense of assurance of the content. With the growing awareness of GHG emissions and climate change issues in the public, several government programs operating in Australia mandate firms to disclose and report emission information to stakeholders (Simnett & Nugent, 2007). The Simnett and Nugent's (2007) study also indicated effort from the Australian government to develop a single streamlined reporting standard for carbon emission and climate change disclosures.

The most obvious advantage in including carbon emission and climate change information in the annual report is the increased credibility of the disclosure (Yapa et al., 2005). An auditor will be asked to review the carbon emissions and climate change information in the annual report and comment in the auditor's independent report, thus adding assurance to the information being disclosed. Simnet and Nugent (2007) suggest that less than 10% of the corporations listed on the Australian Stock Exchange disclose carbon emission and climate change information in their annual reports. However, a later on study found an increasing number of firms disclosing carbon emission and climate change-related information in annual or sustainability reports (Simnett et al., 2009). In addition to that, the Australia Auditing and Assurance Standard Board is working with international communities and professional accounting bodies to build up an assurance standard on carbon emission and climate change disclosures (Shying & Wong, 2007; Simnett et al., 2009).

The significance of the EU's and Australia's behaviour towards carbon emission and climate change topics is that they set examples to rest of the world for disclosure of those issues, and ensure the credibility of the information being disclosed (Crowley, 2007). In contrast to nations like EU and Australia which lead in developing carbon emissions and climate change disclosures, some key players in the global economy, like the US, ought to contribute more to managing and disclosing climate change issues (Green Peace, 2001). Aguilar (2010, p.10) suggests that companies in US “are doing a poor job at reporting their risks stemming from climate change”. China is another large energy consumer in the world. However, as a developing nation, China is able to be more flexible in setting emission reduction targets under the Kyoto Protocol compared with developed nations (Cirman, Domadenik & Polona, 2009). The EU and Australian cases have built up a framework for developing carbon emissions and climate change disclosures in the world context which can be used to explore the disclosure status in China. The following paragraphs will discuss the disclosure of carbon emission and climate change information in China in detail and then analyze that discussion for research gaps.

2.4 Present disclosure status in China

China is one of the largest emerging markets, and at the same time, one of the largest energy consumers in the world. Coal is the primary energy source in China, and has occupied around 70% of the energy consumption consistently since China reformed and opened to the world in 1978 (National Bureau of Statistics of China, 2010.; Xie & Economide, 2009). Alone with the rapid growth of the Chinese economy, the total energy consumption of China has dramatically increased in the last decade (Cirman et al, 2009; National Bureau of Statistics of China, 2010). China nowadays consumes 40% of the world’s coal consumption (Xie & Economide, 2009). On the other hand, the understanding and development of climate change reporting in China is believed to lag behind the world’s (Shan, 2007).

2.4.1 Carbon emissions and climate change disclosure studies in China

Studies have been carried out to investigate the development of carbon emissions and climate change disclosures in China. However, contradictory conclusions are have been found in terms of whether China has done satisfactory work on disclosing carbon emissions and climate change-related environmental information. Some scholars, represented by Huchison (2000), believe that China is well behind the world on climate change disclosure topics, while others, advocated by "Corporate social responsibility in China" (2005) indicate growing interest in China in environmental issues at both corporate and public level.

On one hand, a study undertaken over a decade ago found that emerging markets around the Asia-Pacific region, like China, had realized the importance of environmental issues and showed willingness to cooperate with advanced nations and NGOs (Lempriere, Stanbury & Vertinsky, 1996). This is supported by Wickerham and Zadek (2009). Their study finds that there is increasing understanding in China at both public and corporate level about climate change issues. Wickerham and Zadek's (2009) study also suggests that businesses in China have become aware of the value of disclosing carbon emissions and climate change information to the public, as well as seeking external third party assurance on information disclosed. Moreover, Lwami (2004) states that the rising energy efficiency has made stabilised carbon emission in East Asian countries, and China is trying to increase energy efficiency in order to act as a responsible 'climate change' nation ("Coal consumption is slashed", 2009).

However, the majority of studies undertaken suggest that although a few improvements have been made thus far, current carbon emissions and climate change disclosures in China are still poor (Economy, 2007; Lwami, 2004; Nolan, 2005). According to Managi and Kaneko (2006), environmental disclosure in China is in fact decreasing in quality, because of ineffective management and incomplete regulations. The report suggests that China is giving economic development first priority. Therefore, environmental regulations and policies are not enforced by local governments, and thus businesses are not under pressure to disclose and manage climate change risks. A similar view, presented in Nolan's study (2005), is that China did not measure or disclose the climate change consequences behind its superior economic growth rate. A few studies address the primary reasons causing the poor carbon emissions and climate change reporting and disclosures in China and these claim that weak enforcement from both central and local governments and businesses in China result in a lack of incentives (Ohsita & Ortolano, 2006; Economy, 2007; Macbean, 2007).

2.4.2 Factors in China influencing the development of carbon emissions and climate change disclosures

Regarding the forces promoting carbon emissions and climate change reporting and disclosures in China, businesses themselves play an important role (Wickerham & Zadek, 2009). More and more businesses in China started acting in an environmentally friendly way and revealed climate change information to the public on the belief that this should create competitive advantages over their competitors (Wickerham & Zadek, 2009). Wickerham and Zadek (2009) also found that the government plays a vital role in the Chinese economy in enforcing businesses to comply with environmental disclosure policies and regulations. It is agreed by Lincoln (2004) and Wong (2009), that the conservative culture and centralized political structure in China, and the attitude and actual conduct of both the central and local governments are the keys in implementing and enforcing environmental policies.

The accounting professions are also believed to play an influential role in China in developing carbon emissions and climate change disclosures (Macbean, 2006). Despite the growing interest from the public and businesses in climate change disclosure, Macbean (2006) claims that a shortage of environmental accounting professionals makes retards climate change disclosure in China. Moreover, the diversity of regional cultures in China makes businesses even harder to educate towards a single corporate social reporting standard (Ip, 2008). McKibbin (2006) suggests that the majority of the firms disclosing environmental risks in China are the ones listed on the Stock Exchange. Even though that is the case, Xiao's research (2008) indicates the social and environmental reporting for the Chinese listed firms is still only in the beginning stage and varies among different industries. Furthermore, even the public listed companies lack incentives and willingness to cooperate with environmental NGOs, like the CDP, in disclosing climate change information. The CDP initiates its database about China in 2008 and requests emission and corporate strategy information from the 100 listed firms with the largest market value. In 2008, 5 out of the 100 firms filled in the survey, 20 provided some information, 17 firms declined to participate, and 58 of them did not respond. The number of firm answers to the CDP survey increased to 11 in 2009, while 27 refused to cooperate (Xin Hua News, 2010).

2.4.3 Developing research questions

Previous research studies on the topic of carbon emissions and climate change disclosures in China have been focused primarily at the national level. However, little research has been done at corporate level to study the elements, more specifically carbon emissions and climate change related information, within the annual report prepared by individual firms. As mentioned above, studies undertaken previously have come to different conclusions. Mangi and Kaneko (2006) reveal that the disclosure of carbon emissions and climate change-related information in China is well behind the world. In contrast, Wickerham and Zadek (2009) state that important progress has been recorded in China in terms of disclosure and third party assurance on the carbon emissions and climate change information being disclosed. Therefore, this study will explore the climate change response of the individual businesses in China by analysing their annual reports.

Meyer and Scott (1983) suggest that organizational behaviours are subject to the nature of the business and the institutional environment. In addition, Pacca (2009), Sioshansi (2009) and Stern (2006) find that the power generation industry are particularly affected and sensitive to carbon emissions and climate change topics. As a result, this report will investigate and explore how Chinese listed companies, more specifically the Chinese power companies, are disclosing carbon emissions and climate change information. The research aims to answer the following questions:

1. How, and to what extent, do Chinese power companies disclose carbon emissions and climate change information in their annual report?
2. Why do (or don't) Chinese power companies disclose carbon emissions and climate change information in their annual report?

Chapter Three Research Design

3.0 Introduction

The previous literature review chapter explained the concept of climate change disclosure and outlined the disclosure status of western nations and of China. More specifically, the chapter provided a climate change disclosure framework in developed countries which can be employed to investigate the disclosure practices by Chinese entities. This Chapter explains the research design and the underlying methodology in detail. Most importantly, it explains the content analysis method employed in this study to record carbon emission and climate change-related information from annual reports of Chinese corporations. The chapter is structured as follows. Section 3.1 details the content analysis employed. Section 3.2 discusses the difficulties in recording disclosure information. Section 3.3 provides a summary, and then concludes the research design chapter.

3.1 Content Analysis

Content analysis has been widely used in research studies for counting, categorizing, associating and interpreting the content of written, recorded, or published communications (Cooper & Schindler 2006). It involves codifying both quantitative and qualitative information into predetermined categories (Guthrie & Abeyeskera, 2006). Content analysis works on the principle that the more important a subject is considered to be, then the more times it will be mentioned in words, phrases, themes or images (Crowther & Lancaster, 2009). Jose and Lee (2007) suggest the content analysis method has been widely used in environmental responsibility researches to analyze published information. This is supported by Steenkamp and Northcott (2007) who describe the use of content analysis to reveal accounting disclosure in published corporate reports. Therefore, in order to investigate whether and how carbon emissions and climate change information are disclosed by Chinese entities, a content analysis method is employed in this study. There are also some important issues that need to be addressed when conducting a content analysis in this research: choosing the appropriate corporate reports to analyse, constructing the categories to record climate change related information, and selecting the research units. The following paragraphs explain the research processes of this study in further detail.

3.1.1 Choice of data sources

Many previous studies use annual reports as the sole data source when conducting content analysis (Branco & Rodrigues, 2006; Unerman, 2000). The advantages of applying research to annual reports are the availability of the reports and the credibility of information being disclosed in them (Gray, Kouhy & Lavers, 1995; Neu, Warsame & Pedwell, 1998; Tilt, 1994). To address the climate change disclosure issue, annual reports are the prime source of carbon emission and climate change information for a particular company (Guthrie & Abeysekera, 2006; O'Donovan, 2002). Gray et al. (1995) also suggest that the annual report is perhaps the most important communication medium for a business to demonstrate its social image to various stakeholders. Therefore, this research study also considers the annual reports of Chinese companies as the prime data sources. In addition, the KPMG (2009) report indicates a growing awareness of CSR reporting in Chinese corporations, but there is still a lack of integration in China between annual reports and the social and environmental information disclosed. In that case, in addition to the annual reports, other secondary sources of data in the form of corporate social reports, environment reports, and media reports publicly available are also used in this research to help to answer the research questions.

3.1.2 Sample selection

Annual reports of Chinese power businesses were selected for content analysis. Sioshansi (2009) and Pacca (2009) suggest that the power generation industry would be particularly affected and sensitive to carbon emission and climate change topics. As a result, the Chinese power companies listed on both the Shanghai Stock Exchange and the Shenzhen Stock Exchange were targeted for the research. Fifty-six power enterprises were listed in the Chinese stock market, representing 2.7% of the entire stock value in 2009 (GF Securities, 2009; Chinese Power News Net, 2010). Among the 56 listed power firms, the 10 largest power groups (Some of them are parent companies that control more than one listed firm) produced 58% of the electricity in China in 2008 (Green Peace, 2009), and were all ranked as members of the 500 largest corporations in China in 2009. Further selection criteria are applied to exclude those businesses that (a) do not have serious carbon dioxide emissions or climate change impacts and/or (b) do not publish annual reports in both Chinese and English. Based on these criteria, seven out of the ten power companies were selected for this research based on their market share, capital size, and the availability of English annual reports as well as Chinese versions. According to Green Peace (2009), the seven selected power companies produced 44% of electricity in China in 2008. The other three companies being excluded for this research are China Three Gorges Corporation (purely produce energy from hydro resource), China Guodian Corporation (no English version of annual reports available) and Zhejiang Provincial Energy Group Company Ltd (no English version of annual reports available). Table 3.1 shows the seven power businesses targeted for this research, as well as the availability of their annual reports.

Table 3.1 List of power businesses in China targeted for the research

	Company Name	Annual reports available
1	Huaneng Power Intl. Inc.	2000-09
2	Datang Intl Power Generation Co.	2002-09
3	Huadian Power Intl. Co.	2000-09
4	China Power Investment	2004-09
5	Shenhua Group	2005-09
6	Huarun Power Group	2003-09
7	Guangdong Yudean group	2003-09

Sources: Retrieved from companies' website

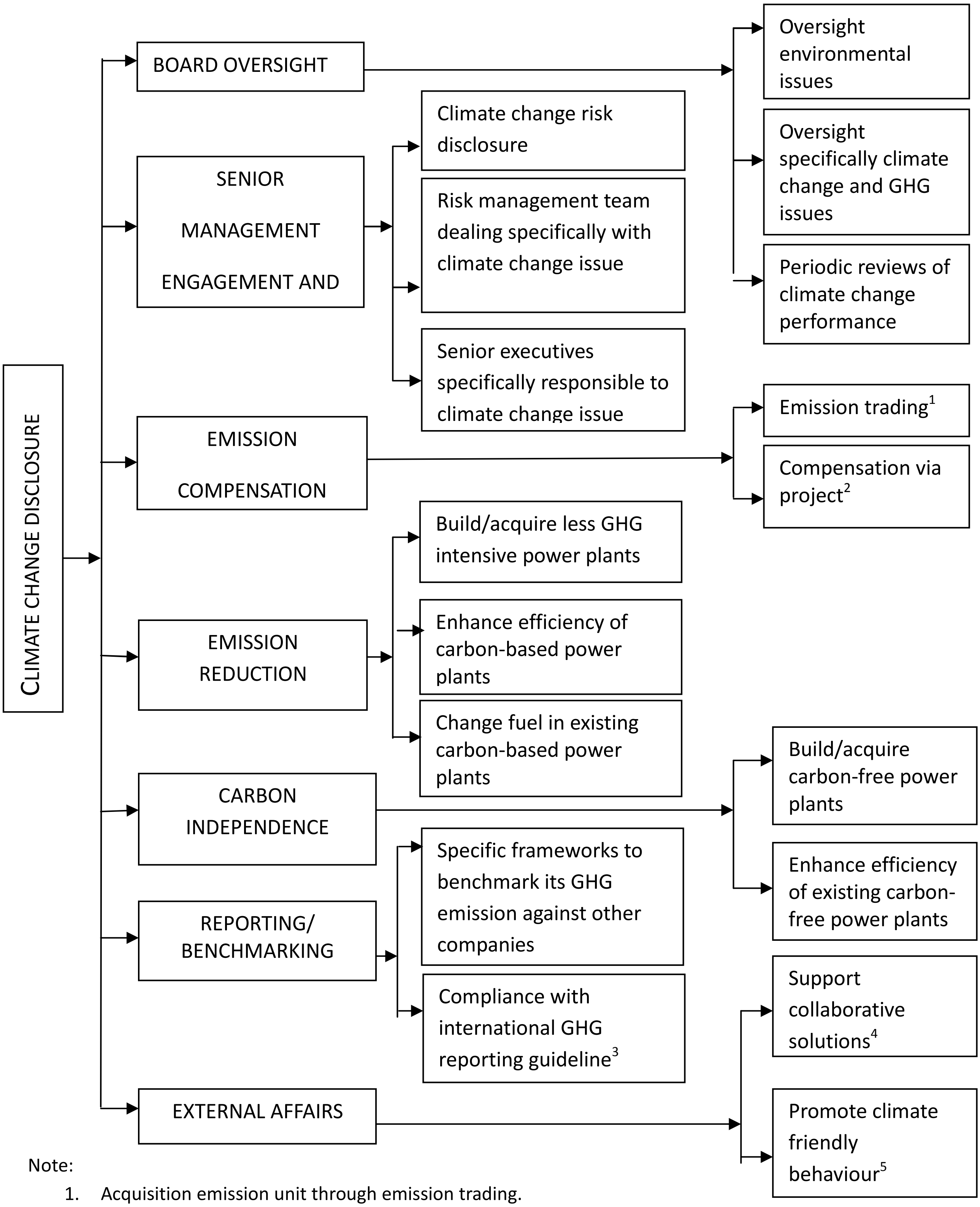
3.1.3 Constructing research categorise: the pilot study

The next step to develop the research method is to construct categories of content to be analysed. Guthrie et al, (2004) suggest the basis of categorizing is particularly important in content analysis method. Steenkamp and Northcott (2007) also state that it is useful to use categories previously adopted by other studies, so that comparisons can be made between different studies. However, problems could arise in adopting categories from earlier studies. The measures of carbon emission and climate change disclosure vary in different countries, and the determination of climate change disclosure in the Chinese economy may not fall within the previous categories developed in western studies. Therefore a pilot study was conducted at the beginning to find out whether categories and sub-categories available from previous studies were appropriate for application to the Chinese situation.

