# CARBON INFORMATION DISCLOSURE STRATEGIES (CIDS): A DECISION METHODOLOGY FRAMEWORK FOR OPTIMIZING CARBON DISCLOSURE

By

Shari L. Meghreblian

Dissertation

Submitted to the Faculty of the

Graduate School of Vanderbilt University

in partial fulfillment of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

in

Interdisciplinary Studies: Environmental Management

August, 2010

Nashville, Tennessee

Approved:

Professor Mark Abkowitz

Professor James Clarke

Professor Mark Cohen

Professor Michael Vandenbergh

Jim Vines, ex-officio

**In Spite of….**

Obstacles along the way

**Because of ….**

The love and support of family and friends

**And in hope of….**

John and Jessi pursuing their dreams…

no matter what

**Acknowledgements**

The submission of this dissertation represents the culmination of years of work toward my goal of achieving my PhD. This certainly did not happen in a vacuum. Many wonderful people have been on this journey with me. My sincere gratitude goes out to them all.

Words really cannot express the gratitude I have for my advisor, Dr. Mark Abkowitz. Without his intellect, guidance, and friendship over the years, I am quite certain I would not have finished this dissertation. I am very fortunate to have had his insight, advice and the occasional "Hello, are you still there?" discussion. He knew how to motivate and encourage me while demanding a high research standard and commitment.

Also, my sincere thanks go out to my committee members Dr. Mark Cohen, Dr. Jim Clarke, Professor Michael Vandenbergh and Jim Vines for their guidance over the years. They have provided valuable input and suggestions that have helped shape this research. I appreciate their wisdom, time and accessibility.

Many friends and colleagues have been instrumental at various stages throughout this process. I am appreciative for all of them. Special thanks go out to Greer Tidwell, Jr., Bill Miller, Bob Martineau and Rick Bolton for being a sounding board for ideas and processes. In addition, much gratitude to my co-workers in the Central Utilities Team at General Motors – Spring Hill who have supported my efforts every step of the way. Also, thanks to Pam Hudson who is like my sister and has been there for many of my significant life events.

Most importantly, none of this would have been possible without the love and support of my family. My parents, Jimmy and Sue, have been a constant source of faith and strength over the years. My husband Mark, and my kids, John and Jessi, have as much time invested in this accomplishment as I have. I am blessed that they have stuck it out with me and appreciate their love.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

# CHAPTER I

## INTRODUCTION

In 1990, a small piece appeared in New Scientist entitled, "The Politics of Climate: A Long Haul Ahead" (Bowler 1990). Twenty years later, climate change and how to respond to it remain among the top issues discussed in the classroom, the board room and on the floor of Congress. In a time where recession, foreclosures and job-losses dominate the news, the topic of climate change is still relevant and a hotly contested topic in our society.

Many countries, regions and states have enacted policies and regulations to control the emissions of greenhouse gases, also referred to as carbon emissions. The United States, while still lacking a Federal program on carbon reduction, has initiated an accounting program for greenhouse gases through the Environmental Protection Agency's (EPA) GHG Reporting Rule (EPA 2009).

In the meantime, corporations, small businesses and independent coalitions are analyzing their impact on and/or from climate change and deciding what actions they need to take to strategically position themselves in the carbon economy. Depending on the nature of the business, this analysis may conclude that the best path will be to do only what is required to comply with upcoming Federal or State greenhouse gas regulations. Most likely, however, a thorough assessment of a company's strategic business model will point out that some actions to reduce its carbon footprint not required by law (e.g., energy conservation) are desirable to pursue purely for business reasons.

Regardless of the specific business drivers (mandatory or voluntary) for pursuing a particular carbon strategy, one fundamental need common to any climate change initiative is to account for and disclose, in some verifiable manner, baseline emissions and future reductions of greenhouse gases. This task is more complicated than it sounds.

In order to establish an effective strategy for disclosing greenhouse gas information, one must thoroughly understand the risks and opportunities associated with the impact of climate change in the context of one's overall business strategy. Once its climate strategy is developed, a company can then design and implement an effective carbon information disclosure strategy.

Figure 1 represents one way of thinking about carbon information disclosure and its place in the overall business strategy of a company. The business strategy of a company is determined by multiple variables including product platforms, growth strategies and marketing plans to name a few. A company's climate or carbon strategy is conditional on a number of factors directly related to the profile of the business, including the company sector and the carbon intensity of the company. Last, carbon information disclosure strategy should be designed to support both the carbon strategy and business strategy of the company.

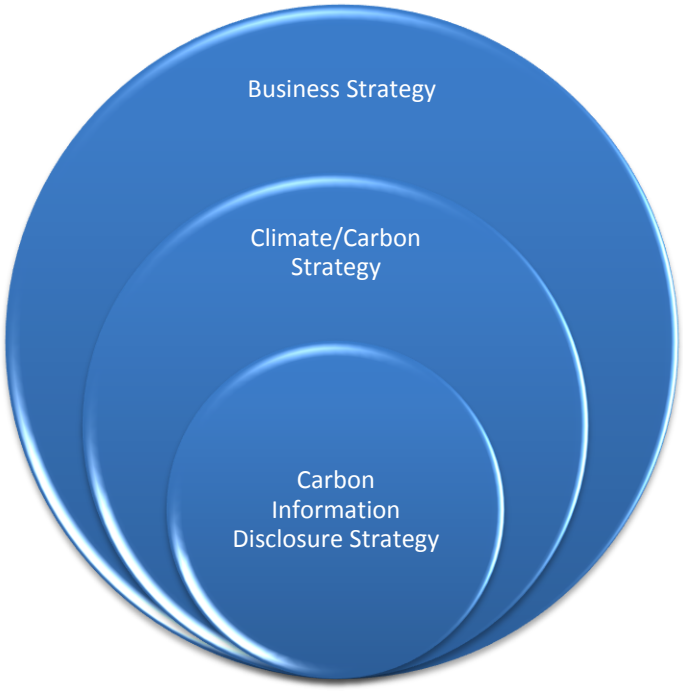


Figure 1 – Carbon Information Disclosure – Subset of Business Strategy

The objective of this dissertation is to develop a decision making framework that companies and organizations can use in establishing an effective carbon disclosure strategy for themselves. This will be accomplished by first researching the current practice of carbon disclosure both in theory through a literature review and in practice by conducting a benchmarking study of carbon disclosure efforts from a sample of U.S. companies. The decision-making framework will be developed and presented taking into account the findings from the literature and benchmarking study.

The following three chapters, while being submitted here as a complete dissertation, are written such that they can be formatted as three separate manuscripts, each for refereed journal publication consideration. Chapter 2 reviews the state-of-the-practice for carbon information disclosure building on literature from multiple

disciplines. This section also includes a review of the literature that addresses the use of decision framework tools for strategic business decision-making. Chapter 3 presents the methodology and results of a benchmarking study analyzing the carbon disclosure efforts of a sample of 63 U.S.-based companies across nine sectors. Chapter 4 offers a decision making methodology framework that was developed as part of this research and validated by peer-review process. This framework is intended to serve as a decision-support tool that a business can use in developing an effective carbon information disclosure strategy that is consistent with its overall business objectives and profile. Chapter 5 concludes by summarizing key contributions of the dissertation research as well as providing some directions for future research.

Because Chapters 2, 3 and 4 are intended to be independent, yet interrelated, certain information is repeated. Efforts were made to keep this redundancy to a minimum, overlapping only when necessary for clarity.

## CHAPTER II

## CARBON INFORMATION DISCLOSURE STRATEGIES: A REVIEW OF CURRENT METHODS AND PRACTICES

### Introduction

Many nations, regions, states and independent coalitions are adopting policies or regulations in response to global climate change. At the center of the climate change issue is the emission of greenhouse gases (GHG), particularly carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_20$) hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride ($SF_6$). For the purposes of this paper, the term *carbon strategy* is defined as those activities associated with reducing or mitigating greenhouse gases.

While proposed methods to achieve carbon emission reductions vary, a fundamental premise is the need to account for and disclose, in some verifiable manner, baseline emissions and future reductions. The exact nature of how this is accomplished depends on the path that is ultimately chosen to address climate change. Several organizations have been conducting some form of greenhouse gas accounting for years pursuant to a state requirement or a regional initiative such as the Regional Greenhouse Gas Initiative (RGGI). Others have begun to calculate emissions "in-house" in an effort to establish a baseline for future regulations or as a precursor to developing their own internal greenhouse gas strategy.

Beyond the actual accounting of the carbon emissions produced by a company and its value chain, there are a host of considerations regarding the impact and strategy

surrounding the disclosure of these emissions. While some organizations will be required by law to make their carbon footprints public, others will not. In addition, it is likely, based on the current proposed reporting frameworks, that those emissions that are required to be disclosed may not paint a complete picture of a company's true carbon footprint.

As companies think through their carbon issues, a key question that they face is, "What is an effective strategy to account for and disclose our carbon footprint?" While part of this answer will likely be driven by the regulations pertaining to a particular business, considerations such as brand value, stakeholder and market demands, and competitor strategies could lead to voluntary actions.

The intent of this paper is to review the scholarly literature available on carbon information disclosure, including the following topics: 1) environmental business strategy; 2) carbon strategy; 3) environmental information disclosure strategy; and 4) carbon information disclosure strategy. The relationship among these topics is depicted in Figure 2. Because climate change, carbon strategy and information disclosure are concerns across multiple sectors of the public and private community, sources cited in this paper include the disciplines of accounting, finance, marketing, corporate strategy, law and engineering.

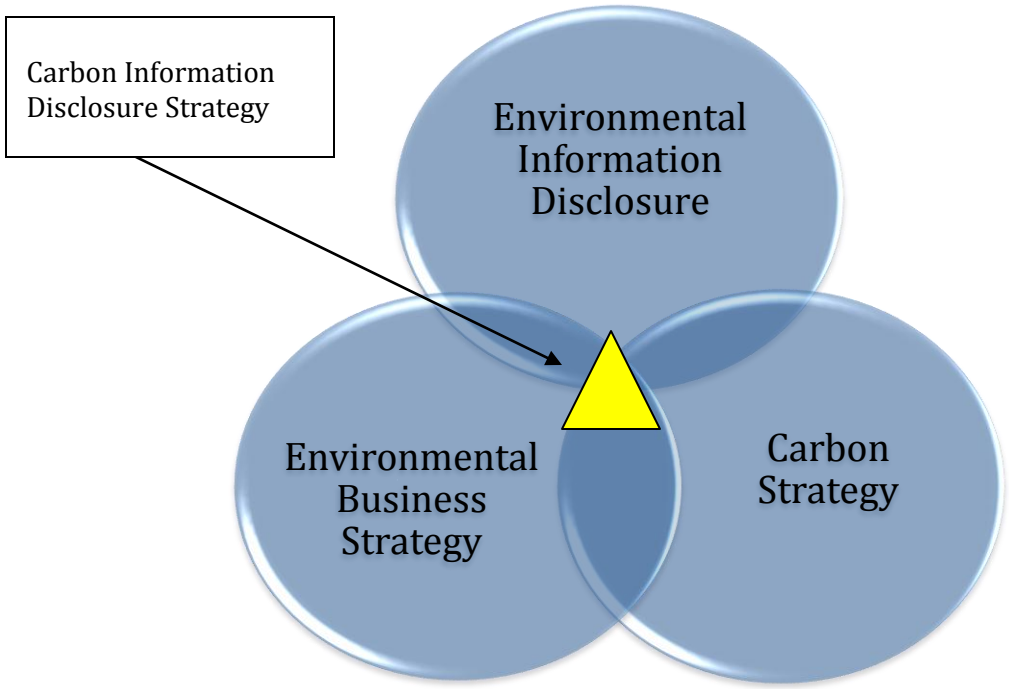


Figure 2 – Foundations of Carbon Information Disclosure

While there are a growing number of scholarly articles being published about carbon strategy and disclosure, there appears to be a gap in the literature with respect to comprehensive carbon disclosure strategy development as it pertains to overall business strategy within a firm. The objective of this review is to understand the extent to which this gap exists, and to serve as a precursor to performing a benchmark study of selected U.S. companies regarding the scope of their carbon information disclosure strategies. Understanding the contributions of previous research in the areas that have influenced carbon information disclosure practices will lay the foundation for the implementation of the benchmarking study.