This study followed the themes of climate change disclosure developed by Deegan and Haque (2009) and Weinhofer and Hoffmann (2010) as the starting point to cover both carbon emissions and risk management information disclosed in the annual reports. Hence, any categories developed from previous studies for accounting practices are not important in this case. Figure 3.1 illustrates the initial categorisation used to investigate the climate change disclosure of Chinese businesses. These categories are: board oversight; senior management, engagement and responsibility; emission compensation; emission reduction; carbon independence; reporting and benchmarking; and external affairs.

Before starting to conduct research using these categories for Chinese businesses, it would be necessary to take a further pilot study to the Chinese businesses to find out whether the categories apply to the Chinese economy. 10 annual reports were analysed accordingly. The results indicated that climate change disclosure in China mostly fits into the categories developed by Deegan and Haque (2009) and Weinhofer and Hoffmann (2010), but modifications were needed for some of the themes.

Figure 3.1 Reporting categories used to capture climate change disclosure



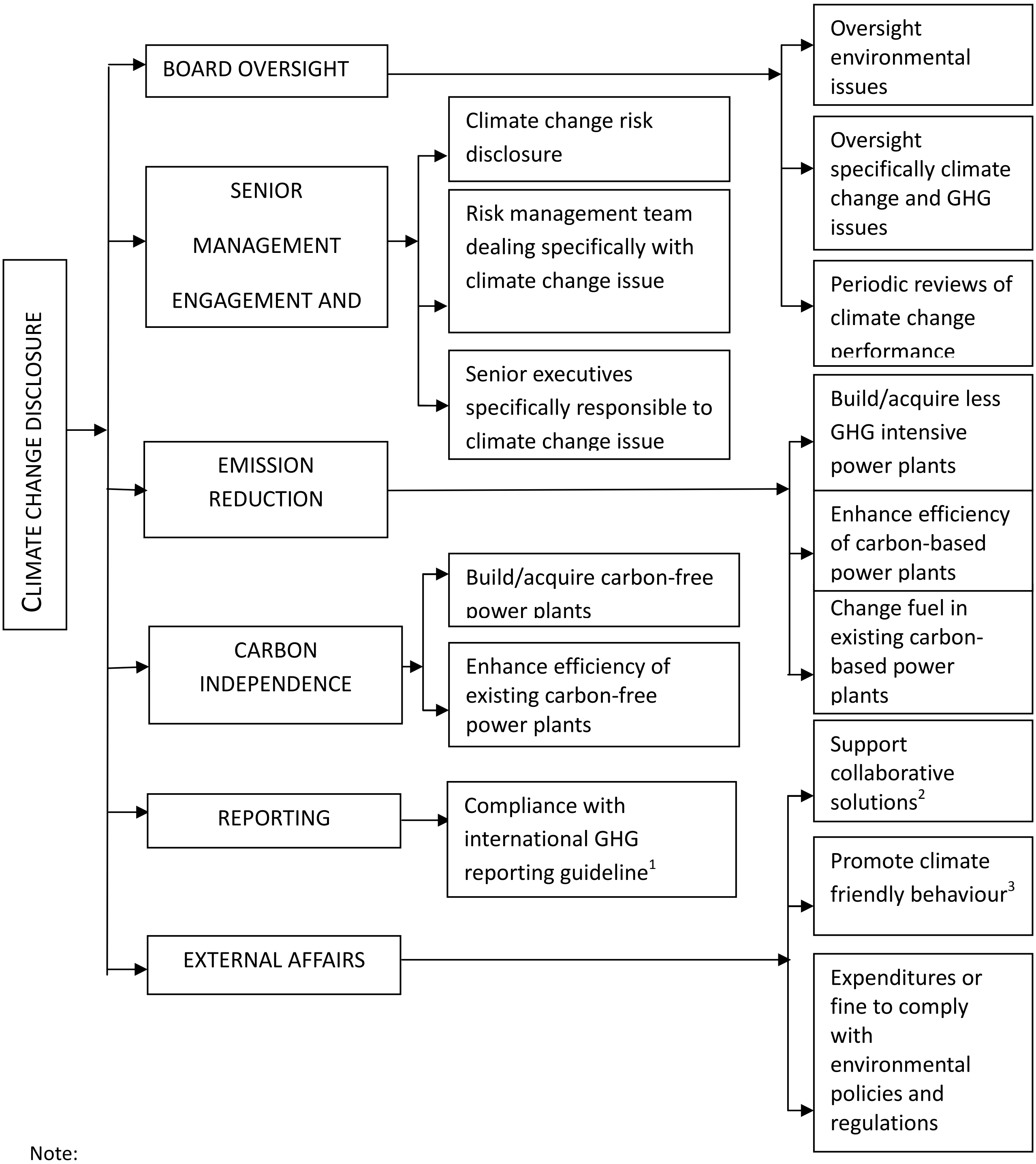
Note:

1. Acquisition emission unit through emission trading.
2. Investment in emission offsetting projects.
3. Following global adopted reporting standards like Global Reporting Initiatives (GRI) or Triple Bottom Line format to report its greenhouse gas emissions and trends.
4. E.g. work with the government and other organisation in voluntary emission reduction project.
5. E.g. raise awareness through environmental sustainability education in the community.

Source: Adopted from Deegan and Haque (2009) and Weinhofer and Hoffmann (2010) studies

The first typical issue is that China is not scheduled to establish its own Emission Trading Scheme until the 12th "Five Year Plan", covering 2011 to 2015 (Li, 2010). Thus, the emission compensation category does not apply to the current Chinese economy, and could not be included in this study. Furthermore, it is not common in China for businesses to benchmark their greenhouse gas emissions against other companies. Hence, the benchmarking sub-category is not used in the present content analysis. An additional compliance cost sub-category under external affairs indicates expenditures or fines for compliance with environmental policies and regulations. Figure 3.2 shows the categories as modified from Deegan and Haque (2009) and Weinhofer and Hoffmann (2010). It is believed the new categories are capable of investigating carbon emission and climate change disclosure in China.

Figure 3.2 Reporting categories used to capture climate change disclosure in Chinese situation



Note:

1. Following global adopted reporting standards like Global Reporting Initiatives (GRI) or Triple Bottom Line format to report greenhouse gas emissions and trends.
2. E.g. work with the government and other organisations in a voluntary emission reduction project.
3. E.g. raise awareness through environmental sustainability education in the community.

Source: Developed from Deegan and Haque (2009) and Weinhofer and Hoffmann (2010) studies

3.1.4 Unit of Analysis

Wimmer and Dominick (2003) suggest that selecting an appropriate unit of measurement is one of the key elements of content analysis. The most frequently adopted analysis units are words (Wilmshurst & Frost, 2000), page proportions (Guthrie & Parker, 1989; Campbell, 2000) and sentences (Milne & Adler, 1999). Each measurement has both advantages and disadvantages when converting qualitative information into quantitative measures. Steenkamp and Northcott (2007) comment on the choice of unit:

> While some CA researchers claim that larger analysis units (e.g. paragraphs) enhance the analyst's ability to capture contextual meaning, this presents a practical challenge in meeting the requirement of mutual exclusivity in the coding of text to categories. Smaller units (such as sentences or words), but tend to abstract the analysis unit from its surrounding context. (p.17)

From the pilot study taken earlier to search for carbon emission and climate change information in 10 sample annual reports, it is found that businesses are likely to employ images, sheets, etc. in annual reports to disclose carbon emission and climate change-related information. As a result, a page proportion method is employed to cover not only words, but also charts and images in the annual reports of selected firms.

Similar to the method adopted by Milne and Adler (1999) to measure the reliability of social and environmental disclosures in corporate annual reports, every page of the research reports was segmented into 100 cells by a transparent grid (4 column and 25 rolls). Each cell was the same length and height to represent 1% of the weight on that particular page. The total number of cells representing climate change information was then added at the end of each page to reveal the proportions of annual reports dedicated to addressing to the carbon emissions and climate change disclosures. The blank portion of surrounding charts, quotes or images was treated the same as the printed material, assuming it also represents that category of carbon emission and climate change measurement. Table 3.2 illustrates the grid used in the research.

Table 3.2 Example of page proportion method adopted to measure carbon emission and climate change disclosure information

Source: Prepared for this study

Table 3.3 Example of recording sheet used to transcribe carbon emission and climate change information

COMPANY NAME									**Year**						
	CATEGORY														
	BOARD OVERSIGHT			**CLIMATE CHANGE RISK MANAGEMENT**			**EMISSION REDUCTION**			**CARBON INDEPENDENCE**		**REPORTING**	**EXTERNAL AFFAIRS**		
	Environmental issues	Climate change and GHG emission issues	Periodic review	Risk disclosure	Risk management team	Senior executives responsibility	Build or acquire less GHG intensive power Plants	Enhance efficiency	Change fuel	Build or acquire carbon-free power plants	Enhance efficiency	Compliance with international GHG reporting guideline	Support collaborative solutions	Promote climate friendly behaviour	Cost to comply with environmental regulations
Qualitative/ quantitative[1]															
News[2]															
Auditable[3]															
Page proportion															

Note:

1. Whether information is descriptive or quantitative.
2. Whether information provides good, bad or neutral news to the business.
3. Whether information can be verified by auditors.

Source: Prepared for this study

3.1.5 Recording and transcribing research data

The next step in conducting a content analysis is to record data into pre-determined categories and sub-categories. In this case, annual reports of the selected Chinese businesses are searched using the page proportion method, and data is then recorded on data sheets. In addition to page proportion, other aspects of the carbon emission and climate change information are also counted. These additional categories include whether a particular piece of information is qualitative or quantitative; whether information is included in the financial reports or notes, thus auditable; and whether data brings good or bad news to the entity. Table 3.3 shows the data recording sheet categorised into these themes.

3.2 Challenge and difficulties experienced in recording data

The prime challenge experienced by the researcher is making subjective judgements during the content analysis study. These subjective judgements include interpreting the meaning of texts and then transcribing them into appropriate categories; measuring the proportion of a particular theme when more than one theme appeared in a sentence or when blank space is involved.

This research follows the categories developed by Deegan and Haque (2009) and Weinhofer and Hoffmann (2010). In addition, a pilot study was taken in advance to modify categories and sub-categories, so then they applied to the Chinese context. However, the researcher still faced difficulties in making interpretations, especially if many messages are covered in a text. Steenkamp and Northcott (2007) suggest that "subjectivity is inherent in the CA (content analysis) method…it is important to be explicit about how subjective judgements are made so that they are transparent to others" (p.21). In this study, the researcher applies this principle when conducting content analysis and tries to make inferences from both contextual words and images.

Another challenge that emerges during content analysis research is recording the blank space around the carbon emission and climate change disclosures in the annual reports. A rule was set in the research design that classifies the blank space surrounding text and images exactly as the material within. However, judgement is necessary to measure the percentage of blank space when only part of the text or image represents carbon emission and climate change disclosures.

3.3 Conclusion

This chapter explores the research design, and the difficulties faced when conducting this research. In order to investigate the carbon emission and climate change disclosure status in Chinese economy, a content analysis was employed to research annual reports of seven listed power enterprises in China. A pilot study was undertaken to modify the classifications of carbon emission and climate change information employed by Deegan and Haque (2009) and Weinhofer and Hoffmann (2010) to make sure they applied to the Chinese context. A page proportion method was used to measure the percentage of climate change-related information disclosed in the annual reports. Rules were set at the beginning, e.g. each cell represented 1% of the page regardless of its text or image nature, and blank spaces were treated the same as printed materials. The rules were followed consistently through the research to increase its validity. Data were then recorded and transcribed to the data sheet. Challenges and difficulties that emerged during the research including the subjectivity of judgements are also discussed at the end of the chapter. The next chapter evaluates and analyzes the data recorded using the research methodology introduced in this chapter.

Chapter Four Findings and Analysis

4.0 Introduction

This chapter analyzes data transcribed from the annual reports of seven largest power businesses in China, and discusses the findings. It follows the methodological approach developed in the last chapter, and records carbon emission and climate change information disclosed by Chinese power businesses using the page proportion method. Data was classified into pre-determined categories adopted from earlier studies like Deegan and Haque (2009) and Weinhofer and Hoffmann (2010), and was then entered into Microsoft Excel worksheets for analysis. The chapter is organized as follows. Section 4.1 provides an overview of the research results. Section 4.2 analyzes the findings in three phases. Section 4.3 demonstrates carbon emissions and climate change disclosures in different categories. Section 4.4 discusses the quality of climate change disclosure. Section 4.5 compares climate change disclosure in annual reports with other disclosure channels. Section 4.6 compares carbon emissions and climate change disclosure in China with that of other nations. A final section provides a summary and concludes the chapter.

4.1 Overview of climate change disclosure in annual reports

This study has collected the proportion of carbon emission and climate change information disclosed in each page of the annual reports, and added them into a total number of equivalent pages for every annual report. Table 4.1 shows the total number of equivalent pages in annual reports disclosing carbon emission and climate change information.

Table 4.1 Number of equivalent pages disclosing climate change information in annual reports

Company name	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
China Power Inv.	N/A[4]	N/A	N/A	N/A	7.71	9.55	8.97	9.38	9.20	9.42
Datang	N/A	N/A	4.00	3.48	5.26	6.44	8.47	7.14	8.02	9.06
Huadian	0.92	1.31	2.24	5.36	6.95	6.44	6.97	7.44	7.00	8.76
Guangdong	N/A	N/A	N/A	5.50	5.55	6.38	5.98	6.59	7.98	8.41
Huaneng	0.41	0.30	2.11	2.02	5.65	2.96	5.10	5.69	6.21	6.48
Huarun	N/A	N/A	N/A	1.47	3.40	2.58	4.04	3.36	5.13	5.61
Shenhua	N/A	N/A	N/A	N/A	N/A	4.04	3.70	4.57	3.59	5.24
Total lengths of pages[1]	1.33	1.61	8.35	17.83	34.52	38.39	43.23	44.17	47.13	52.98
Average per report[2]	0.67	0.81	2.78	3.57	5.75	5.48	6.18	6.31	6.73	7.57
Percentage change[3]		21.05%	245.76%	28.12%	61.34%	-4.68%	12.61%	2.17%	6.70%	12.41%

Note: 1.Total lengths of pages are calculated by adding value of equivalent pages from seven companies in that particular year.

2. Average per report represents the total number of equivalent pages disclosing climate change information divided by the number of annual reports available in a particular year.

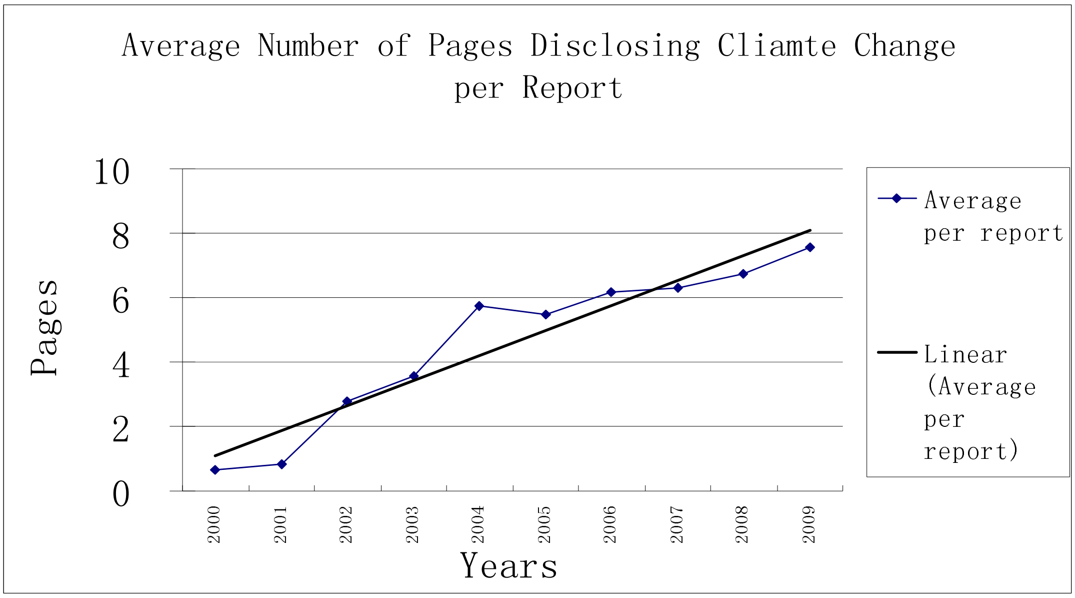
3. Percentage change stands for the percentage increase (decrease) of the average number of pages per report compares to the previous year.

4. N/A is abbreviating for “Not Available”, which means the information (annual report of that company) is not available in that particular year.

Source: Prepared for this study

In general, the lengths of annual reports disclosing carbon emission and climate change information in Chinese power businesses have increased significantly since 2000. The average number of equivalent pages has increased from 0.67 pages in 2000 to 7.74 pages in 2009. Figure 4.1 indicates the growth of climate change disclosure per annual report on average. The increasing lengths of climate change disclosure in annual reports indicate the growing popularity of environmental reporting in China, which is consistent with previous studies (Lempriere et al., 1996; Wickerham & Zadek, 2009).

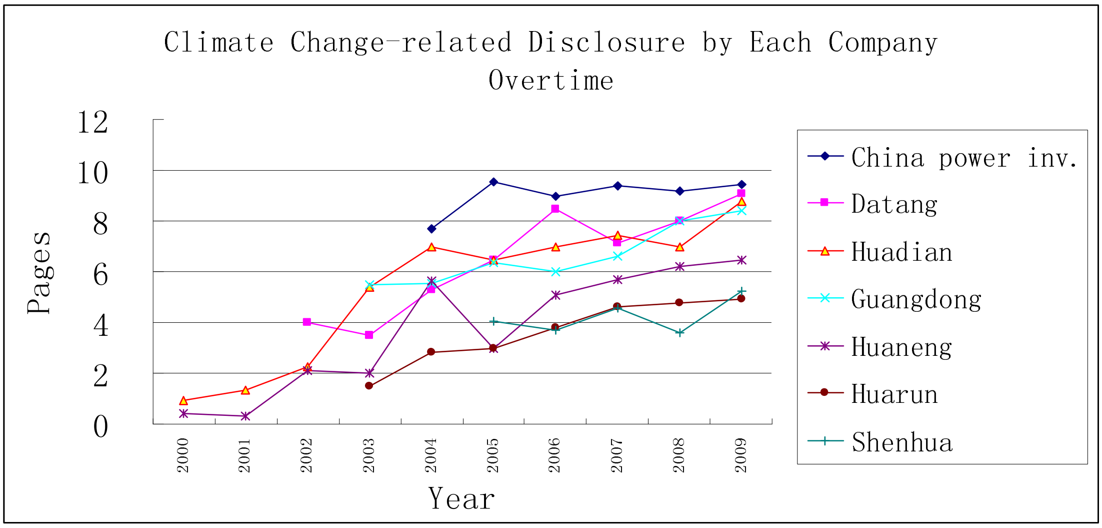
Figure 4.1 Average numbers of equivalent pages disclosing climate change information per report



Source: Prepared for this study

Furthermore, businesses involving operations with a greater proportion of renewable resources were disclosing more carbon emission and climate change information in annual reports than those entities which generate less electricity from renewable resources. Figure 4.2 shows the number of equivalent pages in annual reports disclosing climate change information by company. China Power Investment is found to reveal more carbon emission and climate change information than other power businesses, whose production from renewable resources accounts for 16.92% of its total business operation (Green Peace, 2009). On the other hand, Huarun and Shenhua which focuses on generating power from thermal power stations are disclosing less climate change information than the others. The differences between businesses in disclosing carbon emission and climate change information may indicate that different businesses may have different disclosure strategies towards carbon emissions and climate change issues.

Figure 4.2 Climate change disclosures by each company in equivalent pages



Sources: Prepared for this study

4.2 Disclosures by phases

The period of analysis in this research has been divided into three phases. Phase one represents the movement of climate change disclosure in Chinese power businesses from 2000 to 2001, whilst phase two is from 2002 to 2004 and phase three is 2005 and onwards. The choice of three phases is based on two critical incidents which occurred in the researched period: China ratified *The Kyoto protocol* in 2002, and various nations adopted the protocol in 2005 ("Climate change: the big emitters", 2005). The researcher believes that each of the three phases presents the characteristics of climate change disclosure in different time frames.

Table 4.2 Summary of carbon emissions and climate change information disclosed in page proportion by Huadian

		Phase 1		*Phase 2*			*Phase 3*				
Huadian		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
BOARD OVERSIGHT	1. Environmental issues	11%	18%	32%	49%	117%	83%	72%	143%	79%	164%
	2. Climate change and GHG emission issues	0%	6%	14%	28%	108%	74%	29%	45%	34%	113%
	3. Periodic review	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Sub Total[1]	11%	24%	46%	77%	225%	157%	101%	188%	113%	277%
CLIMATE CHANGE RISK MANAGEMENT	1. Risk disclosure	0%	0%	15%	26%	54%	39%	21%	48%	19%	27%
	2. Risk management team	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	3. Senior executives responsibility	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Sub Total	0%	0%	15%	26%	54%	39%	21%	48%	19%	27%
EMISSION REDUCTION	1. Build or acquire less GHG intensive power Plants	12%	7%	16%	57%	39%	72%	43%	116%	75%	142%
	2. Enhance efficiency	7%	15%	8%	43%	52%	27%	41%	35%	48%	24%
	3. Change fuel	0%	0%	3%	14%	26%	9%	18%	35%	21%	27%
	Sub Total	19%	22%	27%	114%	117%	108%	102%	186%	144%	193%
CARBON INDEPENDENCE	1. Build or acquire carbon-free power plants	19%	57%	86%	143%	82%	174%	235%	138%	186%	135%
	2. Enhance efficiency	0%	0%	5%	62%	45%	71%	56%	44%	21%	50%
	Sub Total	19%	57%	91%	205%	127%	245%	291%	182%	207%	185%
REPORTING	Compliance with international GHG reporting guideline	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Sub Total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
EXTERNAL AFFAIRS	1. Support collaborative solutions	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	2. Promote climate friendly behaviour	36%	28%	37%	72%	115%	64%	136%	82%	174%	143%
	3. Cost to comply with environmental regulations	7%	0%	8%	42%	57%	31%	46%	58%	43%	51%
	Sub Total	43%	28%	45%	114%	172%	95%	182%	140%	217%	194%
Total[2]		**0.92**	**1.31**	**2.24**	**5.36**	**6.95**	**6.44**	**6.97**	**7.44**	**7.00**	**8.76**

Note: 1. The Sub Total values are presented in terms of page proportion, e.g.100% = 1 equivalent page in annual report.

2. Total values are presented in number of equivalent pages, e.g. 1 = 1 equivalent page in annual report.

Source: Prepared for this study

Table 4.3 Summary of carbon emissions and climate change information disclosed in page proportion by Huaneng

		Phase 1		*Phase 2*			*Phase 3*				
Huaneng		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
BOARD OVERSIGHT	1. Environmental issues	7%	12%	47%	34%	45%	37%	48%	39%	58%	43%
	2. Climate change and GHG emission issues	0%	0%	26%	109%	143%	124%	114%	116%	128%	135%
	3. Periodic review	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Sub Total[1]	7%	12%	73%	143%	188%	161%	162%	155%	186%	178%
CLIMATE CHANGE RISK MANAGEMENT	1. Risk disclosure	0%	0%	7%	5%	38%	43%	43%	37%	46%	52%
	2. Risk management team	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	3. Senior executives responsibility	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Sub Total	0%	0%	7%	5%	38%	43%	43%	37%	46%	52%
EMISSION REDUCTION	1. Build or acquire less GHG intensive power Plants	0%	0%	0%	0%	0%	0%	23%	27%	43%	38%
	2. Enhance efficiency	24%	2%	100%	39%	154%	73%	219%	138%	196%	187%
	3. Change fuel	0%	2%	2%	0%	94%	5%	4%	11%	47%	42%
	Sub Total	24%	4%	102%	39%	248%	78%	246%	176%	286%	267%
CARBON INDEPENDENCE	1. Build or acquire carbon-free power plants	10%	14%	13%	15%	27%	0%	5%	113%	27%	57%
	2. Enhance efficiency	0%	0%	0%	0%	0%	0%	0%	0%	5%	0%
	Sub Total	10%	14%	13%	15%	27%	0%	5%	113%	32%	57%
REPORTING	Compliance with international GHG reporting guideline	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Sub Total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
EXTERNAL AFFAIRS	1. Support collaborative solutions	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	2. Promote climate friendly behaviour	0%	0%	11%	0%	14%	0%	0%	12%	9%	23%
	3. Cost to comply with environmental regulations	0%	0%	5%	0%	50%	14%	54%	76%	62%	71%
	Sub Total	0%	0%	16%	0%	64%	14%	54%	88%	71%	94%
Total[2]		0.41	0.3	2.11	2.02	5.65	2.96	5.1	5.69	6.21	6.48

Note: 1. The Sub Total values are presented in terms of page proportion, e.g.100% = 1 equivalent page in annual report.

2. Total values are presented in number of equivalent pages, e.g. 1 = 1 equivalent page in annual report.

Source: Prepared for this study

4.2.1 Phase one: 2000-2001

Only the Huadian and Huaneng annual reports are available in this period in both Chinese and English versions. The summaries of carbon emissions and climate change disclosures for both companies are presented in Table 4.2 and Table 4.3.

This period indicates minimal carbon emission and climate change disclosures in annual reports for both Huadian and Huaneng. Limited environmental issues have been disclosed by both firms with little specific information regarding carbon emission and climate change issues. No climate change management information was disclosed by either of the firms. Huadian revealed more carbon independence information and social affairs in that period than Huaneng. Neither of the firms follows international GHG reporting guidelines.

In general, the carbon emission and climate change disclosure status from 2000 to 2001 indicated a quite dismissive business view of climate change issues among Chinese power businesses.

4.2.2 Phase two: 2002-2004

In addition to the annual reports from Huaneng and Huadian, English versions of annual reports for Datang, Guangdong Yudean, Huarun and China Power Investment became available during 2002 to 2004. The increasing number of copies of annual reports available helped to provide a more comprehensive view of carbon emission and climate change disclosure among Chinese power businesses. Summaries of carbon emissions and climate change disclosures for Datang, Guangdong Yudean,

Table 4.4 Summary of carbon emissions and climate change information disclosed in page proportion by Datang

Datang		2002	2003	2004	2005	2006	2007	2008	2009
		Phase 2			*Phase 3*				
BOARD OVERSIGHT	1. Environmental issues	45%	36%	27%	57%	157%	43%	76%	64%
	2. Climate change and GHG emission issues	29%	24%	15%	25%	46%	25%	51%	38%
	3. Periodic review	0%	0%	0%	0%	0%	0%	0%	0%
	Sub Total[1]	74%	60%	42%	82%	203%	68%	127%	102%
CLIMATE CHANGE RISK MANAGEMENT	1. Risk disclosure	34%	27%	38%	19%	64%	41%	24%	76%
	2. Risk management team	0%	0%	0%	0%	0%	0%	0%	0%
	3. Senior executives responsibility	0%	0%	0%	0%	0%	0%	0%	0%
	Sub Total	34%	27%	38%	19%	64%	41%	24%	76%
EMISSION REDUCTION	1. Build or acquire less GHG intensive power Plants	27%	18%	56%	84%	117%	68%	86%	138%
	2. Enhance efficiency	34%	38%	29%	36%	67%	42%	43%	31%
	3. Change fuel	16%	7%	15%	3%	53%	15%	38%	27%
	Sub Total	77%	63%	100%	123%	237%	125%	167%	196%
CARBON INDEPENDENCE	1. Build or acquire carbon-free power plants	124%	59%	139%	241%	176%	173%	217%	248%
	2. Enhance efficiency	8%	82%	67%	34%	86%	48%	26%	52%
	Sub Total	132%	141%	206%	275%	262%	221%	243%	300%
REPORTING	Compliance with international GHG reporting guideline	0%	0%	0%	0%	0%	0%	0%	0%
	Sub Total	0%	0%	0%	0%	0%	0%	0%	0%
EXTERNAL AFFAIRS	1. Support collaborative solutions	0%	0%	0%	0%	0%	0%	0%	0%
	2. Promote climate friendly behaviour	72%	42%	84%	69%	54%	185%	147%	163%
	3. Cost to comply with environmental regulations	11%	15%	56%	76%	27%	74%	94%	69%
	Sub Total	83%	57%	140%	145%	81%	259%	241%	232%
Total[2]		**4.00**	**3.48**	**5.26**	**6.44**	**8.47**	**7.14**	**8.02**	**9.06**

Note: 1. The Sub Total values are presented in terms of page proportion, e.g.100% = 1 equivalent page in annual report.