The ultimate goal is to develop a decision making framework for companies to use as a strategy development tool. For this reason, a review of relevant literature on the use of decision framework tools for strategic business decision-making is included. This will provide a basis for the development of an appropriate carbon information disclosure framework.

**Environmental Business Strategy**

In the past twenty years, environmental business strategy has gone from being driven mainly by regulatory compliance to being managed as an interdependent aspect of a successful operation along with economic performance and brand value. In this regard, companies are seizing opportunities to reduce emissions from manufacturing, eliminating toxic chemicals in products, and cutting back on energy and water usage. This shift in business strategy, while centered in society's desire to have less impact on the environment for future generations, is motivated by the notion that it makes fundamental business sense. By viewing the migration toward a green economy as an opportunity to gain a competitive edge, companies can be at the forefront of creating value through an effective environmental strategy (Esty and Winston 2009).

Corporate governance to achieve these objectives can be driven internally by shareholders or leaders of a company and defined as environmental policy and values. External forces such as consumers, investors, advocacy groups, and government regulations can also profoundly impact a company's corporate environmental governance (White and Kernan 2004).

While there is little argument that regulations, ethical best practices and oversight committees are a necessary part of corporate existence, there is much debate over the extent to which these requirements promote sustainability. Cartwright and Craig assert that the true sustainability drivers include public awareness and concern, NGO influence and the manager's personal awareness and concern (Cartwright and Craig 2006). This is motivating firms to join and even lead the sustainability movement (Sneirson 2009).

As society has come to expect corporate social responsibility (CSR) from businesses, managing for the "triple bottom line" (i.e., economic, environmental and social) has become a fundamental business planning consideration. A study of 250 business leaders worldwide reflects that companies have moved beyond handling CSR as a philanthropic effort and are "utilizing CSR as an opportunity and a platform for growth" (Pohle and Hittner 2008).

There are multiple recognized benefits of including corporate responsibility as a strategic driver for business (Arthur D Little 2003). These include reputation management, risk management, employee satisfaction, innovation and learning, access to capital and financial performance. The commitment to corporate social responsibility creates new markets, opportunities and relationships, sets the scene for long term profitability and increases the competitiveness of the communities in which firms operate.

Several studies have been conducted that establish a positive correlation between CSR and business financial performance. In one instance, a review of fifty-six companies that are members of the Dow Jones Sustainability Index (DJSI) found that 66.7% surpassed market expectations over a five-year period, outperforming the S&P 500 with regard to return on equity (McPeak and Tooley 2008). This result supports the premise that CSR is not just an ethical obligation as part of corporate governance, but actually has business value.

While corporate social responsibility is a multi-faceted issue, corporate sustainability has emerged as the generally accepted term to describe the genre of efforts associated with short and long term environmental initiatives within companies today. In keeping with the basic principle of CSR, these environmental strategies go beyond considering shareholder value as the sole business criteria to incorporate the community and environment in the mix.

As regulations, resource availability and consumer demands change, businesses are seeing first-hand the risks associated with operating in an unsustainable manner (Anderson 2006). Anderson addresses the critical importance of sustainability risk management by highlighting examples of oil shortages, social justice and climate change. He argues that "anticipating these risks and developing appropriate risk mitigation strategies" can give companies not only protection against potential risks, but also increases profitability through cost efficiencies and competitive advantage.

Grayson et al. addressed the strategic opportunity associated with embracing sustainability as a new corporate mindset (Grayson 2008). As opposed to focusing on mitigating risks, emphasis was placed on innovation and opportunity in order to develop strong business value and sustainable practices which, in turn, positively reflected on the bottom line. Among the steps to incorporate sustainability in the "corporate mindset" is embedding sustainability in every part of the business, bringing stakeholders on board and formulating strategy with sustainability at its heart.

Trying to "go green" and operate sustainably is not limited to major corporations, however. Mid-sized businesses are also actively seeking ways to become better

environmental stewards (Barger 2008). The reasons for doing so, namely cost savings and consumer perceptions, mirror those of their larger counterparts. Regardless of size, the effect of climate change as a growing concern across the globe is forcing companies to assess the risks and opportunities associated with the impact of their carbon footprint on their overall business strategy.

However, even with the growth of sustainability as a legitimate business concern some research shows that many companies are not actively managing sustainability and prioritizing it within the overall company strategy. A report published by McKinsey & Company cite that while more than 50% of CEOs surveyed consider sustainability "very" or "extremely important", only about 30% are investing proactively in sustainability issues. (McKinsey 2010). Potential reasons for this range from a lack of understanding on what sustainability is to a denial about the existence of climate change.

Additional research from the Boston Consulting Group finds similar reasons for the difference between intent and action when it comes to sustainability initiatives. Three major barriers to corporate action include lacking the right information, inability to define the business case for value creation and flawed execution. (BCG 2009)

**Carbon Strategy**

Depending on the size of a company, the nature of its business and the amount of greenhouse gas emissions, some firms are regulated under Federal Greenhouse Gas Reporting regulations and required to account for and report greenhouse emissions. While other companies may not be subject to these regulations, they are motivated from the perspective of brand value to have a formal carbon strategy that is communicated to

the public. Some of these businesses find that they are subject to constraints in the new carbon economy due to dependence on materials that are carbon based. For example, a company that relies on petroleum-based products as raw materials in its manufacturing process will probably find the cost of doing business will increase in the coming years. It is likely that this company will look for alternative materials.

Porter and Reinhardt caution against viewing climate change as strictly a corporate social responsibility and stress the fact that it is a corporate strategy concern (Porter and Reinhardt 2007). The "inside out and outside in" approach of studying the firm's value chain is the method by which the strategic opportunity of climate change can be assessed. Moreover, a multi-disciplinary approach should be taken in reviewing the impacts of a low carbon economy by companies, policy-makers and the investment community (Carbon Trust 2008). By being proactive, a company can be well positioned to create opportunities to increase its value up to 80%, whereas 65% of value could be lost if a company does not address climate change in a timely manner.

Business for Social Responsibility has framed carbon strategy development as the challenge of how a company can respond to climate change in a sensible manner (Waage 2006). As opposed to just mirroring actions that other companies have implemented, companies are encouraged to chart their own course using a three-pronged approach - efficiency, offsets, and renewables – applied across all stages of the business. Hoffman and Woody discuss knowing your carbon exposure, reducing your $CO_2$ footprint through assessing business opportunities and influencing the policy development process as being the crucial steps in strategy development (Hoffman and Woody 2008). They stress

the importance of making the business case for carbon strategy as a primary responsibility of top leadership in the company. While cost savings and new market opportunities are cited as the most common reasons companies employ carbon strategies, scenario planning is also an important decision making tool (GBN 2007). By thinking through risks, opportunities, future regulations, markets and other forces that will shape the future business landscape, companies can take a holistic approach to climate strategy by considering the impacts on the overall business.

Enkvist and Naucer acknowledge that the companies who come out on top are the ones that "reposition themselves to seize the opportunities of a low-carbon future" (Enkvist and Naucler 2008). Some studies have focused on a particular industry or sector to examine trends and considerations. A compilation of case studies that highlighted approaches that companies are taking to reduce their environmental impact and develop more efficient and sustainable production approaches (Manufacturing Leadership Board 2008) . Manufacturing organizations, which account for approximately 30% of total carbon dioxide emissions in the U.S. (EPA 2008), are cited as being under pressure to reduce carbon emissions in response to both internal and external stakeholders. Towards that end, it is important to build a business case for carbon reduction, comprised of potential risks and benefits, both financial and non-financial.

Another important area of carbon strategy lies within the supply chain. By managing carbon effectively through the supply chain, companies can help reduce their environmental emissions footprint, strengthen their brand image and develop competitive advantage (Butner, Geuder et al. 2008).

By positioning itself as an industry leader, a company stands to gain a significant advantage over their competitors and the market (Schuchard 2007). The rationale for establishing a leadership position is based on recognizing: 1) climate change provides a new high-profile social platform on which to compete, 2) legal expectations for climate governance are broadening, 3) investors are looking for climate innovators, 4) customers are gradually beginning to take notice, and 5) climatic realities will require more than individual corporate action. The makings of climate leadership depend on three interrelated areas: building enabling environments, developing climate-friendly value chains, and shaping external systems. Among the best companies, carbon strategy is shaped internally and externally, reviewed regularly and built into implementation design (Little 2007). The strategy is led by senior management and involves the board as well as all levels of management, including employees.

**Environmental Information Disclosure**

The disclosure of environmental information is typically associated with government regulations such as the Toxic Release Inventory or Securities and Exchange Commission (SEC) rules. However, as environmental issues have occupied a more prominent role in limiting investor risk, enhancing marketing and supporting corporate social responsibility programs, environmental information disclosure has taken on a much broader meaning. Here, an important distinction is made between mandatory and voluntary reporting, and the use of different disclosure themes in communicating environmental information.

Mandatory information disclosure has been predominantly an issue of concern for the regulated community, with such programs as "Right-To-Know" in the U.S. and similar programs of varying stringency in other countries (Sand 2002). The effectiveness of mandatory programs has been evaluated as to their impact on pollution reduction and social welfare (Cohen 2006), corporate and community decision making (Stephan 2005), investor reactions (Ferraro 2005) and stakeholder involvement (Abkowitz 1999). While mandatory information disclosure has been used as "a key component of strategies to promote more effective, less costly alternatives to command-and-control regulation" (Case 2001), it has come under increasing scrutiny in terms of both benefits and costs (Beierle 2003). A detailed review of the economic and legal literature available on regulating through information disclosure shows that opportunities exist with information disclosure due to the powerful lever it has in motivating environmental performance (Case 2001). Awareness should be given to the tendency for current informational regulations to be "blunt and unfocused", requiring more empirical research to be conducted by policymakers before using information disclosure as a primary policy.

Information disclosure on a voluntary basis has become more popular as a means of promoting a company's corporate social responsibility initiatives through annual Corporate Social Responsibility (CSR) reporting, press releases and advertising. One widely recognized organization in the field of sustainability reporting is the Global Reporting Initiative (GRI). Transparency and the reliable exchange of sustainability information is advocated and promoted through the GRI Sustainability Reporting Framework (GRI 2009). Known as the "G3 Guidelines", this framework provides guidance on how to report sustainability information and is the foundation for many

other sustainability reporting tools. The specific practice of carbon disclosure has received considerable attention through the continued efforts of the Carbon Disclosure Project (CDP). CDP has developed a worldwide database of carbon emissions from over 2,500 organizations in 60 countries (CDP 2009). Information received annually from questionnaires submitted by companies is analyzed and reported publicly.

A primary communication tool for corporations has been the annual report. Most companies, while required to report some risks and liabilities under SEC rules for financial reports, either disclose additional environmental information in non-financial sections or publish separate reports devoted to corporate social responsibility. Some companies are now issuing annual sustainability reports as a means of communicating environmental initiatives and metrics to stakeholders.