2. Total values are presented in number of equivalent pages, e.g. 1 = 1 equivalent page in annual report.

Source: Prepared for this study

Table 4.5 Summary of carbon emissions and climate change information disclosed in page proportion by Guangdong

Guangdong		2002	2003	2004	2005	2006	2007	2008	2009
			Phase 2				*Phase 3*		
BOARD OVERSIGHT	1. Environmental issues	N/A[1]	127%	86%	127%	84%	116%	82%	139%
	2. Climate change and GHG emission issues	N/A	31%	71%	64%	35%	31%	43%	87%
	3. Periodic review	N/A	0%	0%	0%	0%	0%	0%	0%
	Sub Total[2]	N/A	158%	157%	191%	119%	147%	125%	226%
CLIMATE CHANGE RISK MANAGEMENT	1. Risk disclosure	N/A	15%	43%	38%	42%	37%	42%	49%
	2. Risk management team	N/A	0%	0%	0%	0%	0%	0%	0%
	3. Senior executives responsibility	N/A	0%	0%	0%	0%	0%	0%	0%
	Sub Total	N/A	15%	43%	38%	42%	37%	42%	49%
EMISSION REDUCTION	1. Build or acquire less GHG intensive power Plants	N/A	24%	27%	132%	89%	59%	116%	72%
	2. Enhance efficiency	N/A	67%	78%	57%	38%	52%	38%	67%
	3. Change fuel	N/A	8%	15%	28%	14%	28%	19%	26%
	Sub Total	N/A	99%	120%	217%	141%	139%	173%	165%
CARBON INDEPENDENCE	1. Build or acquire carbon-free power plants	N/A	76%	89%	76%	148%	237%	166%	174%
	2. Enhance efficiency	N/A	34%	17%	35%	27%	18%	15%	32%
	Sub Total	N/A	110%	106%	111%	175%	255%	181%	206%
REPORTING	Compliance with international GHG reporting guideline	N/A	0%	0%	0%	0%	0%	0%	0%
	Sub Total	N/A	0%	0%	0%	0%	0%	0%	0%
EXTERNAL AFFAIRS	1. Support collaborative solutions	N/A	0%	0%	0%	0%	0%	0%	0%
	2. Promote climate friendly behaviour	N/A	129%	84%	53%	89%	42%	226%	168%
	3. Cost to comply with environmental regulations	N/A	39%	45%	28%	32%	39%	51%	27%
	Sub Total	N/A	168%	129%	81%	121%	81%	277%	195%
Total[3]		N/A	**5.50**	**5.55**	**6.38**	**5.98**	**6.59**	**7.98**	**8.41**

Note: 1. N/A stands for Not Available, which means the annual report of Guangdong in 2002 is not available.

2. The Sub Total values are presented in terms of page proportion, e.g.100% = 1 equivalent page in annual report.

3. Total values are presented in number of equivalent pages, e.g. 1 = 1 equivalent page in annual report.

Source: Prepared for this study

Table 4.6 Summary of carbon emissions and climate change information disclosed in page proportion by Huarun

			Phase 2				*Phase 3*		
Huarun		2002	2003	2004	2005	2006	2007	2008	2009
BOARD OVERSIGHT	1. Environmental issues	N/A[1]	27%	56%	43%	35%	49%	76%	113%
	2. Climate change and GHG emission issues	N/A	8%	24%	33%	21%	32%	56%	59%
	3. Periodic review	N/A	0%	0%	0%	0%	0%	0%	0%
	Sub Total[2]	N/A	35%	80%	76%	56%	81%	132%	172%
CLIMATE CHANGE RISK MANAGEMENT	1. Risk disclosure	N/A	0%	8%	17%	22%	19%	28%	33%
	2. Risk management team	N/A	0%	0%	0%	0%	0%	0%	0%
	3. Senior executives responsibility	N/A	0%	0%	0%	0%	0%	0%	0%
	Sub Total	N/A	0%	8%	17%	22%	19%	28%	33%
EMISSION REDUCTION	1. Build or acquire less GHG intensive power Plants	N/A	14%	22%	18%	29%	43%	37%	46%
	2. Enhance efficiency	N/A	85%	142%	79%	127%	83%	194%	92%
	3. Change fuel	N/A	6%	21%	18%	25%	16%	32%	41%
	Sub Total	N/A	105%	185%	115%	181%	142%	263%	179%
CARBON INDEPENDENCE	1. Build or acquire carbon-free power plants	N/A	7%	15%	3%	16%	9%	14%	26%
	2. Enhance efficiency	N/A	0%	0%	0%	8%	0%	4%	6%
	Sub Total	N/A	7%	15%	3%	24%	9%	18%	32%
REPORTING	Compliance with international GHG reporting guideline	N/A	0%	0%	0%	0%	0%	0%	0%
	Sub Total	N/A	0%	0%	0%	0%	0%	0%	0%
EXTERNAL AFFAIRS	1. Support collaborative solutions	N/A	0%	0%	0%	0%	0%	0%	0%
	2. Promote climate friendly behaviour	N/A	0%	52%	39%	116%	71%	63%	124%
	3. Cost to comply with environmental regulations	N/A	0%	0%	8%	5%	14%	9%	21%
	Sub Total	N/A	0%	52%	47%	121%	85%	72%	145%
Total[3]		N/A	**1.47**	**3.40**	**2.58**	**4.04**	**3.36**	**5.13**	**5.61**

Note: 1. N/A stands for Not Available, which means the annual report of Huarun in 2002 is not available.

2. The Sub Total values are presented in terms of page proportion, e.g.100% = 1 equivalent page in annual report.

3. Total values are presented in number of equivalent pages, e.g. 1 = 1 equivalent page in annual report.

Source: Prepared for this study

Table 4.7 Summary of carbon emissions and climate change information disclosed in page proportion by China Power Investment

		Phase 2			*Phase 3*				
China Power Investment		2002	2003	2004	2005	2006	2007	2008	2009
BOARD OVERSIGHT	1. Environmental issues	N/A[1]	N/A	59%	72%	68%	94%	85%	98%
	2. Climate change and GHG emission issues	N/A	N/A	154%	167%	126%	184%	175%	124%
	3. Periodic review	N/A	N/A	0%	0%	0%	0%	0%	0%
	Sub Total[2]	N/A	N/A	213%	239%	194%	278%	260%	222%
CLIMATE CHANGE RISK MANAGEMENT	1. Risk disclosure	N/A	N/A	61%	112%	74%	37%	58%	74%
	2. Risk management team	N/A	N/A	0%	0%	0%	0%	0%	0%
	3. Senior executives responsibility	N/A	N/A	0%	0%	0%	0%	0%	0%
	Sub Total	N/A	N/A	61%	112%	74%	37%	58%	74%
EMISSION REDUCTION	1. Build or acquire less GHG intensive power Plants	N/A	N/A	86%	137%	93%	145%	124%	139%
	2. Enhance efficiency	N/A	N/A	84%	72%	57%	68%	75%	68%
	3. Change fuel	N/A	N/A	73%	61%	83%	58%	72%	57%
	Sub Total	N/A	N/A	243%	270%	233%	271%	271%	264%
CARBON INDEPENDENCE	1. Build or acquire carbon-free power plants	N/A	N/A	134%	167%	242%	174%	183%	158%
	2. Enhance efficiency	N/A	N/A	48%	75%	67%	59%	73%	68%
	Sub Total	N/A	N/A	182%	242%	309%	233%	256%	226%
REPORTING	Compliance with international GHG reporting guideline	N/A	N/A	0%	0%	0%	0%	0%	0%
	Sub Total	N/A	N/A	0%	0%	0%	0%	0%	0%
EXTERNAL AFFAIRS	1. Support collaborative solutions	N/A	N/A	0%	0%	0%	0%	0%	0%
	2. Promote climate friendly behaviour	N/A	N/A	54%	68%	34%	71%	48%	87%
	3. Cost to comply with environmental regulations	N/A	N/A	18%	24%	53%	48%	27%	69%
	Sub Total	N/A	N/A	72%	92%	87%	119%	75%	156%
Total[3]		N/A	N/A	**7.71**	**9.55**	**8.97**	**9.38**	**9.20**	**9.42**

Note: 1. N/A stands for Not Available, which means the annual report of China Power Investment in 2002 and 2003 are not available.

2. The Sub Total values are presented in terms of page proportion, e.g.100% = 1 equivalent page in annual report.

3. Total values are presented in number of equivalent pages, e.g. 1 = 1 equivalent page in annual report.

Source: Prepared for this study

This period reveals climate change disclosure was significantly more prevalent than that in Phase one. The highest number of equivalent pages disclosing carbon emission and climate change information was made by China Power Investment in 2004 (7.71 pages). One reason for the change is that annual reports were viewed from six businesses for carbon emissions and climate change information, whist in phase one, annual reports were available from only two businesses. Therefore, the research result from phase two provides a more comprehensive picture of business attitudes towards climate change topics. Furthermore, businesses were found to disclose information under new categories. Moreover, images were broadly employed to disclose some climate change issues such as 'climate change and GHG emission issues', 'build or acquire carbon-free power plants', and 'promote climate friendly behaviour'. In addition, government played an important role in implementing and enforcing China's environmental policies. The Chinese government announced its intention in 2002 to ratify *The Kyoto Protocol* indicating its determination in dealing with carbon emission and climate change issues. It was then predictable that business would make more disclosures in the 'emission reduction', 'carbon independence' and 'external affairs' general categories.

Compared with disclosures in phase one, businesses in phase two started to identify carbon emission and climate change as specific business risks; however, none of the businesses set up any management team or assigned executives or senior managers to manage such risk. For example, Huaneng tried to highlight emission risk in its 2004 annual report:

> The government has continuously strengthened the enforcement of environmental protection regulations and issued stricter benchmarks on pollutants emitted by the coal-fired power plants. These policies benefit the society and nation as a whole, but have created pressure on the operations of the Company. (p37)

Furthermore, businesses involved in more production from renewable resources were likely to disclose more climate change information in the 'carbon independence' category, whilst businesses engaged in operations primarily from thermal power stations were found to favour the 'emission reduction' category. In 2002, Datang, which is largely involved in production from renewable resources, disclosed in its annual report that:

> Our [Datang] dual emphasis on hydropower and coal-fired power is realised through aggressive development of hydropower operations in addition to our existing focused development of coal-fired power operations, with an aim to optimise the power generation structure of the Company. In particular, we will concentrate our resources on constructing medium-tolarge-scale hydropower projects with reasonable construction costs in regions rich in water resources. The purpose is to minimise the operating risk of having a single power source and to improve the Company's capabilities for sustainable development. (p15)

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The page proportion used to disclose external affairs, especially the 'cost to comply with environmental regulations' has increased from phase one. China Power Investment outlined its increasing discharge fees in 2004 annual report that:

> The Group's mission is "Serving our community with green energy". All the power plants of the Group are subject to strict compliance of the environmental laws and regulations promulgated by the State Council of the PRC and the local government of the regions where our power plants are located. For the year ended 31 December, 2004, the total discharge fees paid by our power plants were approximately RMB8,135,000 for Pingwei Power Plant, approximately RMB17,908,000 for Yaomeng Power Plant and approximately RMB13,522,000 for Changshu Power Plant. There was significant growth in the discharge fees paid by the Group during the year as compared to 2003, which was mainly due to the implementation of new PRC regulations on discharge fees. The construction of desulphurization facilities in the Changshu Power Plant has commenced, which will reduce pollution to the environment as well as the Group's discharge expenses. (p34)

In summary, carbon emission and climate change information disclosed in annual reports by Chinese power businesses increased significantly compared to the previous phase. This indicates growing business attention to climate change topics during phase two.

4.2.3 Phase three: 2005-2009

Shenhua annual reports became available in 2005, which makes it possible to investigate all annual reports for seven Chinese power businesses during phase three. The summary of carbon emissions and climate change information disclosed by Shenhua in terms of equivalent annual report page is presented in Table 4.8. Businesses overall continued the growth trend of climate change disclosure in annual reports, however, at a rate lower than that of phase two. The movements of climate change disclosures from 2005 and onwards show a growing willingness by Chinese power businesses to reveal carbon emissions and climate change information in annual reports. On the other hand, the climate change disclosures in terms of equivalent pages in annual reports for Huadian and Huaneng in 2005 were found to be even lower than in 2004. A possible reason could be that although the *Kyoto Protocol* came into force worldwide in 2005, it did not have a significant impact on Chinese businesses because China was not obligated by mandate to reduce emissions like other developed nations (UNFCCC, 2010). Businesses in China, then, were not forced to set up emission reduction plans or to disclose climate change-related information in annual reports. None of the businesses in this research mentioned the ratification of the *Kyoto Protocol* in their annual reports in 2005. Another possible explanation for reduced phase three disclosures might be that China did not have carbon trading schemes like the EU ETS. Therefore, businesses in China did not have incentives to disclose more carbon emissions and climate change information than before because they were not able to benefit from emission units trading.

All the companies disclosed climate change issues and risks in annual reports in phase three, but there were still no disclosures regarding how businesses manage these risks. Moreover, all businesses revealed information related to the ‘promote climate friendly behaviour’ and ‘cost to comply with environmental regulation’ categories, whilst none of the businesses cooperated with the government in terms of voluntary emission reduction projects, nor did they comply with international emission reporting standards.

Table 4.8 Summary of carbon emissions and climate change information disclosed in page proportion by Shenhua

Shenhua		*Phase 3* 2005	2006	2007	2008	2009
BOARD OVERSIGHT	1. Environmental issues	56%	52%	74%	48%	83%
	2. Climate change and GHG emission issues	24%	36%	29%	35%	47%
	3. Periodic review	0%	0%	0%	0%	0%
	Sub Total[1]	80%	88%	103%	83%	130%
CLIMATE CHANGE RISK MANAGEMENT	1. Risk disclosure	0%	18%	22%	14%	27%
	2. Risk management team	0%	0%	0%	0%	0%
	3. Senior executives responsibility	0%	0%	0%	0%	0%
	Sub Total	0%	18%	22%	14%	27%
EMISSION REDUCTION	1. Build or acquire less GHG intensive power Plants	37%	26%	24%	31%	42%
	2. Enhance efficiency	84%	96%	125%	76%	168%
	3. Change fuel	52%	24%	43%	61%	48%
	Sub Total	173%	146%	192%	168%	258%
CARBON INDEPENDENCE	1. Build or acquire carbon-free power plants	0%	0%	0%	4%	3%
	2. Enhance efficiency	0%	0%	0%	0%	0%
	Sub Total	0%	0%	0%	4%	3%
REPORTING	Compliance with international GHG reporting guideline	0%	0%	0%	0%	0%
	Sub Total	0%	0%	0%	0%	0%
EXTERNAL AFFAIRS	1. Support collaborative solutions	0%	0%	0%	0%	0%
	2. Promote climate friendly behaviour	135%	94%	127%	83%	92%
	3. Cost to comply with environmental regulations	16%	24%	13%	7%	14%
	Sub Total	151%	118%	140%	90%	106%
Total[2]		**4.04**	**3.70**	**4.57**	**3.59**	**5.24**

Note: 1. The Sub Total values are presented in terms of page proportion, e.g.100% = 1 equivalent page in annual report.

2. Total values are presented in number of equivalent pages, e.g. 1 = 1 equivalent page in annual report.

Source: Prepared for this study

In summary, the disclosures of carbon emissions and climate change information in the three phases represent the change in business attitudes towards climate change issues. Chinese power businesses made minimal disclosures in annual reports in phase one from 2000 to 2001. The disclosures were significantly increased during phase two, while the rate of increase slowed down from 2005 onwards. The increasing number of equivalent pages in annual reports disclosing carbon emissions and climate change information indicates a growing concern in China about climate change issues.

4.3 Disclosures by categories

As mentioned in Chapter Three, categories are borrowed from Deegan and Haque (2009) and Weinhofer and Hoffmann (2010) to investigate the disclosure status in China of carbon emission and climate change information, as revealed in the annual reports of seven power businesses from 2000 to 2009. Modifications have been made to ensure those categories apply to the Chinese economy. The six broad categories are: (1) Board Oversight (2) Climate Change Risk Management (3) Emission Reduction (4) Carbon Independence (5) Reporting and (6) External Affairs. A summary of six climate change disclosure categories is presented in Table 4.9. The following part of the section will investigate disclosure in the sample companies by category.