There still exists wide variability in the type and amount of information disclosed by companies, however, particularly in the non-financial sections. This can be a cause for concern with regard to transparency and potential claims of greenwashing against the company. Walden and Stagliano studied the disclosure themes in the annual reports of fifty-three U.S. companies in four major industry groups (Walden and Stagliano 2004) . Environmental disclosures in the financial sections concerned expenditures and contingencies. Disclosures in the non-financial section contained information about pollution abatement and other environmental data. The authors concluded that the highest perceived quality of disclosure is associated with the environmental information in the financial section. This implies that while mandated information is trusted, information that is voluntarily reported is more suspect. It suggests the need for agreed

upon accounting principles such as those used by the insurance and investment industries.

The practice of publishing environmental information in annual or sustainability reports originally began as an exercise in creating legitimacy for companies (Cerin 2002). Without reporting much data in the way of emissions or goals and objectives, corporate reporting of environmental information was often viewed as one-sided rhetoric. As NGOs, such as GRI, began developing reporting frameworks, greater consistency and completeness of a firm's environmental picture began to emerge. A study of the environmental disclosure practices in annual reports of Australian companies revealed, "propensity to disclose higher levels of positive environmental disclosures in the voluntary sections of the annual report than in the statutory sections" (Cowan 2005). This recognized tendency in voluntary reporting suggests that more formal systems of accounting for environmental data can be helpful in ensuring accuracy and credibility.

While disclosing environmental information provides transparency to external stakeholders, it serves internal stakeholders as a management tool for corporate decision making. A study of 1,000 manufacturing facilities was conducted to ascertain whether a correlation existed between disclosing TRI information (mandated disclosure) and influence on environmental performance at the facility (Stephan 2005). Interestingly, it was discovered that while facilities seem to care about environmental performance, "the TRI may not be the vehicle by which they set priorities". Rather, mandated disclosure was viewed as "another report" and other tools were used to make decisions about environmental matters.

Literature regarding the relationship between voluntary information disclosure (primarily sustainability reporting) and environmental performance has increased in the past five years. Near the beginning of this uptick, with CSR reporting becoming commonplace, Friend and Russell posed the question to several business leaders about how they used their CSR report to make better business decisions (Friend and Russell 2003). The majority of respondents were just beginning to utilize the information in the reports for internal business purposes. They surmised that the key is to design these reports to be used as a tool rather than a press release. They further identified a systematic process for producing reports that add business value. In the authors' words, "a good CSR report must communicate an intrinsic relationship between your CSR goals and your business goals and operations. An outstanding report will leverage the reporting process to create significant business value." This is achieved by making available timely, relevant and accurate information.

Adams and Frost were among the first to examine the integration of sustainability reporting into management practices (Adams and Frost 2008). Despite utilizing a small sample of companies, they observed a diversity of approaches to sustainability issues and multiple triggers for the prioritization of sustainability issues. While an underlying reason for this was the various stages of sustainability development in the companies surveyed, lack of consistent reporting had impeded the usefulness of sustainability reporting as a management tool. Recognizing this as a qualitative study, the authors suggested that a more in-depth quantitative perspective is needed.

A survey conducted by KPMG in 2008 tracked reporting trends in the world's largest companies. Two noteworthy insights from this study are that reporting is now

the norm among the largest corporations, and reporting is now more likely to occur within the context of an overarching strategy and management system (KPMG 2008).

Another relevant topic to the decision of disclosing environmental information is weighing the benefits and costs. Brancato cites the benefits as the potential for improved valuation and increased interest from institutions to participate in strategy discussions (Brancato 1997). Costs of disclosure include company exposure to litigation and competitive information being revealed.

A study by Lee and Hutchison reviews previous literature on forces affecting the decision to disclose environmental information. They further categorize these into three factors: 1) societal – laws and regulations, legitimacy, public pressure, publicity, 2) firm/industry – characteristics, rational cost/benefit analysis, and 3) individual – culture, attitudes (Lee and Hutchison 2005).

Some of the literature on environmental disclosure focuses on how it relates to the environmental and financial performance of the company. As far back as 1995, researchers began examining this correlation. Cohen, Fenn and Naimon published one of the first reports using empirical data to study the environmental performance of the Standard and Poor's 500 companies (Cohen, et al. 1995). Even at that early stage of the trend toward global concern for the environment, some correlation was shown to exist between the environmental and financial performance of companies. More recently, Clarkson et al. tested competing predictions from economics-based and socio-political theories of voluntary disclosure. Using a sample of 191 firms in high polluting industries, they found a positive association between environmental performance and the level of

discretionary environmental disclosures (Clarkson, et al. 2007), a finding also substantiated by others (Al-Tuwaijri 2004).

While much literature is available regarding the benefits to firms of disclosing environmental information, it is also recognized that many firms choose not to disclose information when the perceived cost of doing so outweighs the benefits (Verrecchia 2001). These costs can include the direct costs associated with preparation and reporting as well as indirect costs realized by giving information away to competitors (Solomon 2007). Other concerns firms cite as reasons for not disclosing environmental related information is the potential of investors to interpret the disclosure negatively, thus impacting the value of the company as well as legal concerns for added risk of litigation (Clarkson, et. al. 2010).

Solomon and Lewis conducted an empirical study into the incentives and disincentives for corporations reporting environmental information (Solomon 2002). They found that possible reasons for the "inadequacy of corporate environmental disclosure" include a lack of understanding and awareness of environmental issues, possible concern over damage to companies' reputation, and cost of disclosure among others.

As more companies are reporting sustainability information in various forms either as a result of mandatory or voluntary measures, there are still numerous obstacles against both mandatory and voluntary approaches to reporting according to a UNEP/KPMG/GRI report. These include but are not limited to knowledge gap between regulators and industry, inflexibility in the face of change, constraints on efficiency and competitiveness, conflicts of interest and insufficient resources. (GRI 2010).

Additional challenges in sustainability reporting such as "multiple metric frameworks, a lack of uniform definitions and a lack of consistent applications" have been cited as reasons for unreliable data which in turn is a deterrent to reporting as a company (CSR 2010).

**Carbon Information Disclosure Strategy**

Environmental assessments, impact statements and footprint analysis have been used for years to quantify the environmental effect on certain indices of growth, expansion and production. For example, ecological footprints have been used for more than fifteen years as an aggregate measure of sustainability of geographical regions as well as for certain products and activities (Frey 2006).

Organizations are starting to accept the fact that climate change issues are prevalent in the minds of consumers and shareholders, and that they play a role in both creating atmospheric carbon and enacting measures to reduce it. As companies decide and reduce their carbon footprint, they must first understand what it is and how to measure it. Accurate and effective ways of calculating carbon footprints are only the first step in an overall carbon reduction strategy. As momentum builds for some form of greenhouse gas regulation in Congress and the EPA Greenhouse Gas Reporting rule, which requires reporting of GHGs from large sources and suppliers in the U.S. (EPA 2009), is now in effect, it is apparent that carbon disclosure is an imminent issue to be addressed by businesses in specific sectors. For others not affected by these regulations, carbon disclosure should still be considered as a potential business strategy.

While mandatory reporting for firms will largely depend on the size, amount of emissions and industrial sector, voluntary disclosure of greenhouse gas emissions can be undertaken if a company who chooses to do so. Recent research has focused on reasons that firms engage in voluntary disclosure of carbon emissions.

In a study of the UK FTSE 100 and the motivations, drivers and barriers to carbon management, five factors were observed that motivate companies to undertake carbon management (Okereke 2007). These factors are company profit, competition for credibility and leverage in climate policy development, fiduciary obligations, minimization of business risk, and ethical considerations. It is reasonable to that these factors also motivate carbon disclosure as disclosure would be required in order for a company to realize the corresponding benefit.

Reid and Toffel found empirical evidence that, "shareholder actions and regulatory threats are likely to prime firms to adopt practices consistent with the aims of a broader social movement", in this case corporate disclosure of climate change strategies (Reid and Toffel, 2009).

Kolk explored how corporate governance and accountability affect firms' offering of information about sustainability initiatives in both sustainability and annual financial reports (Kolk 2008). In a separate study, corporate responses to climate change were examined in relation to the development of reporting mechanisms for greenhouse gases (Kolk et. al. 2008). The authors cite pressure from investors and environmental non-governmental organizations as one driver to corporate carbon disclosure. In addition, the emergence of carbon trading was examined as a precursor to such voluntary carbon disclosure mechanisms as the Carbon Disclosure Project.

To the extent that carbon strategies are voluntary, they can be considered a subset of corporate social responsibility (CSR). Lyon and Maxwell purport that there are a number of market and non-market forces that make corporate social responsibility profitable. The desire to be seen as a "green" company, the rise in "green" consumers, and the aversion of political conflict all influence a company's decision to engage in CSR activities, including the disclosure of carbon information.

Developments in the regulatory and legislative landscape over the last few years are a testament to the fact that GHG emission accounting and reporting is a legitimate business concern that needs to be addressed on multiple levels within a company. While as of March 2010 no climate reduction bill had made it through Congress, there has been some progress and considerable legislative activity with respect to climate change. All three branches of government have attempted to address greenhouse gas emissions on some level. The following discussion briefly outlines some of the major initiatives, up to date through March 2010, at the international, federal, regional and state level that have contributed to the current status of greenhouse gas regulations or lack thereof. Any legislation that is passed with regard to climate reduction will have some element directly related to climate change disclosure.

Historically, from a government and policy perspective, there has been a hesitancy to formally recognize the existence of climate change and respond accordingly. The refusal of the U.S. to sign the original Kyoto Protocol, the inability to pass Federal legislation to reduce greenhouse gas emissions and the reluctance to address fossil fuels put the U.S. in a position of perceived inactivity.

The climate change debate in the U.S. has seemingly undergone a fundamental shift in the past few years with the introduction of several climate bills in Congress and leading up to the early stages of the Obama administration. Numerous bills to curb greenhouse gas emissions are being introduced into Congress, while many individual states and coalitions of states have already enacted such measures. Legal developments, such as the 2007 U.S. Supreme Court decision in *Massachusetts v. EPA* and the December 7, 2009 Endangerment Finding from the EPA regarding carbon dioxide, increase the likelihood that future means of addressing climate change could be heard by the courts. Many proposals have been introduced by various parties that fall at different points along the policy continuum. At one end are "bottom-up" approaches which rely on programs that are voluntary in nature. At the other end are "top-down" approaches in which governments define explicit and binding agreements that drive national policies (Bodansky 2007). In order to solve a global externality, as in the case of international action in the form of agreed upon GHG emission reduction methods, it is likely that regulation will need to be employed (Wiener 2007). Others believe that voluntary plans to curtail carbon would be more desirable, achieving the required reductions without the expense to business that would accompany mandatory regulation (Smick 2006). Regulated or voluntary GHG reduction policies do share at least one common requirement, however, namely the importance of having an accurate accounting of emissions.

On the international landscape, the original Kyoto Protocol established binding targets for 37 industrialized countries to reduce emissions collectively by 5.2% along with a corresponding timeline. These reductions are leveled against the country's 1990

$C0_2$ emissions. Each country's emission targets are to be calculated as a five-year average and achieved by 2008-2012. While domestic initiatives would be paramount to meeting these reductions, the Kyoto Protocol offered up three implementation mechanisms designed to help countries achieve their targets: emissions trading, joint implementation and clean development (UNFCCC 2008).

The need for accurate and reliable data is addressed in the Protocol's monitoring procedures. It requires countries to have national systems in place for the estimation of greenhouse gas emissions by sources as well as submit annual GHG inventories. In addition, these results would be examined by expert review teams to ensure compliance.