Table 4.9 Summary of six climate change disclosure categories

BOARD OVERSIGHT	1. Environmental issues other than carbon emissions and climate change issues
	2. Climate change and GHG emission issues
	3. Periodic review
CLIMATE CHANGE RISK MANAGEMENT	1. Risk disclosure
	2. Risk management team
	3. Senior executives responsibility
EMISSION REDUCTION	

1. Build or acquire less GHG intensive power

	Plants
	2. Enhance efficiency
	3. Change fuel
CARBON INDEPENDENCE	1. Build or acquire carbon-free power plants
	2. Enhance efficiency
REPORTING	Compliance with international GHG reporting guideline
EXTERNAL AFFAIRS	1. Support collaborative solutions
	2. Promote climate friendly behaviour
	3. Cost to comply with environmental regulations

Source: Developed from Deegan and Haque (2009) and Weinhofer and Hoffmann (2010) studies

4.3.1 Overview of climate change disclosure by categories

Table 4.10 provides a summary of climate change disclosure in the six general categories by Chinese power businesses in average from 2000 to 2009. It is evident from the table that, overall, power businesses in China are disclosing more carbon emission and climate change information under various categories over time, but none of the businesses researched have adopted international emission reporting standards.

The trends in climate change disclosure in the six general categories are presented in Figure 4.3. Among them, the 'emission reduction' category comprises the highest number of disclosures. This may be due to the reason that these 7 power firms in China conduct most of the business operations from thermal power stations. Both regulatory bodies and the general public are interested in the 'emissions reduction' related issues (Li & Zhao, 2009; Kroeze, Vlasblom, Gupta, Boudri & Blok, 2004; Xin, 2010). As a result, businesses are willing to disclose large amount of 'emission reduction' information to the public in order to retain a positive corporate image. The disclosures in terms of equivalent pages in annual reports for 'board oversight', 'carbon independence', and 'external affairs' also increased significantly from 2000 to 2009, whilst the 'climate change risk management' category emerged in 2001 and then stayed at a more constant level since 2004. In contrast to the increasing disclosure in the other five categories, disclosure for the 'reporting' category remained nil throughout the research period.

Table 4.10 Summary of climate change disclosure by general categories[1]

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Board oversight	Total	0.18	0.36	1.93	4.73	9.05	9.86	9.23	10.20	10.26	13.07
	Average[2]	0.09	0.18	0.64	0.95	1.51	1.41	1.32	1.46	1.47	1.87
Climate change risk management	Total	0.00	0.00	0.56	0.73	2.42	2.68	2.84	2.41	2.31	3.38
	Average	0.00	0.00	0.19	0.15	0.40	0.38	0.41	0.34	0.33	0.48
Emission reduction	Total	0.43	0.26	2.06	4.20	10.13	10.84	12.86	12.31	14.72	15.22
	Average	0.22	0.13	0.69	0.84	1.69	1.55	1.84	1.76	2.10	2.17
Carbon Independence	Total	0.29	0.71	2.36	4.78	6.63	8.76	10.66	10.13	9.41	10.09
	Average	0.15	0.36	0.79	0.96	1.11	1.25	1.52	1.45	1.34	1.44
Reporting	Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Average	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
External affairs	Total	0.43	0.28	1.44	3.39	6.29	6.25	7.64	9.12	10.43	11.22
	Average	0.22	0.14	0.48	0.68	1.05	0.89	1.09	1.30	1.49	1.60

Note: 1. The values are presented in terms of page proportions, e.g. 1 = 1 equivalent page in annual report.

2. The average climate change disclosure per categories is calculated by dividing the total page proportion of a category in a particular year by the number of annual reports available in that year, e.g. 0.09 (Average board oversight disclosure in 2000)= 0.18 (Total board oversight in 2000)/ 2 (number of annual reports available in 2000: Huaneng and Huadian).

Source: Prepared for this study

4.3.2 Board oversight disclosure in annual reports

The 'board oversight' category includes climate change information disclosed in the annual reports in terms of environmental and climate change issues reorganization, as well as board supervision on these issues.

In Table 4.11, page proportion for both environmental and emission issues disclosed in annual reports increased from 2000 to 2009. This suggests that the boards of all seven businesses are aware of environmental and climate change issues faced by companies. Environmental issues disclosed in annual reports other than carbon emissions and climate change topics are employment safety, solid waste cleanup, and social responsibilities. It is notable that a business like Huaneng separated these environmental issues within the 'corporate citizenship', 'human resources' and 'corporate governance' sectors in its earlier years of annual reports, but put them together under an individual section called 'corporate social responsibility' in the 2009 annual report. Boards of the seven power businesses in China also oversee these environmental issues. For instance, Huarun in its 2009 annual report recorded that directors were assigned to budget and manage 'restoration, rehabilitation and environmental costs for mining sites and facilities' (Huarun 2009 annual report, 2010, p85). To be specific, the prime carbon emissions and climate change issue disclosed by boards was 'discharging costs to comply with national and local emission regulations'. For example, China Power Investment, Guangdong Yudean and Huadian all mentioned in their 2009 annual reports that the announcement made by the national government during the Copenhagen Summit to further reduce carbon emission levels would increase the cost of business operations. Another view stated in Huaneng's 2004 annual report was that the business had started to realize that managing these climate change risks in an appropriate way would benefit all shareholders in the long run. However, this critical view was not explored further in subsequent annual reports.

In contrast to the increasing environmental and climate change disclosure in annual reports, power businesses in China did not perform periodic reviews of climate change performances. This reflects the fact that companies in China are less interested in climate change performance than in disclosure.

Table 4.11 Summary of board oversight disclosure per annual report [1]

			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Board Oversight	Environmental issues	Total	0.18	0.30	1.24	2.73	3.90	4.75	5.16	5.58	5.04	7.04
		Average [2]	0.09	0.15	0.41	0.55	0.65	0.68	0.74	0.80	0.72	1.01
	Climate change and GHG emission issues	Total	0.00	0.06	0.69	2.00	5.15	5.11	4.07	4.62	5.22	6.03
		Average	0.00	0.03	0.23	0.40	0.86	0.73	0.58	0.66	0.75	0.86
	Periodic review	Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Average	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: 1. The values are presented in terms of page proportions, e.g. 1 = 1 equivalent page in annual report.

2. The average climate change disclosure per categories is calculated by dividing the total page proportion of a category in a particular year by the number of annual reports available in that year, e.g. 0.09 (Average board oversight disclosure in 2000)= 0.18 (Total board oversight in 2000)/ 2 (number of annual reports available in 2000: Huaneng and Huadian).

Source: Prepared for this study

4.3.3 Climate change risk management disclosure in annual report

The 'climate change risk management' category consists of the carbon emissions and climate change risks as disclosed by business, and outlines their attempts to manage those threats. Table 4.12 shows a summary of climate change risks disclosed in terms of page proportion in annual reports by seven Chinese power businesses from 2000 to 2009.

Referring to Table 4.12, climate change risks were disclosured by power businesses in China, but no risk management teams were set up or executives assigned to deal with specific climate change risks. It was also found that businesses did not include carbon emission and climate change risks in annual reports until 2002. The page proportions reflect climate change risk disclosure on average, and have become more stable since

2004. The most frequent risk disclosed by power businesses is the likelihood of increasing cash outflow in the future to compensate for carbon emission and climate change impacts. Huaneng disclosed the climate change risks as pressure on the operation of the company in their 2004 annual report

Table 4.12 Summary of Climate change risk management disclosure per annual report [1]

			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Climate change risk manageme nt	Risk disclosure	Total	0.00	0.00	0.56	0.73	2.42	2.68	2.84	2.41	2.31	3.38
		Average[2]	0.00	0.00	0.19	0.15	0.40	0.38	0.41	0.34	0.33	0.48
	Risk management team	Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Average	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Senior executives responsibility	Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Average	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: 1. The values are presented in terms of page proportions, e.g. 1 = 1 equivalent page in annual report.

2. The average climate change disclosure per categories is calculated by dividing the total page proportion of a category in a particular year by the number of annual reports available in that year, e.g. 0.19 (Average risk disclosure in 2002)= 0.56 (Total risk disclosure in 2002)/ 3 (number of annual reports available in 2002: Huaneng, Huadian and Datang).

Source: Prepared for this study

(Huaneng 2004 annual report, 2005). In addition, Huadian in its 2006 annual report mentioned that these risks would increase borrowing in the future and, thus, impact on the liquidity of the business (Huadian 2006 annual report, 2007). Carbon emission and climate change risks are most likely to be recorded under the provisions of environmental expenditures or discharge expenses in the annual report. Huadian in 2009 also introduced a term of ‘administrative expense’ specifically in relation to pollutant emissions. Some power businesses, like Huaneng and Datang in the early years (2005 and before), disclosed climate change risks and business management of these issues in the 'Frequently asked questions' section of the annual report. In contrast, more and more businesses like Huadian, China Power Investment, Datang and Huaneng in the later years (after 2005), introduced an individual environmental section in their annual reports specifically explaining the environmental risks (including carbon emission and climate change risks) that businesses faced, as well as business strategies for dealing with these risks. On the other hand, Huarun, Shenhua and Guangdong Yudean spread out climate change risk over the annual reports.

None of the power businesses provided information within their annual reports about setting up management teams or appointing senior executives with specific responsibility for climate change risks. However, it is clear from the annual reports that attempts will be made in the future to manage these risks. This is illustrated by China Power Investment in their 2009 annual report which states that:

> The Company made fuel management its first priority among its internal management tasks. It adopted a lot of measures to control fuel costs, which included: continued to improve the "one policy for one plant" mode for coal management, enhanced fuel benchmarking management, reasonably adjusted the strategies for coal purchasing and the coal supply structure, worked hard in improving the quality of coal, increased the fulfilment rate of key contract coal, opened up new coal supply channels, etc. (p11)

4.3.4 Emission reduction disclosure in annual reports

The emission reduction category focuses on disclosures in annual reports in terms of how businesses are managing existing GHG intensive power plants. All of the seven power businesses conduct their operations from thermal power plants, with a range from 83.08% (China Power investment) to 99.07% (Shenhua), recorded in 2009 (Green Peace, 2009). Therefore, the 'emission reduction' category has the highest amount of disclosure in terms of page proportion in annual reports compared to other categories. Table 4.13 shows a summary of emission reduction disclosure by sub categories. These include 'build or acquire less GHG intensive power plants', 'enhance efficiency' and 'change fuel'.

As shown in Table 4.13, all three sub categories moved from minimum disclosure in the early years to a large page proportion of disclosure in the later years of the study. The increasing disclosures of these three categories were at a faster rate pre 2005 and then slowed down after that. Technological innovation is the most frequent term appearing in the annual reports. Therefore 'enhance efficiency' becomes the most frequently mentioned sub category in

Table 4.13 Summary of emission reduction per annual report[1]

			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Carbon reduction	Build or acquire less GHG intensive power Plants	Total	0.12	0.07	0.43	1.13	2.30	4.80	3.97	4.55	4.69	5.79
		Average[2]	0.06	0.04	0.14	0.23	0.38	0.69	0.57	0.65	0.67	0.83
	Enhance efficiency	Total	0.31	0.17	1.42	2.72	5.39	4.28	6.45	5.43	6.70	6.37
		Average	0.16	0.09	0.47	0.54	0.90	0.61	0.92	0.78	0.96	0.91
	Change fuel	Total	0.00	0.02	0.21	0.35	2.44	1.76	2.21	2.06	2.90	2.68
		Average	0.00	0.01	0.07	0.07	0.41	0.25	0.32	0.29	0.41	0.38

Note: 1. The values are presented in terms of page proportions, e.g. 1 = 1 equivalent page in annual report.

2. The average climate change disclosure per categories is calculated by dividing the total page proportion of a category in a particular year by the number of annual reports available in that year, e.g. 0.06 (Average less GHG intensive power plants in 2000)= 0.12 (Total less GHG intensive power plants disclosure in 2000)/ 2 (number of annual reports available in 2000: Huaneng and Huadian).

Source: Prepared for this study

the annual reports, followed by 'build or acquire less GHG intensive power plans'. 'Change fuel' is much less often mentioned in the annual reports by Chinese power businesses compared to the other two topics. This is probably due to the fact that coal is the prime energy source in China, and the dominant place of coal is not expected to be replaced by any other sources in the near future. The power businesses in China involving operations primarily with coal resources are not likely to give 'change fuel' the first place in considering carbon reduction. For example, it was noted in Huadian's 2002 annual report that:

> Industry development strategy was "focus on the development of thermal power generating units with large capacity, efficiency and of a environment conservation nature.
>
> Development Implementation strategy: Carry out acquisition as well as construction of new plants with an emphasis on economic benefits and scale. (p.13)

In contrast, in Huadian's 2009 annual report, the importance of using alternative resources was mentioned, however, it also emphasized the development of large-scale coal power plants:

> Development strategy: The Group will build up an optimized assets structure of "one principal business with diversification", namely, taking large-scale coal-fired thermal power as the principal business, complemented with hydropower, wind power and other renewable energy sources, and guarantee coal resources (p,15).

4.3.5 Carbon Independence disclosure in annual reports

The carbon Independence category counts for the disclosures in annual reports in relation to environmental friendly energy resources. Table 4.14 provides a summary of page proportion for the 'build or acquire carbon-free power plants' and 'enhance efficiency' categories of carbon-free power plants, for each business.

As shown in Table 4.14, the average total carbon independence disclosure increased from 15% per annual report in 2000 to 144% in 2009. Power businesses in China are disclosing more 'build or acquire carbon-free power plants' than 'enhance efficiency' of existing carbon-free power plants, which may indicate a technological lag in China's ability to enhance the efficiency of renewable resources. For example, the concept of developing clean energy had been realized by Huadian since 2002. However, fewer page proportions were found in annual reports disclosing 'enhance efficiency' of existing carbon free facilities than 'build and acquire carbon free plants'. Its 2002 annual report mentioned that 'to develop the business of heat and electricity cogeneration and hydro power projects appropriately; place emphasis on acquiring new sources of energy and cautiously invest in high-tech new energy power projects' (Huadian 2002 annual report, 2003, p.13).

Another finding from the 'carbon independence' disclosure is that power businesses in China involving greater proportions of renewable resources, disclose significantly more carbon independence information in annual reports than those with lesser proportions of renewable resources. China Power Investment, Datang, Huadian and Guangdong Yudean in 2009 disclosed three times more carbon independence information than Huaneng, Huarun and

Table 4.14 Summary of carbon independence disclosure per annual report[1]

			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Carbon Independence	Build or acquire carbon free power Plants	Total	0.29	0.71	2.23	3.00	4.86	6.61	8.22	8.44	7.97	8.01
		Average[2]	0.15	0.36	0.74	0.60	0.81	0.94	1.17	1.21	1.14	1.14
	Enhance efficiency	Total	0.00	0.00	0.13	1.78	1.77	2.15	2.44	1.69	1.44	2.08
		Average	0.00	0.00	0.04	0.36	0.30	0.31	0.35	0.24	0.21	0.30

Note: 1. The values are presented in terms of page proportions, e.g. 1 = 1 equivalent page in annual report.

2. The average climate change disclosure per categories is calculated by dividing the total page proportion of a category in a particular year by the number of annual reports available in that year, e.g. 0.15 (Average carbon free power plants in 2000)= 0.29 (Total carbon free power plants disclosure in 2000)/ 2 (number of annual reports available in 2000: Huaneng and Huadian).

Source: Prepared for this study

Shenhua. This finding indicates that businesses engaging in production from renewable resources recognize the operational structure as a business strength and are willing to present this positive image to the public through annual reports. For example, China Power Investment acquired Wu Ling hydro power plants in 2009. In its annual report, the key word 'Wu Ling' was mentioned 93 times, covering information from the financial impact of the acquisition to how the acquisition of hydro power plant could help to 'accelerate the structural optimization of assets' (China Power Investment 2009 annual report, 2010, p.40).

Table 4.15 Carbon independence disclosed by each company[1]

	Proportion of using renewable resources[2]	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
China Power Inv.	16.92%	N/A[3]	N/A	N/A	N/A	1.82	2.42	3.09	2.33	2.56	2.26
Datang	13.26%	N/A	N/A	1.32	1.41	2.06	2.75	2.62	2.21	2.43	3.00
Huadian	8.92%	0.19	0.57	0.91	2.05	1.27	2.45	2.91	1.82	2.07	1.85
Guangdong Yudean	8.40%	N/A	N/A	N/A	1.10	1.06	1.11	1.75	2.55	1.81	2.06
Huaneng	8.03%	0.10	0.14	0.13	0.15	0.27	0.00	0.05	1.13	0.32	0.57
Huarun	0.96%	N/A	N/A	N/A	0.07	0.15	0.03	0.24	0.09	0.18	0.32
Shenhua	0.03%	N/A	N/A	N/A	N/A	N/A	0.00	0.00	0.00	0.04	0.03

Note: 1. The values are presented in terms of page proportions, e.g. 1 = 1 equivalent page in annual report.

2. The proportion of renewable resources is adopted from Green Peace (2009).

3. N/A is abbreviating for "Not Available", which means the information (annual report of that company) is not available in that particular year

Source: Prepared for this study

4.3.6 Reporting disclosure in annual reports

The reporting category in this research aims to investigate the compliance reporting standards followed by Chinese power businesses when reporting carbon emission and climate change information in annual reports.

In this study, power businesses in China did not comply with international standards or industry accepted standards when reporting carbon emissions and climate change information in annual reports. However, with the likelihood of China introducing a carbon trading scheme in its 12th 'Five year plan' covering 2011 to 2015 (Li, 2010), businesses are expected to follow specific standards and guidelines on carbon emission and climate change reporting in the near future.

4.3.7 External affairs disclosure in annual reports

The external affairs category reveals the impact of external climate change activities on businesses. These activities include volunteering to disclose carbon emission and climate change information, promoting climate friendly behaviours, as well as mandatory compliance with environmental regulations. Table 4.16 demonstrates the movement of external affairs disclosure in annual reports. In general, the average external affairs disclosure has significantly increased from 2000 to 2009.

'Promoting environmentally friendly behaviours' is the most frequent topic covered in annual reports. Various climate change education initiatives and social functions like planting trees and sponsoring climate-friendly social activities were found in the annual reports of all seven power businesses in China. For example, Guangdong Yudean noted in its 2009 annual report that:

> In 2009, Huizhou and Qianwan LNG power plants' CDM [Clean Development Mechanism] projects got registered successfully one after another, which has aroused a great attention from the CDM industry of the world. According to the relevant contract, the three projects together with Shibeishan Wind Power's CDM project will bring net income continually for the related companies. The execution of the CDM project has reflected the fact that YUDEAN Group's contribution to slowdown of the global warming trend has been recognized internationally, and also shown that Yudean Group's operational philosophy of clean energy and harmonious environment is of profound and lasting social significance (p.04).

It is remarkable that Guangdong Yudean engaged in international climate change-friendly projects like the Clean Development Mechanism (CDM) under the *Kyoto Protocol* (UNFCCC, 2010). The incident indicates the willingness and commitment of Chinese power businesses to participate in international activities by disclosing and managing carbon emissions and climate change-related issues.

Table 4.16 Summary of external affairs disclosure per annual report[1]

			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
External affairs	Support collaborative solutions	Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Average[2]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Promote climate friendly behavior	Total	0.36	0.28	1.20	2.43	4.03	4.28	5.23	5.90	7.50	8.00
		Average	0.18	0.14	0.40	0.49	0.67	0.61	0.75	0.84	1.07	1.14
	Cost to comply with environmental regulations	Total	0.07	0.00	0.24	0.96	2.26	1.97	2.41	3.22	2.93	3.22
		Average	0.04	0.00	0.08	0.19	0.38	0.28	0.34	0.46	0.42	0.46

Note: 1. The values are presented in terms of page proportions, e.g. 1 = 1 equivalent page in annual report.

2. The average climate change disclosure per categories is calculated by dividing the total page proportion of a category in a particular year by the number of annual reports available in that year, e.g. 0.18 (Average 'promote climate change friendly behavior' in 2000)= 0.36 (Total 'promote climate change friendly behavior' disclosure in 2000)/ 2 (number of annual reports available in 2000: Huaneng and Huadian).

Source: Prepared for this study

The second most popular disclosure issue is the cost resulting from complying with environmental regulations. As mentioned in the earlier sub section, all seven power businesses in China view carbon emission and climate change issues as threats to their operation and development. Expenditures or fines incurred during business operations, in order to comply with environmental regulations, are mainly disclosed under the financial flow sub-category. It is interesting to note that apart from the discharge fees, emission cost, and associated administrative costs required to comply with national and local environmental regulations, some businesses have received financial inflows from climate change related activities. The term 'deferred income' is shown in the income statement of China Power Investment, Huarun and Shenhua under 'refund profit of the year' for subsidies to business granted for efforts made in upgrading technologies to reduce carbon emission, and investing and researching alternative clean energies. Moreover, Huaneng recorded in its 2004 annual report that it could lobby for a 'discharge fee refund for renovation items and the enactment of a pollution discharging fee-electricity price linkage mechanism' (p.38). Huadian was also found to include over 11 millions in Chinese currency of 'Carbon Assets Management Sweden AB' under the Accounts receivable list in its 2009 annual report. Therefore, information disclosed by power businesses in China suggests that businesses actually can benefit from or minimize the cost from managing carbon emissions and climate change issues.

The disclosure for 'supporting collaborative solutions', on the other hand, remained nil throughout the research period. None of the power businesses were found to participate in voluntary disclosure programs, either carried out by government or NGOs. None of the seven power businesses in China responded or mentioned the survey conducted by the Carbon Disclosure Project in their annual reports. This is believed to be primarily because most of the power businesses researched considered the climate change topic as a risk for businesses. Therefore, disclosing too much carbon emission and climate change information to the public might expose businesses to more risks.

4.4 Disclosure quality in annual reports

In addition to the climate change disclosure measured by different categories, this study also investigated the quality of carbon emissions and climate change information in annual reports. The disclosure quality is measured by the nature of information revealed, for example, whether the information is of a qualitative or quantitative nature; does the news disclosed provide good, bad or neutral consequences to businesses; and can the information be verified? A summary of carbon emissions and climate change information measured by disclosure quality is presented in Table 4.17.

Overall, both qualitative and quantitative information disclosed in annual reports in terms of equivalent pages has been increased; however, the qualitative carbon emissions and climate change information has increased much faster than the quantitative information. This is primarily because a large number of images have been introduced to demonstrate upcoming climate change issues and business strategies for promoting climate change-friendly behaviours and building carbon-free power plants. In contrast, most of the quantitative information related to carbon emissions and climate change in annual reports is presented under the 'emission reduction' and 'external affairs' categories. Although the sample companies in this study provided more qualitative climate change information in their annual reports than quantitative information, most of the quantitative information is included in financial reports and notes and, thus. is auditable by external auditors. Therefore, quantitative disclosures are deemed to be more significant to external users as they provide more reliable information about businesses' climate change performances.

The results in this study indicate that power businesses in China have disclosed more good news related to carbon emissions and climate change than bad news in annual reports. This finding reflects increasing positive corporate images, like reducing carbon emission, promoting climate change friendly behaviours, etc. revealed to the public via annual reports.

Table 4.17 Summary of carbon emissions and climate change information measured by disclosure quality[1]

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Board oversight	Disclosure[2]	0.09	0.18	0.64	0.95	1.51	1.41	1.32	1.46	1.47	1.87
	Quali[3]	0.09	0.15	0.59	0.87	1.23	1.16	1.24	1.32	1.28	1.51
	Quant[4]	0.00	0.03	0.05	0.08	0.28	0.25	0.08	0.14	0.19	0.36
	Good	0.00	0.00	0.08	0.18	0.51	0.24	0.30	0.15	0.61	0.78
	Bad	0.09	0.16	0.42	0.68	0.74	1.03	0.79	0.86	0.69	0.84
	Netural	0.00	0.02	0.14	0.09	0.26	0.14	0.23	0.45	0.17	0.25
	Auditable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Climate change risk management	Disclosure	0.00	0.00	0.19	0.15	0.40	0.38	0.41	0.34	0.33	0.48
	Quali	0.00	0.00	0.19	0.15	0.40	0.31	0.35	0.34	0.29	0.42
	Quant	0.00	0.00	0.00	0.00	0.00	0.07	0.06	0.00	0.04	0.06
	Good	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Bad	0.00	0.00	0.19	0.15	0.37	0.38	0.35	0.34	0.33	0.42
	Netural	0.00	0.00	0.00	0.00	0.03	0.00	0.06	0.00	0.00	0.06
	Auditable	0.00	0.00	0.00	0.00	0.04	0.00	0.08	0.13	0.00	0.12
Emission reduction	Disclosure	0.22	0.13	0.69	0.84	1.69	1.55	1.84	1.76	2.10	2.17
	Quali	0.20	0.09	0.58	0.72	1.43	1.25	1.37	1.69	1.75	1.83
	Quant	0.02	0.04	0.11	0.12	0.26	0.30	0.47	0.07	0.35	0.34
	Good	0.22	0.13	0.60	0.76	1.53	1.26	1.47	1.62	1.87	1.79
	Bad	0.00	0.00	0.05	0.05	0.16	0.17	0.06	0.14	0.14	0.14
	Netural	0.00	0.00	0.04	0.03	0.00	0.12	0.31	0.00	0.09	0.24
	Auditable	0.04	0.00	0.02	0.04	0.13	0.12	0.20	0.00	0.11	0.14
Carbon Independence	Disclosure	0.15	0.36	0.79	0.96	1.11	1.25	1.52	1.45	1.34	1.44
	Quali	0.15	0.30	0.56	0.74	0.89	1.06	1.27	1.32	1.08	1.12
	Quant	0.00	0.06	0.23	0.22	0.22	0.19	0.25	0.13	0.26	0.32
	Good	0.15	0.36	0.79	0.89	1.06	1.25	1.37	1.45	1.25	1.44
	Bad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Netural	0.00	0.00	0.00	0.07	0.05	0.00	0.15	0.00	0.09	0.00
	Auditable	0.00	0.00	0.12	0.05	0.11	0.04	0.15	0.08	0.04	0.13
Reporting	Disclosure	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
External affairs	Disclosure	0.22	0.14	0.48	0.68	1.05	0.89	1.09	1.30	1.49	1.60
	Quali	0.10	0.12	0.37	0.28	0.86	0.64	0.75	0.84	1.26	1.32
	Quant	0.12	0.02	0.11	0.40	0.19	0.25	0.34	0.46	0.23	0.28
	Good	0.22	0.14	0.48	0.68	1.05	0.89	1.05	1.30	1.36	1.60
	Bad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Netural	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.13	0.00
	Auditable	0.06	0.00	0.05	0.20	0.15	0.08	0.23	0.18	0.09	0.17
Summary[5]	Quali	0.54	0.66	2.29	2.76	4.81	4.42	4.98	5.51	5.66	6.20
	Quant	0.13	0.15	0.50	0.81	0.94	1.06	1.20	0.80	1.07	1.37
	Good	0.58	0.63	1.95	2.50	4.15	3.64	4.19	4.52	5.09	5.61
	Bad	0.09	0.16	0.65	0.88	1.27	1.58	1.20	1.34	1.16	1.40
	Netural	0.00	0.02	0.18	0.19	0.34	0.26	0.79	0.45	0.48	0.55
	Auditable	0.10	0.00	0.19	0.29	0.43	0.24	0.66	0.39	0.24	0.56

Note: 1. The values are presented in terms of page proportions, e.g. 1 = 1 equivalent page in annual report

2. The Disclosure values are adopted from Table 4.10 Summary of climate change disclosure byl categories
3. Quali stands for Qualitative information
4. Quant stands for Quantitative information
5. The values in the summary are caculated by adding the figures for each measurement in subcategories, e.g.0.54 (volume of qualitative information disclosed in 2000)=0.09 (qualitative disclosed from board oversight category)+ 0 + 0.2+ 0.15+ 0+ 0.1

Source: Prepared for this study

4.5 Annual report disclosure versus other disclosure channels

Apart from annual reports, other media for businesses to disclose carbon emissions and climate change information are also examined in this study. The most frequently used channels for the seven power businesses in China to disclose climate change information are stand alone Corporate Social Responsibility reports and web pages.

Standalone CSR reports have been reviewed in this study, and the findings from these publications are consistent with the trend of carbon emissions and climate change disclosures in annual reports. For example, disclosed carbon emissions and climate change performance information in CSR reports is mainly descriptive. Moreover, none of the CSR reports in this research provide external assurances. Therefore, threats to the reliability of information may exist. Another important issue about CSR reporting in China is the availability of reports to the public. As stated in the KPMG (2005) report, CSR reporting was a new topic for Chinese businesses, and there were barely any CSR reports by 2005. Table 4.18 shows the number of CSR reports available in this research for the seven Chinese power businesses. It shows that only 13 copies of stand alone CSR reports were available for this study, which made it difficult to investigate the longitudinal movement of carbon emissions and climate change disclosures.

Another popular channel for businesses to disclose carbon emissions and climate change information is through websites. China Power Investment and Guangdong Yudean, which did not publish CSR reports, provide social and environmental information on their web pages. Other businesses like Huaneng and Datang were disclosing carbon emissions and climate change information in both CSR reports and web pages. The obvious advantage of releasing climate change information through websites is that such information is easily accessed by various information users. However, the carbon emissions and climate change information posted on websites in this study may not provide relevant information on corporate performance on climate change issues, as the disclosures were not found to be updated regularly.

Table 4.18 Availability of CSR report from sample companies

Company name	Years
China Power Investment	N/A[1]
Datang	2008,2009
Huadian	2007,2008,2009
Guangdong Yudean	N/A
Huaneng	2006,2007,2008,2009
Huarun	2009
Shenhua	2007,2008,2009

Note: 1. N/A stands for Not Available

Source: Prepare for this study

To sum up, there are different channels for Chinese power businesses to disclose carbon emissions and climate change information. However the annual report provides the most relevant and credible disclosures of corporate performance on climate change issues.

4.6 Conclusion of the chapter

This chapter follows the research method developed in the previous chapter, and analyzes carbon emissions and climate change information disclosed in annual reports by seven major Chinese power businesses from 2000 to 2009. The data generated from the study were analyzed by time zone, categories, nature of data, as well as being compared with other disclosure channels and previous studies.

The results of this study indicate the carbon emissions and climate change information disclosed by Chinese businesses in annual reports has increased significantly both in terms of reporting length and quality. More and more businesses in China have realized the risk of climate change issues, and made efforts to disclose these issues for the purpose of internal management and for providing positive corporative images to the public.

The development of carbon emissions and climate change disclosures was found to be significant in the 2002 to 2004 period, after which the trend became steady. Businesses in China focus on the carbon reduction and carbon independence categories, whilst there are no management approaches or reporting standards found regarding climate change issues and standard reporting.

Power businesses in China examined in this study were mainly disclosing non-monetary and declarative information in annual reports. Moreover, the annual report is the main source for the businesses in China to disclose carbon emissions and climate change information. The advantages of presenting information in annual reports are the credibility and relevance of information being included.