The success of the Kyoto Protocol is arguable at best. Although 187 nations ratified the Protocol, including several of the largest contributors to greenhouse gas emissions, the U.S. did not. Many countries who did sign are having difficulty attaining their assigned targets. Moreover, China, which is the largest emission source of GHGs, does not even have targets under Kyoto.

The COP15 Copenhagen Conference which took place in December of 2009 did not result in any binding agreements, but did leave the door open for continued dialogue and progress through the Copenhagen Accord (UNFCCC 2010). While not considered to be transforming, the general consensus seems to be that the Accord is a step in the right direction. The success of the nonbinding Copenhagen Accord is seen as being largely dependent on what the large emitting countries do with respect to offering up plans to reduce carbon emissions by the year 2020.

The European Union Emissions Trading System (EU-ETS), established in 2005, is the world's first and largest-scale GHG trading program, covering roughly 12,000 installations in twenty-five countries and six industrial sectors. The EU-ETS was enacted to help member states jointly meet an 8% reduction requirement of GHG emissions set forth in the Kyoto Protocol. The EU-ETS is a cap-and-trade program where a fixed amount of emissions allowances are allocated. The trading system affects the power sector and other large emission sources from the refining, glass, cement, aluminum and paper industries. Each member state has to implement a National Allocation Plan (NAP) which is subject to approval by the EU. These plans determine the allocation methodology and vary by sector, with energy sources having more stringent goals than others. Additionally, new industries face tougher restrictions.

Every year, each source must report its emissions in order to accurately account for the number of allocations they must surrender. Monitoring and reporting of an installation's emissions are carried out based on binding EU-wide guidelines, mainly through fuel purchases and use of emissions factors, although continuous monitoring and outside review are allowed. All self-reported emissions must be verified by an independent third party. Methodologies are under development to allow for inclusion of additional sources, greenhouse gases and emissions factors (Ellerman 2008).

In addition to influencing the way a U.S. cap-and-trade scheme could look, the EU is also making decisions that could directly affect export of U.S. goods, thus creating a non-economic trade barrier. For example, the European Commission is considering a carbon tariff on goods from countries where greenhouse gas emission policies do not

match European standards. The tariff system would force companies that import products into Europe to buy EU carbon emissions permits through the Emissions Trading Scheme (ETS) (Wynn 2008).

While as of March 2010, the U.S. has yet to pass comprehensive greenhouse gas reduction legislation, it may only be a matter of time. The topic of climate change, while divisive among scientists, politicians and the public, seems to have garnered a permanent place on the "to-do" list of all three branches of U.S. government. The executive, legislative and judicial branches of government all have relevant climate change activities going on within their scope of influence.

The issue of climate policy and the need for federal action has been on the radar screen of the executive branch of government for some time. However, it has been the Obama administration that has taken the topic of climate and energy policy and made it a priority on its presidential agenda. In addition to creating the White House Office of Energy and Climate Change Policy (OECC) and making multiple public addresses regarding the need for climate change action, including an appearance at Copenhagen in 2009 (FP 2009), President Obama has overseen the implementation of the American Recovery and Reinvestment Act of 2009 (ARRA 2009). While not directly addressing climate change reductions, this act does include funding for climate science and energy reduction activities.

The Environmental Protection Agency has been one of the more active entities with respect to institutionalizing the control of greenhouse gasses, partly as a result of a Supreme Court decision in *Massachusetts v. EPA,* U.S. 497 (2007). On December 7, 2009,

the EPA Administrator issued an endangerment finding addressing the threat to public health and welfare of the six key greenhouse gasses (EPA-2 2009).

One rule that became effective in September 2009 and directly addresses the disclosure of carbon related emissions is the EPA's Greenhouse Gas Reporting Rule. With the effectiveness of this rule, many companies no longer have the option to voluntarily disclose their emissions. For sources that emit greater than or equal to 25K metric $CO_2$ equivalent level annually, or are in a certain source category such as suppliers of fossil fuels or utilities, reporting requirements went into effect at the beginning of 2010 (EPA 2009).

Certainly for those companies that are included in the rule by virtue of their industrial source category, the reporting path is clear. They must calculate their CO2e emissions for calendar year 2010 and report the results by March 2011. While perhaps simple in concept, this can be difficult in practice if a company must account for any specialty businesses belonging to a named source category. For example, while Bridgestone is considered principally as a tire manufacturer, the company also produces roofing products, bicycles and golf balls.

If a company is not associated with one of these source categories, interpretation of the applicability of the rule becomes more complex. For example, if a facility has fuel combustion sources that create GHG emissions at or above the level of 25k equivalents of carbon dioxide ($CO_2e$), it is subject to the rule regardless of the type of industry. The landfills category is another area where many facilities will "qualify" for mandatory reporting. Except for the suppliers of natural gas and coal based products, which can

report company wide, the rule is facility-based. It is estimated that 10,000 facilities, comprising approximately 85% of the total U.S. GHG emissions, will be required to report greenhouse gas emissions because of the applicability of this rule (EPA 2009).

The judicial branch of government has weighed in on the climate debate through decisions on several important cases regarding the Clean Air Act as well as common law nuisance and tort claims (PEW 2009). One of the most notable has been the U.S. Supreme Court decision in *Massachusetts v. EPA,* (No. 05-1120), decided on April 2, 2007 (US Supreme Court). The decision was in favor of the State of Massachusetts and basically found that EPA has the authority to regulate carbon dioxide and other greenhouse gases under the Clean Air Act. This gives the agency authority to regulate these emissions and could become an important source of leverage if Congress fails to pass legislation to reduce global warming emissions.

Another more recent decision concerning common law nuisance, issued on September 21, 2009 by the 2nd Circuit Court of Appeals, overturned a previous decision in the case of *Connecticut v. American Electric Power* (Civ. No. 05-5104; 2d Cir. September 21, 2009) holding that "state governments and private environmental organizations may pursue nuisance claims based on federal common law against companies that emit carbon dioxide from their facilities" (Lippard 2009).

The legislative branch of the U.S. government has also undertaken climate change policy and may enact the first Federal legislation requiring a national greenhouse gas "cap and trade" or similar program in the near future. The leading bill in the first half of 2009 was the American Clean Energy and Security Act (H.R. 2454), also known as the

Waxman-Markey bill. Highlights of this bill include a reduction of GHG emissions in increments over forty years, totaling 83% below 2005 levels by 2050. In addition, there are provisions for increasing energy efficiency across renewable energy development and establishing programs to increase energy efficiency across multiple sectors of the economy (111th Congress 2009).

This legislation would have a significant impact on energy and carbon intensive industries (Campbell 2009). Some industries, such as those in the power sector, will be included in the "cap" and will have to submit allowances for their carbon emissions. Other industries that are "outside the cap" but use large amounts of energy, will be impacted indirectly as the cost of their energy bill or feedstock rises to incorporate the fuel's carbon price. While this legislation passed out of the House of Representatives on June 2, 2009, it has not been brought to a vote in the Senate and interest seems to have waned as other climate change bills have been introduced in the Senate.

The Kerry-Boxer bill, also known as the Clean Energy Jobs and American Power Act of 2009 (S. 1733), was introduced on September 30, 2009 and is also based on cap-and-trade system, but calls for a 20% emission reduction cap as opposed Waxman-Markey's call for 17%. There has been no vote on this bill since it was reported out of the Senate Environment and Public Works Subcommittee in November 2009.

As of March 2010, discussion continues regarding climate action in the legislature as other senators continue to make proposals and introduce climate change bills. While it is not clear at this point what legislation will survive, it is likely that any bill making it through the process into law will impact carbon disclosure activities on companies.

Despite federal inaction, many regions have introduced and passed legislation requiring inventory development and reduction targets. Table 1 highlights four of the major regional initiatives that are currently underway.

Particularly well-known is the Regional Greenhouse Gas Initiative (RGGI), a cap and trade program involving ten (10) northeast states. The RGGI rule affects electric generating units (EGUs) and began in January 1, 2009. The RGGI program requires participation of EGUs serving generators greater than 25 megawatts, with each EGU being considered a carbon dioxide ($CO_2$) budget unit. The EGUs will account for over 95% of $CO_2$ from the regional electrical generating sector. The RGGI program requires that annual $CO_2$ emissions for the 2009 through 2014 period not exceed the annual average regional $CO_2$ emission level from the electrical generation sector for the 2000 to 2004 period. Beginning in the 2015 through 2018 period, a 2.5% reduction is required. The 2.5% reduction will achieve an overall 10% reduction of $CO_2$ emissions by 2019.

| Regional Initiative | Initiation Year | Region | Participating States | Goals/Targets |
|---|---|---|---|---|
| Midwestern Regional GHG Reduction Accord | 2007 | Midwest | Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Ohio, South Dakota, Wisconsin | establish GHG reduction targets and timelines; develop market-based, multi-sector cap-and-trade program |
| New England Governors/Eastern Canadian Premiers (NEG/ECP) | 2001 | New England | Connecticut, Maine, Massachusetts, Rhode Island, New Hampshire and Vermont | establish regional standardized GHG inventory; short-term reduction - 1990 levels by 2010; mid-term goal-10% below 1990 levels by 2020; long term goal-75%-85% below 1990 levels |
| Regional Greenhouse Gas Initiative (RGGI) | 2003 | Northeast/ Mid-Atlantic | Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont | establish regional cap-and-trade program to reduce carbon dioxide emissions |

| | | | | |
|---|---|---|---|---|
| Western Climate Initiative (WCI) | 2007 | West | Arizona, California, Montana, New Mexico, Oregon, Utah and Washington; also, British Columbia, Manitoba, Ontario and Quebec in Canada | multi-state greenhouse gas registry; develop regional market-based multi-sector mechanisms for achieving goals; aggregate reduction of 15% below 2005 levels by 2020 |

Sources: (MGA 2007; NEGC 2001; RGGI 2003; WCI 2007)

Table 1 - Regional GHG Initiatives

The RGGI program is a cap and trade program similar to the federal $NO_X$ Budget Trading Program and it is anticipated that the incentive for $CO_2$ reductions will occur due to the $CO_2$ allowance price as a result of marketplace auctioning of the allowances. $CO_2$ budget units will be allowed to satisfy 10% of their $CO_2$ allowance compliance obligations from emission offsets. Currently, there are five categories of emission offsets allowed under the RGGI program: 1) landfill methane ($CH_4$) capture and destruction, 2) reduction in emissions of sulfur hexafluoride, 3) sequestration of carbon due to afforestation, 4) energy efficiency in the building sector, and 5) avoided $CH_4$ emissions from agricultural manure management operations.

| **State** | **Selected State Initiatives**<br><br>**(Include Exec Orders, Statutes, and other programs)** |
|---|---|
| Arizona<br>www.azclimatechange.gov | • Executive Order 2010-06<br>• Arizona Climate Action Plan (2006)<br>• Member Western Climate Initiative |
| California<br>www.climatechange.ca.gov | • Global Warming Solutions Act of 2006 (AB 32)<br>• California Climate Action Registry (SB 1771)<br>• Member Western Climate Initiative |
| Connecticut<br>www.ctclimatechange.com | • CT Global Warming Solutions Act (Public Act 08-98)<br>• Member Regional Greenhouse Gas Initiative |

| | |
|---|---|
| Florida<br>http://myfloridaclimate.com | • Florida Governor's Action Team on Energy and Climate Change (Executive Order 07-128<br>• Florida Climate Protection Act (HB 7135) |
| Iowa<br>www.iaclimatechange.us | • Greenhouse Gas Emissions Bill (SF 485)<br>• Midwest GHG Reduction Accord |
| New Jersey<br>www.state.nj.us/globalwarming | • New Jersey Global Warming Response Act (P.L. 2007, c.112)<br>• Member Regional Greenhouse Gas Initiative |
| New Mexico<br>www.nmclimatechange.us | • New Mexico Climate Change Action Council and Advisory Group (Executive Order 05-033)<br>• Member Western Climate Initiative |
| Washington<br>www.ecy.wa.gov/climatechange/index.htm | • Washington's Leadership on Climate Change (Executive Order 09-05)<br>• Member Western Climate Initiative |

(PEW 2010; Independent State Websites)
Table 2 – Select State GHG Reduction Initiatives

Individual states have also begun formulating regulations in lieu of federal involvement in climate change action (Zacaroli 2008). Table 2 contains a listing of select state initiatives concerning greenhouse gas programs. Some states have already passed legislation addressing the reduction of greenhouse gas while others are developing action plans to address executive orders.

One exemplary state initiative is New Jersey's Global Warming Response Act (GWRA) and Executive Order 54 (EO54). This mandates the development of an economy-wide GHG emission inventory and sets an initial mandatory GHG emission reduction to below 1990 levels by 2020 and a 20% reduction from 2006 levels by 2050. As part of EO54, the New Jersey Department of Environmental Protection (NJDEP) has developed a statewide emission inventory baseline, primarily relying on available state entity-wide data. Data sources for the NJDEP GHG emission inventory development include the U.S. Department of Energy (DOE) Energy Information Administration (EIA), New Jersey

Bureau of Public Utilities (NJBPU), New Jersey Department of Transportation (NJDOT), NJDEP, and U.S. EPA. Although New Jersey does not require individual companies and/or facilities to provide GHG emission inventory reports, major facilities that are required to submit annual emission fee statements must now include direct $CO_2$ emissions from facility process units as part of the submittal (Stender et al. 2006).

In New Mexico, regulations focus on select industry types for mandated GHG emission inventory reporting. New Mexico's GHG emissions reporting rule requires that EGUs greater than 25 megawatts, petroleum refineries, and cement manufacturing facilities report GHG emissions. Calendar year 2008 serves as the first GHG reporting year. The adopted rule does not set a de minimis level, but rather outlines a phased reporting schedule. New Mexico references the reporting protocol of The Climate Registry for compliance and verification of GHG emission inventory reporting (Stone 2006).

An increasing number of U.S. companies are participating in voluntary climate-change programs to prepare for future regulations (see Table 3). There are a variety of reasons for companies to voluntarily join these programs, including pressure by investors and environmental groups, desire to influence the future of climate change policy, and the potential to increase market share for their goods and services.

| Program | Type | Activity |
|---|---|---|
| **US-EPA Climate Leaders** | Industry/ Government Partnership | Partners complete GHG inventory, set reduction goals, annually report progress |

| | | |
|---|---|---|
| **US-DOE Climate Vision** | Public/ Private Partnership | Partners commit to 18% intensity reduction; inventory and report emissions; develop and share strategies |
| **US-Climate Action Partnership** | Business/Env Organization Partnership | Collectively calling on Congress to pass mandatory GHG policies |
| **Carbon Disclosure Project** | Independent NGO | Collects data on companies climate change programs; aimed at creating shareholder value |
| **Climate Registry** | Independent NGO | Develops an accurate, complete and consistent GHG measurement protocol |

Source: (US-EPA 2008; US-DOE 2008; USCAP 2008; CDP 2008; Climate Registry 2008)

Table 3 – Voluntary Initiatives

The voluntary climate-change programs include GHG emissions registries, such as the Climate Registry, which allow companies to report annual emissions and potentially gain "credits" to be used under a future regulation for any early reductions achieved. Another type of program requires companies to commit to a specific emissions-reduction goal in order to receive public recognition (Kolwey 2007).

The United States Climate Action Partnership (USCAP), a coalition of 27 major corporations and six NGOs, is calling on Congress to enact mandatory domestic climate policies soon. They want short and medium term binding emissions targets in the U.S. on a trajectory to reduce emissions by 60%-80% by 2050.

The latest trend in emissions reporting is for companies to disclose their emissions through a registry, instead of solely through their own reports. Reporting through an established third-party registry adds credibility to the company statements, and can also provide publicity and recognition to the company. The California Climate Registry is an example of an organization that allows companies to report their emissions

publicly. The registry has developed a set of measuring protocols that are aligned with the GHG Protocol Initiative, but adapted to California (BSR 2008).

In addition to individual state programs, the voluntary U.S. EPA Climate Leaders initiative offers a glimpse as to which industries may be mandated to report GHG emissions. Under the Climate Leaders program, municipal solid waste landfills, iron and steel production, aluminum manufacturing, cement production, and pulp and paper manufacturing are industries that would report GHG emissions (Climate Leaders 2009).

The development of GHG emission inventories is not a simple undertaking for a corporation or a single facility. Each reporting program varies in its protocol. For example, emissions can be reported on an entity-wide or facility level. There may be a de minimis level of GHG emissions that do not require reporting, or certain types of activities that require reporting. The difference between entity-wide and facility level reporting is of utmost concern to industry as the effort to develop and verify emission inventories can be quite costly.

Recognizing that The Climate Registry would serve as a model for a federal reporting program, many industries have participated in this program for some time in an effort to understand and influence the development of its reporting protocols. The Climate Registry is a collaboration among states, provinces and tribes, aimed at developing and managing a common GHG emission reporting system (Climate Registry 2010). It also includes a third party verification of the GHG emissions inventory. As a national policy continues to develop regarding the control of GHG emissions, the entity-wide versus facility emission reporting debate will remain a significant issue. Key

proponents of the entity-wide approach are those corporations that are already participating in voluntary reporting and/or reduction programs such as Climate Leaders.

Arguments have been made that GHG emissions disclosure and transparency serve as a motivating force for emission reductions (Fagotto et al. 2007). Such disclosure is believed to, "expose inefficiencies and allow investors, consumers, businesses and the community to make comparisons". This, in turn, provides companies with incentives to reduce emissions sooner than they otherwise would.

Among the driving forces behind calculating carbon footprints are corporate social responsibility, competitive advantage, cost of doing business, regulatory compliance and power usage restrictions. However, to be successful, the exercise of determining a carbon footprint for a company must be undertaken at all levels of the company (Kenney 2008). Disclosing emissions is beneficial to companies by using carbon disclosure as an accountability mechanism. While some companies may be reluctant to report potential risks and liabilities, the benefits are believed to far outweigh the risks for many companies (Bortz 2007). Moreover, it should be considered as a fiduciary duty of companies to their stakeholders and as a tool for strategy development.

While existing Securities and Exchange Commission (SEC) regulations already require companies to disclose "significant" carbon emissions and related environmental liabilities, it has been expected that climate risk disclosure would increase in scope as developments continued to occur in the scientific and legal field (Mounteer, et.al. 2008). These include formal rulemaking requests of the SEC asking that the agency clarify the nature and scope of a public company's duty to disclose its climate change risk as well as

increased shareholder resolutions recognizing climate change as a concern. Many investment funds specialize in offering options for customers who desire to invest in companies that are responsive to social and environmental issues. Growing numbers of investors have requested that companies address climate change through added disclosure (Cogan and McAteer 2008).

Until recently, requirements for publicly traded businesses to disclose risks to or from climate change have been considered weak at best. As reported in a recent study co-sponsored by Ceres and the Environmental Defense Fund, "the vast majority of S&P 500 companies remain silent with respect to the risks and opportunities posed by climate change" (Doran 2009).

Another report co-issued by Ceres and EDF highlights the fact that even though securities law requires publicly traded corporations to disclose material risks, "few companies currently provide information about how climate change will impact their business" (Young, et. al 2009).

With the January 2010 issuance of interpretive guidance from the Securities and Exchange Commission (SEC) regarding disclosure of business impacts and legal developments of climate change, the disclosure landscape has changed (SEC 2010). This guidance clarifies requirements on existing disclosure rules that may require a publicly held company to disclose the impact that business or legal conditions related to climate change have on its business. SEC disclosure requirements, including annual reports and 10-K filings, can be triggered due to the relevance of legislation and regulation,

international accords, consequences of GHG regulations on business trends, or the physical impact of climate change.

One of the most widely recognized organizations for expertise in carbon information disclosure is the Carbon Disclosure Project (CDP). The CDP is "an independent not-for-profit organization", which is one of the primary repositories of corporate carbon emission data (Carbon Disclosure Project 2010). The data is collected from companies in response to an annual questionnaire. A joint study by CDP and IBM concluded that carbon information leaders set targets, have tools in place to collect and manage information, and publicly disclose their findings and commitments. Five main themes are identified as critical to carbon information management: understanding your data, engaging with stakeholders, managing carbon information as a process, assigning a responsible leader, and exercising control and influence.

The CDP has also been instrumental in leading workshops across the globe to focus on standards and procedures for comprehensive reporting. Key topics of interest include how CDP informs corporate and investor climate change strategies, business value of reporting data to CDP, challenges companies face in reporting on climate change, and carbon accounting and related audit/legal issues associated with voluntary reporting of climate change information.

When a company gets ready to account for its carbon footprint, it must give careful thought to the process they will use, particularly what information will be publicly divulged. Moreover, the company should use this exercise to learn as much as it can about its own carbon emissions.

Several protocols are available to serve as a guideline for determining one's carbon footprint (Matthews, Hendrickson et al. 2008). Some protocols suggest using only direct emissions (Scope 1), while others include emissions from energy inputs (Scope 2). Approaches based on life-cycle assessment methods can also track emissions across the entire supply chain (Scope 3). Among the more widely used greenhouse gas protocols are the protocols produced by the California Climate Action Registry and the World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD). As a starting point, it is recommended that companies use a screening level analysis to ensure that they do not ignore large sources of emissions.

As mentioned previously, the intent of this dissertation is to develop a decision-making framework for firms to use in creating and implementing a comprehensive carbon disclosure strategy. While the literature review did produce an abundance information related to decision frameworks for environmental management applications, a study could not be found that addressed the subject of comprehensive carbon disclosure strategy.

In addition to reviewing the literature on carbon disclosure and related environmental and business strategy, it is also important to consider the literature on the use of decision framework tools for strategic business decision-making.

There is an abundance of literature addressing this subject. Research on this topic spans multiple decades (Lindblom 1959) and disciplines (Roulac 1996; Ho and Lin 2004; Miller 1992). As evidenced in the literature, effectively designed decision-making frameworks define the scope of each decision, the types of evaluations criteria and decision support tools that may be beneficial. (IEA 2004) Some of the key principles and

considerations that will be critical in the design of a carbon disclosure framework are discussed below in terms of their validity from previous work. Specifically important in designing the carbon disclosure framework is defining the scope of the framework to include both mandatory and voluntary disclosure themes as well as accommodating a multidisciplinary process.

Central to developing a strategic framework to use as a decision tool is a thorough understanding of the inherent considerations for the particular process in question. The extensive body of research and academic literature available on developing decision making frameworks establish the variety of decision making models available and the importance of choosing a model that fits the decision process. These models emphasize the players, their decisions, and the factors that influence these decisions (Roulac 1996).

Understanding the roles played by stakeholders such as top managers and organizational members is important for developing an integrative decision-framework (Hart 1992). A study by Badal supports the benefits of using cross-functional teams (i.e., interdisciplinary intellectual views) as a method to enhance organization decision-making and yield better results (Badal 2005). Work focused on improving real estate strategy provides insight into the critical nature of thoroughly understanding the process, including the interdependencies and linkages that exist between the processes, and objectives of the participants as key to making better decisions (Roulac 1996). Miller develops a framework for analyzing uncertainties in international risk management and proposes a tool for, "outlining both financial and strategic corporate responses" (Miller 1992).