Although the general trend of carbon emission and climate change disclosure in China is consistent with the rest of the world, businesses in developed nations appear to be more advanced in accounting, reporting, and managing climate issues than businesses in China.

The next chapter concludes this study by answering the research questions. Limitations of this research and suggestions for future study are also considered.

Chapter Five Conclusions, limitations and suggestion for future research

5.0 Introduction

Growing demands from both internal management and external stakeholders motivate businesses to disclose carbon emissions and climate change information in western nations. This paper investigates their disclosure status in China, and tries to explore why businesses in China reveal or hide carbon emission and climate change information in annual reports. A content analysis research method is employed to study the climate change disclosure of seven major Chinese power businesses through annual reports. This study also employs disclosure categories developed in earlier studies. Modifications are made to ensure that these are categories which can be applied to Chinese context. Carbon emission and climate change information revealed in annual reports is then recorded under different categories and analyzed in the previous chapter. This chapter concludes the research findings generated in the previous chapter to answer the preset research question. Limitations of the current study and suggestions for future research are also included at the end of the chapter.

5.1 Response to research question one

Research Question One：*How, and to what extent, do Chinese power companies disclose carbon emissions and climate change information in their annual report?*

5.1.1 Climate change disclosure development between 2000 to 2009

In this research, the power businesses in China were found to improve carbon emissions and climate change disclosure significantly from 2000 to 2009, in terms of both disclosure quality and quantity. The finding is consistent with the previous study undertaken by Wickerham and Zadek (2009) who found that there is increasing understanding and willingness for Chinese businesses to reveal the related information about environment and climate change. The average number of equivalent pages, as measured by the page proportion method, per annual report disclosing carbon emissions and climate change information has increased significantly from 0.67 pages in 2000 to 7.47 pages in 2009. Referring to Figure 4.2, businesses involved in a greater proportion of renewable resources generally disclose more carbon emissions and climate change information than businesses with a lesser proportion. In terms of disclosure quality, the weight of quantitative information has been lifted over time. Therefore carbon emission and climate change information disclosed by businesses has become auditable and, thus, more reliable to both internal and external users.

5.1.2 How and what kinds of climate change information are disclosed

Table 4.3 demonstrates the carbon emission and climate change information disclosed in annual reports in different categories.

Chinese power businesses are found to emphasize carbon reduction disclosure over other climate change information. This is due to the fact that coal dominates the power resources in China, then reducing GHG emission on existing power sites becomes the priority challenge for power businesses.

The increasing board oversight and climate change risk management disclosures have also indicated that businesses in China realized that climate change risks derived from business productions, and then tried to manage those risks. However, none took the view that managing carbon emissions and climate change risks might create a business advantage, and no specific management resolution was disclosed that would deal with climate change risks.

The carbon independence information disclosed in annual reports contributed to the differences in climate change information reported by seven different power businesses in China. China Power Investment, Datang, Huadian and Guangdong Yudean engaged in a higher proportion of business operations with renewable resources and disclosed significantly more information about carbon emissions and climate change than Huaneng, Huarun and Shenhua with less energy generated from renewable resources.

The reporting category reflects a key weakness of climate change disclosure in China. In this study, none of the power businesses were found to apply global or industrial recommended climate change reporting standards. This finding represents a regulation gap in China, but may change if an emission trading scheme is carried out within the next five years, as is likely.

Disclosures of external affairs in annual reports, although they did not increase as fast as the other categories, contained most of the quantitative information about climate change in the annual reports. Emission discharge fees and deferred income were the most frequent items used in the annual reports. Power businesses in China were also found to include not only expenditures related to carbon emissions and climate change issues in the past, but also to estimate possible future cash outflows and to then record them under provisional liabilities.

5.2 Response to research question two

Research Question Two: *Why do (or don't) Chinese power companies disclose carbon emissions and climate change information in their annual reports?*

The incentive for businesses in China to disclose carbon emissions and climate change information in their annual reports is the need to control internal risk as well as to provide an environmentally responsible image to the public.

China does not have a national emission trading scheme so far, so businesses in China are not able to benefit from trading carbon emission units. Emission discharge expenditures therefore become the most overt cost for businesses, either under current operation or in the foreseeable future. Hence, carbon emissions and climate change information disclosed by Chinese power businesses in this research reflect growing awareness and recognition of climate change risks to businesses.

In addition to the internal control purposes, power businesses in China were disclosing positive news like carbon reduction, carbon free plants and social responsibilities to the public rather than news related to carbon risks or costs of complying with environmental regulations. This finding indicates that the emphasis on carbon emissions and climate change disclosure in China results in the provision of social and environmentally friendly images and information to external stakeholders. This, on one hand, reflects growing demands from external stakeholders to ask for carbon emission and climate change information, and on the other hand also suggests that businesses in China consider that providing this information to various stakeholders will create business strength.

Moreover, the annual report is the main channel in China for releasing relevant carbon emission and climate change information. A growing number of power businesses in this research started to provide separate CSR report in China, but most of them failed to provide third party assurance for the information included. Furthermore, power businesses in China were reporting corporate social performance randomly, rather than on a periodic basis. Therefore, carbon emissions and climate change information disclosed in the annual report supplies more reliable and relevant data than do other reporting media and that is why the annual report has become the prime source of business carbon emissions and climate change information.

5.3 Comparisons between different studies

This study shows that, overall, carbon emissions and climate change reporting in China is consistent with findings conducted in other studies. Moreover, the frameworks used globally to measure climate change disclosures, such as carbon control and risk disclosure themes, generally apply in China. These findings indicate that Chinese businesses are increasingly aware of carbon emissions and climate change issues, and are willing to disclose them in both corporate annual reports and in stand alone CSR reports.

On the other hand, there are differences between the carbon emissions and climate change disclosures in China and other nations. First of all, Chinese businesses focus primarily on disclosing non-monetary carbon emissions and climate change information, in either annual reports or other publications. In contrast, businesses in Australia are disclosing climate change issues under 'emissions accounting' categories, where the information disclosed can be verified by external auditors (Deegan & Haque, 2009). Furthermore, Australian company reports include more comprehensive and verified information in their stand-alone sustainability reports (Deegan and Haque, 2009), whilst only limited copies of CSR reports are available in China, with no third party assurances of the information disclosed. Compared to Chinese businesses, European companies operating under the EU ETS disclose more verified carbon emission and climate change information in annual reports, and follow more accepted international reporting standards (Kolk et al., 2008). Moreover, the results from this study also show that risk management in China lags behind that in the rest of the world. Although carbon emissions and climate change risks are recognized by more and more businesses in China, few of them have developed specific management strategies to deal with these issues. In addition, findings in this study also reflect the fact that few Chinese businesses have realized the potential benefits from managing and disclosing climate change information compared with businesses in the developed nations. Most businesses in China are viewing climate change issues as a threat, rather than an opportunity to manage such issues and provide advantages to businesses. Overall, climate change disclosure is at an embryonic stage in China.

5.4 Limitations of the current study

This study help to contribute to the literature of social and environmental accounting, as it provides longitudinal research into the carbon emissions and climate change disclosure of major Chinese power businesses: a topic which has been addressed by few studies in the past. On the other hand, there are some limitations of this study which should be mentioned.

The most significant weakness of this research is its limited data sources. Annual reports of Chinese power businesses from 2000 to 2009 were investigated in this research. However, these were selected subject to the availability of an English copy of the annual report, so that only 53 copies of annual reports from seven major power businesses in China were studied. Therefore, there is a sample-size issue, and results of this study do not necessarily represent the carbon emissions and climate change disclosure of the whole industry. Furthermore, limited information was examined from other carbon emissions and climate change disclosure media like CSR reports, publications, presentations, etc., which means that the annual reports studied would have covered only a part of the climate change disclosures that occurred.

Another limitation is that this study focuses on the carbon emissions and climate change disclosures of a carbon intensive industry: the power businesses in China. No comparisons have been made between different industries or between heavy-polluter and light-polluter businesses.

Finally, annual reports investigated in this study are available in both English and Chinese. The different expressions between these two languages might cause differences in the content analysis recording of carbon emissions and climate change information in annual reports, as they may be expressed in different words or phrases of different lengths.

5.5 Suggestions for further research

Although only seven major power businesses are focuses, this research has developed a scheme for assessing carbon emissions and climate change disclosure in Chinese businesses. Future research could employ the same disclosure classification adopted in this research, and then compare findings between different industries.

Furthermore, future research could be encouraged to examine carbon emissions and climate change information from resources other than the annual report. In addition, in terms of research methods other than content analysis, interviews could collect information first hand from managers of businesses and from outsider stakeholders. This range of interviewees will have views about carbon emissions and climate change information disclosure that should be taken into consideration. The approaches listed above would then provide a more comprehensive view of climate change disclosure status in China than the present study could achieve.

Reference list

Aguilar, M. (2010). Disclosure: Climate Risk Still Remains Cloudy. *Compliance Week*, 7(83), 10-12

Aguiar, T. & Fearfull, A. (2010). Global Climate Change and Corporate Disclosure: Pedagogical tools for critical accounting? *Social and Environmental Accounting Journal*, 30(2), 64-79

American Institute of Certified Public Accountants (AICPA). (2005). *Statement of Position 03-2:Attest Engagements on Greenhouse Gas Emission Information,* New York

Barnea, A.; Heinkel, R. & Kraus, A. (2005). Green Investors and Corporate Investment. *Structural Change and Economic Dynamics*, 16(3), 332-46.

Bebbington, J.; Brown, J.; Frame, B. & Thomson, I. (2007). Theorizing engagement: the potential of critical dialogic approach. *Accounting, Auditing and Accountability Journal*, 20(3), 356-74

Beekes, W., & Brown, P. (2006). Do better-governed Australian firms make more informative disclosure? *Journal of Business Finance and Accounting*, 33(3-4), 422-50

Betsill, M. & Corell, E. (2001). NGO Influence in International Environmental Negotiations: A Framework for Analysis. *Global Environmental Politics*, 1(4), 65-85

Bohringer, C. (2002). Industry-Level Emission Trading between Power Producers in the EU. *Applied Economics*, 34(4), 523-33

Boiral O. 2006. Global warming: should companies adopt a proactive strategy? *Long Range Planning* **39**(3): 315–330

Branco, M. & Rodrigues, L. (2006). Communication of corporate social responsibililty by Portuguese banks: A legitimacy theory prespective, *Corporate Communications: an International Journal*, 19(1), 31-51

Cagon, D. (2006). *Corporate Governance and Climate Change: Making the Connection.* Boston, MA: Ceres

Cambell, D. (2000). Legitimacy theory or managerial reality construction?

Corporate social disclosure in Marks and Spencer Plc Corporate Reports, 1969-1997. *Accounting Forum*. 24(1), 80-100

Campbell, D., Craven, b. & Shrives, P. (2003). Voluntary social reporting in three FTSE sectors: a comment on perception and legitimacy. *Accounting, Auditing and Accountability Journal*, 16(4), 558-81

Carbon Disclosure Project[a]. (2010). *What we do?* Retrieved from https://www.cdproject.net/en-US/WhatWeDo/Pages/overview.aspx

Carbon Disclosure Project[b]. (2010). *CDP drives forward carbon management globally*. Retrieved from https://www.cdproject.net/en-US/WhatWeDo/CDPNewsArticlePages/CDP-drives-carbon-management-globally.aspx

Carbon Disclosure Project[c]. (2010). *Carbon disclosure leadership index and the CDP 2010 rating methodology*. Retrieved from https://www.cdproject.net/en-US/Results/Pages/leadership-index.aspx

Carroll, A. (1979). A three-dimensional conceptual model of corporate social performance, *Academy of Management Review*, 4(4), 497-505

Carroll, A. (1999). Corporate social responsibility: Evolution of a definitional construct. *Business & Society*, 38(3), 268-95

Chevalier, J. (2009). Carbon Futures and Macroeconomic Risk Factors: A View from the EU ETS. *Energy Economics*, 31(4), 614-25

China Power News Net (2010). Industry profile (in Chinese). Retrieved from http://www.cpnn.com.cn

Cirman, A.; Domadenik, P. & Polona, K. (2009). The Kyoto Protocol in a Global Perspective. *Economic and Business Review*, 11(1), 29-54

Climate change: the big emitters. (2005, July 4). *BBC News*, Retrieved from http://news.bbc.co.uk

Clo, S. (2009). The effectiveness of the EU emission trading scheme, *Climate Policy*, 9(3), 227-41

Combet, G. (2009). *Address to the Roundtable on Climate Change Washington*. Retrieved August 20, 2010, from http://www.climatechange.gov.au/minister/combet/2009/speeches/October/sp10052009.aspx

"Coal consumption is slashed", (2009 October 5). *China Daily.* Retrieved from http://www.chinadaily.com.cn

Convery, F. (2009). Origins and Development of the EU ETS. *Environmental and Resource Economics*, 43(3), 391-412

Cooper, D. & Schindler, P. (2006). *Business research methods, 9th ed.* Boston, Mass.: Irwin/McGraw

"Corporate social responsibility in China". (2005 May 13). *China daily*. Retrieved from http://www.chinadaily.com.cn

Crawford, E. & Williams, C. (2010). Should corporate social reporting be voluntary or mandatory? Evidence from the banking sector in France and the Unite States. *Corporate Governance. Bradford*, 10(4), 512-26

Crowley, K. (2007). Is Australia Faking It? The Kyoto Protocol and the Greenhouse Policy Challenge. *Global Environmental Politics*, 7(4), 118-39

Crowther, D. & Lancaster, G. (2009). *Research Method. 2nd ed.* Oxford. UK: Jordan Hill.