While the aforementioned literature addresses issues common to strategic decision making in a variety of fields, other literature provides meaningful examples of using different types of tools to visually represent the decision making process. Ho and Lin have demonstrated the applicability of business decision models in implementing an integration framework for analyzing critical intra- and inter-prise business processes in a manufacturing environment (Ho and Lin 2004). Their work stresses the need to consider various critical success factors to a decision/process from an internal and external perspective early in the project.

The U.S. government also employs decision framework tools as a means of describing and analyzing business processes and decisions. The Department of the Interior uses established reference models, such as the example provided in their process to define target business environments (DOI 2007). Their methodology uses a combination of visual diagrams, including a swim-lane flowchart, to describe a logical set of business processes performed on a continual basis.

The field of environmental business strategy has similarly adopted common business decision making tools to represent the relationships and processes in unique systems. This approach was utilized in a study by Rugman and Verbeke concerning the impact environmental regulations have at the firm level on managers making corporate strategy decisions (Rugman 1998). Another use of decision-making tools has been to assess environmental management system (EMS) profiles within an organization and for comparison with competitors (Tinsley 2002).

Taplin et al. worked in partnership with a chemical company to develop a framework for sustainable decision-making to be used to assess supply chain impacts

(Taplin et. al. 2006). According to the study, "the modular nature of the framework and its ability to pinpoint discrete areas of business operation allowed management to better engage with sustainability issues."

Finally, as the measurement of corporate environmental performance becomes standard business practice among a firm's reporting regime, there is an increasing need for tools that identify, measure, assess and valuate environmental impacts and dependencies. Business for Social Responsibility has issued a report assessing the "ecosystem service tools and interface points with existing corporate governance strategy and operations decision making" (Waage 2010). Many examples are given that address the use of decision-making tools to explore stakeholder engagement, identify assumptions, understand implications for corporate processes and other critical areas where environmental strategy decisions must be considered.

The prior discussion establishes the importance of decision frameworks and their applicability in a broad scope of disciplines. The process of developing decision frameworks should follow generally accepted guidelines of rational decision theory tailored to the inputs, outputs and types of the specific decisions required. According to Bohanec, "decision models are typically developed through the decomposition of complex decision problems into smaller and less complex sub-problems; the result of such decomposition is a hierarchical structure that consists of attributes and utility functions" (Bohanec, et. al.).

Of primary importance in developing a decision framework is the ability to recognize key issues, develop a structure for analyzing the problem and a method for carrying out a cogent analysis.

## Conclusions

It is evident from this literature review that the topic of climate change and greenhouse gas reduction has become established as more than a passing fad. Many stakeholders are involved in achieving measurable progress across multiple disciplines. This diversity has resulted in a plethora of proposed concepts, methods and policies for addressing the climate change problem.

It is also evident that proper accounting of carbon emissions is fundamental to the success of any climate change strategy. This provides a baseline by which to measure all future reductions, identifies carbon intensive operations from which to prioritize initiatives, and provides opportunities for businesses to enter new markets.

While carbon information disclosure has become a widely researched topic, review of the open literature did not produce a comprehensive approach that a company could use to develop a carbon disclosure strategy tailored to its particular business situation.

To accommodate such an approach, there is an abundance of literature demonstrating the applicability of commonly used business decision tools across a broad spectrum of disciplines. This includes numerous examples of environmental strategy decisions being represented with the use of multiple types of decision-flow logic. This suggests that a decision-making framework incorporating multiple elements of carbon information disclosure strategy with consideration of multiple stakeholders and disclosure avenues would be appropriate.

# CHAPTER III

# CARBON INFORMATION DISCLOSURE OUTLETS: A BENCHMARKING STUDY OF U.S. COMPANIES

## Introduction

As the debate over controlling greenhouse gas emissions through Federal regulation continues, many companies are engaging in the first nationally mandated process requiring disclosure of GHG emissions. Closely following the effectiveness of the EPA Greenhouse Gas Reporting Rule, which requires certain companies to track their greenhouse gas emissions beginning in January 2010 and reporting in 2011 (EPA 2009), is the interpretive guidance issued by the SEC on February, 2010 (SEC 2010). This guidance requires a publicly traded company to disclose its risks and opportunities associated with climate change in the company's annual 10K filing.

Several organizations have been conducting some form of greenhouse gas accounting and disclosure for years pursuant to a state requirement or a regional initiative such as the Regional Greenhouse Gas Initiative (RGGI). Others have begun to calculate emissions "in-house" in an effort to establish a baseline for future regulations or as a precursor to developing their own internal greenhouse gas strategy.

Beyond the actual accounting of carbon emissions produced by a company and its value chain, there are a host of considerations regarding the disclosure of these emissions and related carbon impacts and initiatives. While some organizations will be required by law to make their carbon footprints public, others will not. In addition, it is likely, based

on current and proposed reporting frameworks, that those emissions required to be disclosed may not paint a complete picture of a company's true carbon footprint and related impacts.

Previous research on carbon information disclosure has focused primarily on companies that disclose and types of disclosures in a specific medium, such as the Carbon Disclosure Project or corporate sustainability reports. Analysis of the number and type of company reporting by sector, for example, has provided insight into the steady rise of carbon disclosure as a permanent fixture on the environmental reporting landscape.

Disclosing information regarding environmental-related issues has been commonplace for many years in regulatory reporting, such as the Toxic Release Inventory (TRI). In contrast, sustainability reporting is driven from the corporate social responsibility sector and is predominantly voluntary. Carbon information disclosure, with aspects that are both mandatory and voluntary, has moved to the forefront of environmental disclosure discussions.

While carbon disclosure has become a widely researched topic, review of the open literature available has not produced a study that addresses a comprehensive approach for a company to use to determine a carbon disclosure strategy tailored to its particular business situation. As stated previously, the objective of this dissertation is to submit for consideration a decision making framework for carbon information disclosure that can be used by firms in conjunction with normal business strategy planning. As a precursor to developing this framework, it is important to have a thorough understanding of the

different disclosure avenues available. This chapter of the dissertation accomplishes that task through a carbon disclosure benchmarking study of a sample of U.S. companies.

The benchmarking study, reported herein, was performed to analyze the carbon disclosure efforts of a sample of 83 U.S.-based companies, positioned across nine industry sectors. Five of these sectors (basic materials, healthcare, industrials, oil&gas/energy, and utilities) are considered carbon intensive industries, while the remaining four sectors (consumer goods, consumer services, financials, and technology) are considered non-carbon intensive industries. In the discussion to follow, the terms "carbon emissions", "carbon equivalent emissions" and "greenhouse gas emissions" are used interchangeably. The same holds true for the terms "carbon disclosure", "greenhouse gas disclosure" and "climate disclosure".

It is evident from the literature review on environmental strategy and carbon disclosure that companies are participating in a variety of initiatives and programs to communicate their carbon strategy. It is my hypothesis that the scope and degree to which companies disclose carbon information is directly related to characteristics of the particular business and industry. In particular:

- Firms that are publicly owned will be more likely than firms that are privately owned to publicly disclose carbon emissions and related information.
- Firms that are carbon intensive will be more likely than firms that are non-carbon intensive to publicly disclose carbon emissions and related information.

- Firms that do not respond to The Carbon Disclosure Project are not likely to voluntarily disclose carbon information in other disclosure avenues.
- Firms that are subject to legal requirements to report carbon related information are more likely to voluntarily disclose carbon information in other disclosure avenues than firms who do not have legal requirements to report carbon related information.
- Firms that sell products are more likely to voluntarily disclose carbon related information than those who sell services.

These particular hypotheses were developed as a result of findings in the literature review that suggest that particular drivers exist for the disclosure of carbon information that likely differ among companies and industries based on their business profile. For example, public companies are more likely to disclose voluntary information due to pressures from shareholders, proxy votes and other external influences such as non-governmental organizations (KPMG 2008).

Due to the fact that carbon intensive firms potentially have a greater direct impact on climate issues due to the total and relative carbon emissions, it is likely that they will disclose more information both from a mandatory (i.e. legal requirements) and voluntary perspective (Mounteer, et. al. 2008).

Carbon Disclosure Project reports reflect a substantial increase in disclosures year over year to the annual CDP questionnaire with 66% of the S&P 500 responding for the 2009 report. With a majority of S&P companies responding to CDP, it is likely that those

who do not respond to this popular disclosure avenue do not disclose carbon information through other voluntary disclosure avenues.

Marketing opportunities exist for some companies based on the perceived value of a reduced carbon footprint in certain products or by certain companies who manufacture goods (Esty 2009). It is likely that these opportunities result in greater carbon disclosure information for those companies that market products versus those that market services.

**Study Methodology**

The approach taken in this study was to perform the following sequential tasks:

- Perform a literature review of extant carbon information disclosure reports
- Select study industry sectors and sample companies
- Identify mandatory and voluntary carbon information disclosure mechanisms
- Benchmark company carbon disclosure practices
- Assess disclosure trends and patterns as a function of sector and company characteristics (e.g., carbon vs. non-carbon intensive, publicly vs. privately held)

In an effort to develop a comprehensive tool to evaluate carbon disclosure strategy, it is necessary to have a complete picture of the disclosure outlets available to companies. For this reason, the benchmarking study focused on firms from a wide range of industrial sectors that fall within three categories of current disclosure practice[1]: 1) publicly traded companies that are currently engaged in carbon disclosure and

[1] Subcategories within the sample set will be referred to as: 1) disclosure leaders 2) private firms 3) non-CDP responders

considered to be sustainability, green or carbon disclosure leaders, 2) private companies similar in size to those publicly traded companies in the previous category and 3) publicly traded companies that are not considered industry leaders in reporting and also do not respond to The Carbon Disclosure Project[2][3].

The 2009 Carbon Disclosure Leadership Index (CDLI), 2009 Dow Jones Sustainability Index (DJSI) and 2009 Newsweek Green Rankings were used as the basis for sample selection of those companies considered to be leaders in sustainability or carbon reporting. These leadership rankings were chosen specifically to ensure that this portion of the benchmarking sample would contain companies that are engaged in some level of carbon disclosure.

To ensure that companies were included in the study from a wide range of industrial sectors and varying carbon footprints, the Carbon Disclosure Project Report 2008 – S&P 500 was used as the starting point for selecting appropriate industrial sectors. This report split industry groups into two categories: carbon-intensive and non-carbon-intensive. The first column of Appendix A lists the industries used by CDP for analysis purposes. The remainder of Appendix A correlates the relevant Global Industry Classification Standard (GICS) for that particular industry. The benchmarking study used the highest level of classification, which for GICS is the Sector. Whereas CDLI uses the GICS, which is supported by Standard and Poors, both the Dow Jones Sustainability Index (DJSI) and Newsweek Green Rankings, which are also used to choose sample companies

[2] The 2009 Carbon Disclosure Project Report for the S&P 500 lists 137 companies that did not respond to the questionnaire. This is the basis for the sample category of companies not reporting.
[3] The sample of private companies and non-CDP companies were chosen from the same industry categories as the disclosure leaders.

for this study, use the Industry Classification Benchmark (ICB). Appendix B addresses the relationship between GICS and ICB with respect to the industries used in the sample. From this point forward in the benchmarking study, the ICB classification will be used. Sectors for the benchmarking study were classified as follows:

Carbon Intensive:
Basic Materials, Healthcare, Industrials, Oil&Gas/Energy, Utilities

Non-Carbon Intensive:
Consumer Goods, Consumer Services, Financials, Technology

Next, the 2009 CDLI (Appendix C), 2009 DJSI (Appendix D) and 2009 Newsweek Green Rankings (Appendix E) were combined into one table, with companies appearing under the relevant industrial classification. Appendix F is the output from this effort. It represents the pool of companies from which the benchmarking sample was selected.

The CDLI rates the quality of a company's disclosure and assesses the comprehensiveness of its response to the Carbon Disclosure Project questionnaire. Firms disclose voluntarily to CDP, so by including some of these companies in the benchmarking sample, tone can increase the likelihood of finding information to help understand the research objectives.

Companies listed on the DJSI represent the top 10% of the leading sustainability companies in each of the DJSI sectors based on the Corporate Sustainability Assessment from Sustainable Asset Management (SAM) research. (SAM 2010) All companies in the Dow Jones family of stocks are given an opportunity to participate in a Corporate Sustainability Assessment. For those that respond, they are assigned a primary ICB

classification and scored against a defined set of criteria and rankings. Environmental reporting, which includes carbon disclosure, is considered part of this category.

The 2009 Newsweek Rankings were the result of a partnership effort between Newsweek and several research groups including KPMG, TruCost and CorporateRegister. A company's green score is comprised of three components: environmental impact score, green policies score, and reputation score (Newsweek 2009). By using lists of leading sustainability companies from both DJSI and Newsweek, the benchmarking study will be able to maximize the potential to capture a true picture of the different disclosure strategies being employed.

Once the lists of companies from the three sources were correlated by sector (Appendix F), five companies from each sector were selected using the following criteria:

-2 companies that appear on all lists (CDLI, DJSI and Newsweek)

-1 company that appears on DJSI and Newsweek

-1 company that appears on Newsweek list only

-1 company that appears on CDLI only

The selected companies are shaded in green in Appendix F. Exceptions to the selection methodology occurred where a company appeared only one list. In that case, in order to create a sample selection of five per sector, the company was chosen that did appear on multiple lists.

The forty-five companies chosen using this selection are all publicly owned. In an effort to include privately held firms, companies appearing in the Forbes 2009 list of America's Largest Corporations were also considered (Appendix G). Two of the largest U.S. owned companies by revenue were chosen for each of the benchmarking study sectors.

In order to include a group of companies who are not considered leaders in disclosure and in fact may not disclose carbon information at all, 20 additional companies were chosen from a list of non-respondents to the Carbon Disclosure Project.[4] There were 137 non-respondents to the 2009 CDP questionnaire. This list was compared against the 2009 DJSI and 2009 Newsweek Green Rankings to make sure companies chosen for the sample did not appear on any sustainability leadership list. This left a sample of 134 companies, of which 20 were randomly sampled with at least two companies representing each of the industry sectors chosen for the study. This list appears in Appendix H.

The complete benchmarking sample consists of 83 companies. Appendix I contains a list of companies chosen for the benchmarking study. The disclosure practices (i.e. where they are reporting and what they are reporting) of each company in the study sample were determined by reviewing the following sources: company website, CSR/sustainability report, annual report, 10-K filing, and Carbon Disclosure Project submittals. In addition, websites for the disclosure outlets were examined and cross-referenced. Disclosure outlets included The Climate Registry, Climate Leaders, US-DOE,

[4] There is no known list of companies that do not report at all, so the CDP list non-respondents was used as a starting point.

US-EPA, CERES, GEMI, Climate RESOLVE and US-EPA Smartway (see list of references). Appendix J is the database constructed as the result of the benchmarking study.

## Study Results

After identifying the various disclosure outlets across the benchmarking sample, these outlets were grouped into categories based on the nature of disclosure. In general, avenues for carbon disclosure can be classified into three categories: 1) mandatory emissions reporting to outside agencies, 2) voluntary emissions reporting and communications through outside organizations, and 3) reporting and communications directly from the company to the public. Each of these avenues is discussed in greater detail below.

### Mandatory Emissions Reporting to Outside Agencies

#### EPA GHG Reporting Rule

With the promulgation of the final EPA Greenhouse Gas Reporting Rule, many companies no longer have the option to voluntarily disclose their emissions. For sources that emit greater than or equal to 25K metric $CO_2$ equivalent level annually, or are in a certain source category such as suppliers of fossil fuels or utilities, reporting requirements went into effect at the beginning of 2010 (EPA 2009).

Certainly for those companies that are included in the rule by virtue of their industrial source category, the reporting path is clear. They must calculate their CO2e emissions for calendar year 2010 and report the results by March 2011. While perhaps

simple in concept, this can be difficult in practice if a company must account for multiple types of businesses across varying industrial categories.

If a company is not associated with one of these source categories, interpretation of the applicability of the rule becomes more complex. For example, if a facility has fuel combustion sources that create GHG emissions at or above the level of 25k equivalents of carbon dioxide ($CO_2e$), it is subject to the rule regardless of the type of industry. The landfills category is another area where many facilities will be subject to mandatory reporting. Except for the suppliers of natural gas and coal based products, which can report company wide, the rule is facility-based.

It is estimated that 10,000 facilities, comprising approximately 85% of the total U.S. GHG emissions, will be required to report greenhouse gas emissions because of the applicability of this rule (EPA 2009). The following table shows the variability of the impact on mandatory reporting for the companies in the study sample based on their industry sector.

| Industry Sector | EPA GHG Reporting Rule Applicability |
|---|---|
| Basic Material | Likely all covered. |
| Healthcare | Plant specific. Pharmaceutical production is not covered, but facilities that have industrial boilers would be covered |
| Industrials | Plant specific. Some company's facilities may be impacted while others will not. Whereas UPS will not likely be required to report[5], Caterpillar likely will because it manufactures heavy duty engines. The railroad and aircraft industry is not covered, unless a facility has combustion sources, which may often be the case. |
| Oil & Gas/Energy | Most likely all facilities are covered. Petroleum refining and petrochemical production is an "all in" source. |
| Utilities | Covered as electricity generators. |
| Consumer Goods | Depends on combustion sources. Whereas Wal-Mart would not likely be covered, large bakeries and facilities such as General Mills would likely have combustion sources above the threshold. |
| Consumer Services | Depends on the size of combustion sources. |
| Financial Services | Not impacted. |
| Technology | Not likely impacted. |

Table 4 – Sector Applicability of EPA GHG Reporting Rule

**Regional/State/Local Reporting**

Many of the companies in the study sample either have been or soon will be reporting greenhouse gas emissions under regional, state or local rules. Much like the federal GHG Reporting Rule, carbon intensive industries are the predominately affected

[5] Based on current reporting regulations in the EPA GHG Reporting Rule, emissions from mobile sources are not included in the reporting requirements. Therefore, emissions from the UPS fleet of trucks and plane would not be subject to reporting under this rule.

group. However, the industry sector and the state in which a company operates determine which criteria are used to determine reporting applicability.

| Regional Initiative | Initiation Year | Region | Participating States | Goals/Targets |
|---|---|---|---|---|
| Midwestern Regional GHG Reduction Accord | 2007 | Midwest | Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Ohio, South Dakota, Wisconsin | establish GHG reduction targets and timelines; develop market-based, multi-sector cap-and-trade program |
| New England Governors/Eastern Canadian Premiers (NEG/ECP) | 2001 | New England | Connecticut, Maine, Massachusetts, Rhode Island, New Hampshire and Vermont | establish regional standardized GHG inventory; short-term reduction - 1990 levels by 2010; mid-term goal-10% below 1990 levels by 2020; long term goal-75%-85% below 1990 levels |
| Regional Greenhouse Gas Initiative (RGGI) | 2003 | Northeast/ Mid-Atlantic | Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont | establish regional cap-and-trade program to reduce carbon dioxide emissions |
| Western Climate Initiative (WCI) | 2007 | West | Arizona, California, Montana, New Mexico, Oregon, Utah and Washington; also, British Columbia, Manitoba, Ontario and Quebec in Canada | multi-state greenhouse gas registry; develop regional market-based multi-sector mechanisms for achieving goals; aggregate reduction of 15% below 2005 levels by 2020 |

Sources: (MGA 2007; NEGC 2001; RGGI 2003; WCI 2007)

Table 5 – Regional GHG Initiatives

Largely as a result of years of federal inaction, several regions have introduced or passed legislation requiring inventory development and reduction targets through regional cap-and-trade programs. These programs, which will serve as compliance carbon markets, are in various stages of development. Figure 2 highlights the three

regional initiatives that comprise compliance markets in the U.S. Only the Regional Greenhouse Gas Initiative is currently in operation.

The Regional Greenhouse Gas Initiative (RGGI) is a cap and trade program involving electric generating units (EGUs) in ten northeast states. Effective January 1, 2009, RGGI requires participation of EGUs serving generators of greater than 25 megawatts, with each EGU considered as a carbon dioxide ($CO_2$) budget unit. These EGUs will account for over 95% of $CO_2$ from the regional electrical generating sector. The RGGI program requires that annual $CO_2$ emissions for the period from 2009 to 2014 not exceed the annual average regional $CO_2$ emission level from the electrical generation sector for the 2000 to 2004 period. For the period from 2015 to 2018, a 2.5% reduction is required. This reduction will achieve an overall 10% reduction of $CO_2$ emissions by 2019. Reporting of emissions is required quarterly.

Roughly 36% of individual states have promulgated regulations mandating disclosure of greenhouse gas emissions. However, the affected industries and thresholds vary by state, thus posing additional considerations for those companies who have facilities in multiple states. In addition, the federal GHG Reporting Rule does not preempt states from requiring their own GHG emissions reporting. Table 6 contains a listing of select state initiatives related to greenhouse gas emission programs (PEW 2010; state websites).

According to the Pew Center on Climate Change, states that have partnered with the Climate Registry are requesting data in a common Climate Registry format. This helps to ensure that data is reported consistently between states. However, the reporting

mechanism does vary by state, with some states requiring those facilities that hold Title V air permits to report greenhouse gases such as carbon dioxide ($CO_2$) and methane ($CH_4$) along with the rest of its permitted air emissions.

| State | Selected State Initiatives<br><br>(Includes Exec Orders, Statutes, and other programs) |
|---|---|
| Arizona<br>www.azclimatechange.gov | • Executive Order 2010-06<br>• Arizona Climate Action Plan (2006)<br>• Member Western Climate Initiative |
| California<br>www.climatechange.ca.gov | • Global Warming Solutions Act of 2006 (AB 32)<br>• California Climate Action Registry (SB 1771)<br>• Member Western Climate Initiative |
| Connecticut<br>www.ctclimatechange.com | • CT Global Warming Solutions Act (Public Act 08-98)<br>• Member Regional Greenhouse Gas Initiative |
| Florida<br>http://myfloridaclimate.com | • Florida Governor's Action Team on Energy and Cliamte Change (Executive Order 07-128<br>• Florida Climate Protection Act (HB 7135) |
| Iowa<br>www.iaclimatechange.us | • Greenhouse Gas Emissions Bill (SF 485)<br>• Midwest GHG Reduction Accord |
| New Jersey<br>www.state.nj.us/globalwarming | • New Jersey Global Warming Response Act (P.L. 2007, c.112)<br>• Member Regional Greenhouse Gas Initiative |
| New Mexico<br>www.nmclimatechange.us | • New Mexico Climate Change Action Council and Advisory Group (Executive Order 05-033)<br>• Member Western Climate Initiative |
| Washington<br>www.ecy.wa.gov/climatechange/index.htm | • Washington's Leadership on Climate Change (Executive Order 09-05)<br>• Member Western Climate Initiative |

Source: (PEW 2010; Independent state websites)
Table 6 - GHG Reduction Initiatives in Selected States

In addition, participation by some states in regional cap and trade plans will determine the reporting requirements for companies in those states. To eliminate confusion and inefficient use of resources associated with multiple cap-and-trade

programs and reporting schemes, some companies have a strong preference for implementation of a federal cap-and-trade program that would supersede any regional program (MGA 2009). Conversely, some companies also lobby strongly against cap and trade citing competitive advantage concerns and increased costs of doing business (EL 2009).