Deegan, C. & Haque, S. (2009). An Exploration of Corporate Climate Change-related Governance Practices and Related Disclosures: Evidence from Australia. *The Accounting and Finance Association of Australia and New Zealand*. Retrieved August, 2010, from http://www.afaanz.org

Demark. (2010). *COP15*. Retrieved on December 20, 2010, from http://www.denmark.dk/en/menu/Climate-Energy/COP15-Copenhagen-2009/cop15.htm

Dunn S. 2002. Down to business on climate change – an overview of corporate strategies. *Greener Management International* **39**(Autumn):

27–41

Economy, E. (2007). The great leap backward? The costs of China's environmental crisis, *Foreign Affairs*, 86(5), 38-59

Egenhofer, C. (2007). The making of the EU emission trading scheme: status, prospects and implications for business. *European Management Journal*. 25(6), 453-463

Ellerman, A, & Buchner, B. (2007). Symposium: the European union emissions trading scheme: the European union emissions trading scheme: origins, allocation, and early results. *Review of Environmental Economics and Policy*, 1(1), 66-87

Ellerman, A., & Buchner, B. (2008). Over-allocation or abatement? A preliminary analysis of the EU ETS based on the 2005-06 emission data. *Environmental and Resource Economics*, 41(2), 267-87

Ernst & Young. (2009). *Accounting guidance for emissions programs*. Retrieved October 13, 2010, from http://www.ey.com/US/en/Industries/Oil---Gas/Carbon-market-readiness---4---Accounting-guidance-for-emissions-programs

Europa. (2007). *Emission trading: commission announces linkage EU ETS with Norway, Iceland and Liechtenstein*. Retrieved July 10, 2010, from http://europa.eu/rapid/pressReleasesAction.do?reference=IP/07/1617

GF Security. (2010). *Index Constitutents List.* Retrieved August 24, 2010, from http://www.sse.com.cn/sseportal/index/en/singleIndex/000010/const/index_const_list_en_1.shtml

Gray, R.; Kouhy, R. & Lavers, S. (1995). Methodological themes: Constructing a research database of social and environmental reporting by UK companies. *Accounting, Audinting and Accountability Journal*, 8(2), 78-101

Freeman, R. (1984). *Strategic management: A stakeholder approach.* Boston: Pitman

Friedman, M. (1962). *Capitalism and freedom.* Chicago: University of Chicago Press

Fund pushes emissions disclosure. (2009, August 15). *Calgary Herald*, p.C.4

Green Peace. (2001). *U.S. Withdraws From Kyoto Protocol.* Retrieved on December 12, 2010, from http://www.greenpeace.org/usa/en/news-and-blogs/news/u-s-withdraws-from-kyoto-prot/

Green Peace. (2009). Climate change impact ranking for Chinese power industry (in Chinese). Retrieved from http://www.greenpeace.org/raw/content/china/zh/press/reports/climate-rankingnew.pdf

Griffith, R. (1992). Green Investment: Using Annual Reports for Ethical Decision-Making: Postscript. *Green Reporting: Accountancy and the challenge of nineties* (pp. 256-261). New York; London and Melbourne

Guthrie, J. & Abeysekera, I. (2006). Content Analysis of Social, Environmental Reporting: What is New? *Journal of Human Resource Costing and Accounting*. 10(2), 114-26

Guthrie, J.; Petty, K & Ricceri, F. (2004). Using Content Analysis as a research Method to Inquire into Intellectual Capital Reporting. *Journal of Intellectual Capital*, 5(2), 282-93

Guthrie, J. & Parker, K. (1989). Corporate social reporting: A rebuttal of legitimacy theory. *Accounting and Business Research*. 9(76), 343-52

Hassel, L., Nilsson, H. & Nyquist, A. (2005). The Value relevance of environmental performance. *European Accounting Review*, 14(1), 41-61

Hargreaves, B. (2010). Coming clean about carbon. *Environmental Engineering*. 23(2), 44

Heinkel, R.; Kraus, A. & Zechner, J. (2001). The Effect of Green Investment on Corporate Behavior. *Journal of Financial and Quantitative Analysis*, 26(4). 431-49

Hutchison, P. (2000). Environmental accounting: issues, reporting and disclosure, *The Journal of Applied Business Research*, 16(4), 37-46

IFRS. (2010). *Emission Trading Scheme*. Retrieved September 20, 2010, from http://www.ifrs.org/Current+Projects/IASB+Projects/Emission+Trading+Schemes/Emissions+Trading+Schemes.htm

Institute of Charactered Accountants of England and Wales (ICAEW). (2004). *Sustainability: The Role of Accountants,* ICAEW, London

Ip, P. (2008). The Challenge of Developing a Business Ethics in China. *Journal of Business Ethics*, 88, 211-24

IPCC. (2007). Intergovernmental Panel on Climate Change. *Climate Change 2007: Impacts, adaptation and vulnerability*, IPCC, New York

Jeswani HK, Wehrmeyer W, Mulugetta Y. 2008. How warm is the corporate response to climate change? Evidence from Pakistan and the UK. *Business Strategy and the Environment* **17**(1): 46–60

Jones, M. & Oldroyd, D. (2009). Financial accounting: past, present and future. *Accounting Forum*, 33(1), 1-10

Jones, T. (1995). Instrumental stakeholder theory: A synthesis of ethics and economics. *The Academy of Management Review,* 20, 404

Jose, A. & Lee, S. (2007). Environmental reporting of global corporations: content analysis based on website disclosures. *Journal of Business Ethics*, 77, 307-32

Keyes, T. & Schilmoeller, G. (2009). SEC Mandatory Climate Change Risk Disclosure Is on the Horizon. *Accounting Policy & Practice Report.* 5(25), 1107-11

Kolk,A., Levy, D. & Pinkse, J. (2008). Corporate response in an emerging climate regime: the institutionalization and commensuration of carbon disclosure. *European Accounting Review,* 17(4), 719-45

Kolk, A. And Pinkse, J. (2004). Market Strategies for Climate Change, *European Management Journal*, 22(3), 304-14.

Kolk A, & Pinkse J. (2005). Business responses to climate change: identifying emergent strategies. *California Management Review* **47**(3): 6–20

Kolk, A. & Pinkse, J. (2007). Multinationals' political responses to climate change. *Business & Society,* 46(2), 201-228

Kolk, A. & Pinkse, J. (2008). A Prespective on Multinational Enterprises and Climate Change: Learning from 'An Inconvenient Truth'? *Journal of International Business Studies*, 39(8), 1359-78

Korosec, B. & Horvat, R. (2005). Risk reporting in corporate annual reports. *Economic and Business for central and south – Eastern Europe*. 7(3), 217-237, 284

KPMG. (2005). KPMG international Survey of Corporate Responsibility Reporting 2005, retrieved 12 September, 2010, from http://www.kpmg.com/nr/dronlyres/1ad7fadd-8f59-4a15-b07c-2b9c7017618/0/kpmgiar2005.pdf.

KPMG. (2008). *Climate change: current accounting and tax issues for Australian business leaders*, Retrieved August 20, 2010, from http://www.kpmg.com.au/Portals/0/CurrentAccountingTax_IssuesAustBusinessLeaders.pdf.

KPMG. (2009). *KPMG international survey of corporate responsibility reporting 2008.* Retrieved July 20, 2010, from http://www.kpmg.com/SiteCollection Documents/International-corporate-responsibility-survey-2008_v2.pdf.

Kroeze, C., Vlasblom, J., Gupta, J.; Boudri, C. & Blok, K. (2004). The power sector in China and India: greenhouse gas emissions reduction potential and scenarios for 1990-2020. *Energy Policy*, 32(1), 55-76.

Labatt, S. & White, R. (2007). *Carbon finance: the financial implications of climate change*. Hooken: New Jersey. John Wiley & Sons.

Leahy, S. (2008, January 22). Climate Change: NGO pushes companies to cut their emissions. *Global Information Network*, p.1

Lees, G. (2010, March). Accounting for Sustainability. *Financial Management*, 26-27

Lempriere, T.; Stanbury, W. & Vertinsky, I. (1996). Demand for Environmental Improvement in the Developing and Industrializing Nations of the Asia Pacific Region. *Journal of the Asia Pacific Economy*, 1(2), 139-69

Li, J. (2010, July 22). Carbon trading in pipeline. *China Daily*. Retrieved from http://www.chinadaily.com.cn

Li, X. & Zhao, C. (2009). Wen: China's emission reduction commitment practical. *Chinadaily*. Retrieved from http://www.chinadaily.com.cn

Lincoln, T. (2004). *Sustainable development and corporate social responsibility in chia,* China Beief. Retrieved August 25, 2010, from http://www.jamstone.org/programs/chinabrief/archivescb/cb2004/?tx_publicationsttnews_pi2%5Bissue%5D=21

Langrock, T. (2006). The role of Stakeholder Driven Corporate Governance the Example of BP's Climate Change Strategy. *Emissions Trading and Business*. 241-55

Lwami, T. (2004). Economic Development and/or Environmental Quqlity: Emissions of CO2 and SO2 in East Asia. *Seoul Journal of Economics*, 17(1), 55-83

MacBean, A. (2007). China's Environment: Problems and Policies, *World Economy*, 30(2), 292-307

Managi, S. & Kaneko, S. (2006). Producitivity of market and environmental abatement in China, *Environmental Economics and Policy Studies.* 7(4), 459-470

Margolick, M. & Russell, D. (2001). *Corporate Green house Gas Reduction Targets* Washington, DC: Pew Center on Global Climate Change

Mason, M. (2008). Transparency for whom? Information disclosure and power in global environmental governance. *Global Environmental Politics*, 8(2), 8-13

Metz, B., Davidson, O., Bosch, P., Dave, R. & Meyer, L. (Eds.). (2007). *Contribution of working group III to the fourth assessment report of the intergovernmental panel on climate change*. Cambridge, United Kingdom. Cambridge University press

Meyer, J. & Scott, W. (1983). *Organisational Environments*. Beverly Hills, California: Sage

McKibbin, W. (2006). Environmental consequences of rising energy use in China, *Asian Economic Policy Review*, 1(1), 157-74

Milne, M & Adler, M. (1999). Exploring the reliability of social and environmental disclosures content analysis, *Accounting , Auditing and Accountability Journal*. 12(2), 237-56

National Bureau of Statistics of China. (n.d.). *7-2 Total Consumption of Energy and Its Composition*. Retrieved on August 15, 2010, from http://www.stats.gov.cn/tjsj/ndsj/2007/html/G0702E.HTM.

Neu, D.; Warsame, H. & Pedwell, K. (1998). Managing public impressions: Environmental disclosures in annual reports. *Accounting, Organisations and Society*, 23(3), 265-82

Nolan, P. (2005). China at the crossroad, *Journal of Chinese Economic and Business Studies*, 3(1), 1-22

Oberthur, S. (2007). The Climate Policy of the European Union: The European Union in International Climate Policy: The Prospect for Leadership. *Intereconomics/Review of European Economic Policy*, 42(2), 77-83

O'Donovan, G. (2002). Environmental Disclosures in the Annual Report: Extending the Applicability and Predictive Power of Legitimacy Theory. *Accounting, Auditing and Accountability Journal*, 15(3), 344-371

Ohsita, S. & Ortolano, L. Effects of Economic and Environmental Reform on the Diffusion of Cleaner Coal Technology in China. *Development and Change*, 37(1), 75-98

Organisation for Economic Co-operation and, D. (2007). *Policies for a Better Environment: Progress in Eastern Europe, Caucasus and Central Asia*. Paris and Washington, D.C.

Pacca, S. (2009). Life-Cycle Assessment (LCA) as a Management Tool: An Emphasis on Electricity Generation, Global Climate Change, and Sustainability. *Handbook of Inpout-Output Economics in Industrial Ecologgy* (pp.247-61). Eco-efficiency in Industry and Science, vol.23. Dordrecht and New York: Springer

Potoski, M.; & Prakash, A. (2005). Covenants with weak swords: ISO 14001 and facilities' environmental performance, *Journal of Analysis and Management*, 24(4), 745-69

Porwal, L. (2004). *Accounting theory, 3rd ed.* India: McGraw- Hill

Reid, E. & Toffel, M. (2008). Responding to Public and Private Politics: Corporate Disclosure of Climate Change Strategies. *Harvard Business School, Working Paper*, 9-19

Reid, E., & Toffel, M. (2009). Responding to public and private politics: corporate disclosure of climate change strategies. *Strategic Management Journal*, 30(11), 1157-78

Ratnatunga, J. (2007). An Inconvenient Truth about Accounting. *Journal of Applied Management Accounting Research*, 5(1), 1-20

Ranchhod, A., & Park, P. (2004). Market Positioning and Corporate Responsibility. *International Journal of Corporate Governance and Ethics*, 1(2-3), 175-91

Schreurs, M.; & Tiberghien, Y. (2007). Multi-level reinforcement: explaining European union leadership in climate change mitigation, *Global Environmental Politics*, 7(4), 19-46

Shan, Z. (2007). *Chinese Enterprises Corporate Social Responsibility Survey Report*. (In Chinese). Beijing, China: Economy and Science Press

Shying, M. & Wong J. (2007). Ensuring credibility in emissions trading. *Intheblack, Melbourne*, 77(10), 62-64

Simnett, R. & Nugent, M. (2007). Developing an Assurance Standard for Carbon Emission Disclosures. *Australian Accounting Review*, 17(2), 37-47

Simnett, R.; Green, W. & Huggins, A. (2009). GHG emissions standard on its way. *Charter*. 80(9), 64-66

Sioshansi, F. (2009). De-carbonizing Electricity Generation: It Won't Be Easy, Cheap, nor Enough. *Utilities Policy*. 17(3-4), 217-24

Skjaerseth, J. & Wettestad, J. (2009). The Origin, Evolution and Consequences of the EU Emission Trading System. *Global Environmental Politics*, 9(2), 101-22

Spies Butcher, B. & Stilwell, F. (2009). Climate Change Policy and Economic Recession. *Journal of Australian Political Economy*, (63), 108-125

Sterman, J., & Sweeney, L. (2002). Clody skies: assessing public understanding of global warming. *System Dynamics Review*, 18(2), 207-40

Stern, N. (2006). Stern Review on the Economics of Climate Change. *HM Treasury*. Retrieved on December, 12, 2010, from http://www.hm-treasury.gov.uk/independent_reviews/

Stern, N. (2009). *A Blueprint for a Safer Planet: How to Manage Climate Change and Create a New Era of Progress and Prosperity*. London: Bodley Press

Steenkamp, N. & Northcott, D. (2007). Content Analysis in Accounting Research: the Practical Challenges. *Australian Accounting Review*. 17(3), 12-25

Tilt, C. (1994). The influence of external pressure groups on corporate social disclosure: Some empirical evidence. *Accounting, Auditing & Accountability Journal*, 7(4), 47-72

Unerman, J. (2000). Methodological issues: reflections on quantification in corporate social reporting content analysis. *Accounting, Auditing & Accountinability Journal*, 13(5), 667-681

United Nations Economic Commission, (2004). *Business ethics for start-up entrepreneurs and SMEs: The principles of responsible entrepreneurship*. Retrieved August 10, 2010, from http://www.unece.org/indust/sme/BusinessEthics-final.pdf

UNFCCC. (2010). *Kyoto Protocol*. Retrieved October 25, 2010, from unfccc.int/kyoto_protocol/items/2830.php

Vormedal, I. (2008). The Influence of Business and Industry NGOs in the Negotiation of the Kyoto Mechanisms: The Case of Carbon Capture and Storage in the CDM. *Global Environmental Politics*, 8(4), 36-65

Weinhofer, G. & Hoffmann, V. (2010). Mitigating climate change – how do corporate strategies differ? *Business Strategy and the Environment*. 19(2), 77-89

Wickerham, J. & Zadek, C. (2009). China's corporate social responsibility change makers, *Fortune China*. 3, 2-16

Wilmshurst, T. & Frost, G. (2000). Corporate Environmental reporting: A test of legitimacy theory, *Accounting, Auditing & Accountability Journal*. 13(1), 10-26

Wimmer, R. & Dominick, J. (2003). *Mass Media Research: An Introduction* (7th ed.). Thomson Wadsworth, Australia.

Wong, L. (2009). Corporate social responsibility in china: between the market and the search for a sustainable growth development. *Asian Business and Management*, 8(2), 129-48.

World Bank. (2010). *State and trends of the carbon market 2010*. Retrieved July 12, 2010 from http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2010/06/30/000333037_20100630025512/Rendered/PDF/554190WP0State10Box349452B01PUBLIC1.pdf

Xiao, H. (2006). Corporate Environmental Accounting and Reporting in China: Current Status and the Future. *Sustainability Accounting and Reporting*, 21, 45-71

Xie, X. & Economides, M. (2009). China's coal consumption. *Portworld*. Retrieved August 15, 2010, from http://www.portworld.com/news/i90452/China_s_coal_consumption

Xin Hua News. (2010). *Carbon Information Disclosure: Are Chinese businesses ready?* (In Chinese). Retrieved August 30, 2010, from http://news.xinhuanet.com

Xin, B. (2010). China's emission reduction pledge and global response. *Peopledaily.* Retrieved on December 12, 2010, from http://english.peopledaily.com.cn/90001/90780/91345/7096279.html

Yapa, P., Harvey, D. & Ellis, G. (2005). Disclosure of Corporate Environmental Policies in Annual Report: Further Evidence Incorporating a National Ideology—An Australian Study. *Journal of Asia-Pacific Business*, 6(1), 75-90