**SEC Disclosures**

Until recently, requirements for publicly traded businesses to disclose risks to or from climate change have been weak at best. As reported in a recent study co-sponsored by Ceres and the Environmental Defense Fund, "the vast majority of S&P 500 companies remain silent with respect to the risks and opportunities posed by climate change" (Doran 2009). With the January 2010 issuance of interpretive guidance from the Securities and Exchange Commission (SEC) regarding disclosure of business impacts and legal developments of climate change, the disclosure landscape has changed (SEC 2010). SEC disclosure requirements can be triggered due to the relevance of legislation and regulation, international accords, consequences of GHG regulations on business trends, or the physical impact of climate change.

Few companies in this benchmarking study, with the exception of those in the utilities sector, are currently disclosing any information with regard to the effects of climate change other than perhaps a brief mention. With these new disclosure requirements, it will likely elicit more focus on carbon disclosure across a wider range of companies and their value chains.

**Voluntary Emissions Reporting & Communications Through Outside Organizations**

An increasing number of U.S. companies are participating in voluntary climate change programs (see Table 7). There are a variety of reasons for joining these programs, including pressure by investors and environmental groups, desire to influence the future of climate change policy, the potential to increase market share and to prepare for future regulations. Among the voluntary climate change programs are GHG emissions registries, such as the Climate Registry, which enable companies to report annual emissions and potentially gain "credits" to be used under a future regulation for any early reductions achieved. Another type of program requires companies to commit to a specific emissions reduction goal in order to receive public recognition.

The Carbon Disclosure Project is widely acknowledged as the premier source of voluntary carbon disclosure information. All but one of the forty-five publicly traded companies within the study sample reported to the CDP in 2009 (Jacobs Engineering did not respond). Of those sample companies who reported, only four (Abbot Laboratories, Smith International, McDonald's Corp, and Goldman-Sachs) stipulated that their information is "not publicly available". Reasons for this designation could include a hesitancy to share what is considered confidential business information or concerns that emission levels or perceived inactivity could draw public criticism.

Private companies, who are not typically sent a questionnaire by CDP, do have an opportunity to volunteer information. Of those in the study, however, none chose to respond.

| Program | Type | Activity |
|---|---|---|
| **US-EPA Climate Leaders** | Industry/ Government Partnership | Partners complete GHG inventory, set reduction goals, annually report progress |
| **US-DOE Climate Vision** | Public/ Private Partnership | Partners commit to 18% intensity reduction; inventory and report emissions; develop and share strategies |
| **US-Climate Action Partnership** | Business/Env Organization Partnership | Collectively calling on Congress to pass mandatory GHG policies |
| **Carbon Disclosure Project** | Independent NGO | Collects data on companies climate change programs; aimed at creating shareholder value |
| **Climate Registry** | Independent NGO | Develops an accurate, complete and consistent GHG measurement protocol |

Source: (US-EPA 2008; US-DOE 2008; USCAP 2008; CDP 2008; Climate Registry 2008)

Table 7 – Voluntary Initiatives to Track GHGs

Prior to the Carbon Disclosure Project, US-EPA Climate Leaders and US-DOE sponsored programs provided companies with partnership opportunities that allowed them to voluntarily track and report initiatives to curb greenhouse gas emissions. These programs provided government agencies with guidance on how to organize greenhouse gas emissions, gave recognition to those companies who participated and, most importantly, provided a forum for companies to provide input to the regulatory development process. As shown in Table 8 which looks at the sample subset of

companies who are reporting leaders, there was little sample company participation in the EPA programs, with the exception of the utility industry. The study sample of private companies and the non-CDP companies showed virtually no participation in the EPA programs with nominal exceptions. The non-CDP responding companies in the oil& gas and utilities industries show participation in the US-DOE 1605 (b) program which suggests industry specific government programs are supported regardless of other disclosure practices.

| Industry Sector | Climate Leaders | US-DOE 1605(b) |
|---|---|---|
| Basic Materials | 3 of 5 | 0 of 5 |
| Healthcare | 4 of 5 | 2 of 5 |
| Industrials | 3 of 5 | 1 of 5 |
| Oil&Gas/Energy | 0 of 5 | 1 of 5 |
| Utilities | 1 of 5 | 4 of 5 |
| Consumer Goods | 2 of 5 | 1 of 5 |
| Consumer Services | 2 of 5 | 0 of 5 |
| Financials | 0 of 5 | 0 of 5 |
| Technology | 5 of 5 | 1 of 5 |

Table 8 - Study Sample Participation of Reporting Leaders in Voluntary EPA Disclosure Programs

Another option for companies to voluntarily disclose carbon emissions to outside organizations is through registries. Reporting through an established third-party registry can add credibility to company statements and provide visibility. The Climate Registry is an example of a resource that enables companies to report their emissions publicly. It is a collaboration of states, provinces and tribes, aimed at developing and managing a

common GHG emission reporting system (Climate Registry 2008). The Climate Registry has developed measurement protocols that are aligned with the GHG Protocol Initiative (BSR 2008), and includes a third party verification of GHG emissions. Interestingly, of the study sample, participants in The Climate Registry were all publicly owned companies in the carbon-intensive sectors (see Table 9).

| Industry Sector | Companies Participating in The Climate Registry |
|---|---|
| **Basic Materials** | Alcoa, PPG |
| **Healthcare** | Allergan, Johnson& Johnson |
| **Industrials** | Caterpillar |
| **Oil&Gas/Energy** | Chevron, Conoco Phillips |
| **Utilities** | PG&E, Consolidated Edison, Xcel Energy |

Table 9 – Sample Companies Participating in The Climate Registry

Since many industries believe that The Climate Registry will serve as a model for a federal regulatory reporting program, they are actively participating in the development of its reporting protocols. However, as a national policy develops regarding the control of GHG emissions, the entity-wide versus facility emission reporting debate will remain a significant issue. Key proponents of the entity-wide approach are those corporations that are already participating in voluntary reporting and/or reduction programs such as Climate Leaders. This is partly because they are already calculating emissions on an

entity-wide basis. It is likely, however, that companies also want to reduce the chance of any one facility being singled out as a particularly large emitter of greenhouse gases.

Coalitions, while not typically repositories for detailed carbon disclosure information, do provide a public forum for declaring support for greenhouse reduction strategies. Table 10 presents an overview of major coalitions that may be attractive to companies in each of the sample industry sectors as it relates to carbon emissions.

In some cases, coalitions are formed for the sole purpose of furthering a specific agenda. For example, the United States Climate Action Partnership (USCAP), a coalition of 27 major corporations and six NGOs, is pushing Congress to pass federal legislation requiring reductions in greenhouse gas chemicals (USCAP 2010).

In other instances, a coalition will focus on an initiative that is central to its member organizations, much like the Business Roundtable's Climate RESOLVE program. The goal of the Climate RESOLVE program is for member organizations to agree to reduce their greenhouse gas emissions. Although there is no specific disclosure required as part of this program, participating companies do respond to a survey from the Business Roundtable regarding such issues as whether they calculate and review emission profiles, use energy conservation programs, and publicly report emissions (Business Roundtable 2010). This data is then aggregated and reported.

Both CERES and GEMI are coalitions that tackle multiple issues with regard to environmental management and sustainability. They are global in scope, providing members with a variety of resources for calculating and reporting greenhouse gas emissions. Most notably, CERES is responsible for developing the Global Reporting

Initiative (GRI), recognized as the first global framework for reporting sustainability metrics (CERES 2010).

| | Basic Materials | Healthcare | Industrials | Oil & Gas/Energy | Utilities | Consumer Goods | Consumer Services | Financials | Technology |
|---|---|---|---|---|---|---|---|---|---|
| **CERES** | | | | | X | X | X | | X |
| **Global Env. Management Initiative (GEMI)** | | X | X | | | | | | |
| **US Climate Action Partnership (USCAP)** | X | X | X | X | X | | | | |
| **Climate Resolve** | X | X | X | X | | X | X | X | X |
| **US EPA Energy Star** | X | X | X | X | X | X | X | X | X |
| **US EPA Smartway** | | X | X | X | | X | X | | X |
| **Climate Savers** | | | | | | | | | X |

Table 10 - Coalitions for Addressing Carbon Disclosure

The U.S. EPA has established Energy Star and Smartway. These government-backed programs help businesses curb greenhouse emissions by focusing on energy efficiency and more efficient transportation, respectively (U.S. EPA 2010). Saving money on energy or transportation costs along with the public recognition by EPA are significant motivators for companies to participate in these programs.

Some coalitions are narrower in scope and cater to a specific industry. The Electronic Industry Citizenship Coalition (EICC), for example, is geared toward the electronics industry and works to promote "efficiency and social responsibility in the

global supply" (EICC 2010). Within the study sample, Advanced Micro Systems and IBM belong to this organization.

The Carbon Principles, of which sample company JP Morgan Chase is a partner, address the evaluation of carbon risks in the financing of electric power projects. In this coalition, companies from different industry sectors form an alliance to work on issues that are integral to the success of all (Carbon Principles 2010).

In other instances, coalitions serve more of a public relations function to dispel myths about certain industries categorized as large emitters of greenhouse gases. One example is the Air Transport Action Group, who publicly declare that aviation "is responsible for 2% of man-made $CO_2$ emissions worldwide" (ATAC 2010).

While trade associations typically serve as lobbying bodies for member companies, some of these organizations have taken a forward looking stance on reporting of greenhouse gas emissions in an effort to urge formal rulemaking on carbon reductions and to poise its members to take advantage of greenhouse gas reducing initiatives.

The lack of greenhouse gas legislation poses a significant source of business uncertainty that interferes with a company's ability to plan. Some trade associations, as well as individual businesses, supported establishment of a federal GHG reporting rule (ACC 2009). They have taken it a step farther and require their member companies who participate in their voluntary high performance programs to disclose greenhouse gas emissions by sector to the association. The American Chemical Council is one such example. ACC requires member companies to track greenhouse gas emissions as part of its Responsible Care program (Responsible Care 2010).

Trade associations also provide an information clearinghouse on accounting for greenhouse gas emissions as well as a platform for companies to have someone else tout their climate change initiatives. The American Petroleum Institute, for example, provides a "Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry" (API 2009). This information can also be used as a foundation for companies in this sector to participate in other voluntary reporting schemes, such as the DOE 1605(b) program.

The API Climate Action Challenge (API 2010) requires participants to develop plans to reduce, offset or avoid greenhouse gas emissions. This requires accounting using the API method and reporting through the API organization. A benefit for the organization as well as its individual members is that it enables the petroleum industry to share information on proactive measures that companies are taking to reduce their impact.

Another similar effort in the electric utilities industry is the partnership between Edison Electric Institute members and the Department of Energy, called the Power Partners Climate Challenge Program. This joint government/industry initiative develops voluntary actions to reduce greenhouse gas emissions (EEI 2010).

Voluntary carbon markets provide companies with an opportunity to make a "voluntary but legally binding commitment to meet annual GHG emission reduction targets"(CCX 2010). Those who reduce their emissions below target levels can then sell or save differential for later use. Companies who need or would like to purchase offsets can do so through the same market.

The only active voluntary carbon market in the U.S. is the Chicago Climate Exchange. While all nine sectors in the study are represented on the Chicago Climate Exchange (CCX), only DuPont and Abbot Laboratories are listed as active members. All levels of membership within the CCX require disclosure of greenhouse gas emissions, verified by the Financial Industry Regulatory Authority (CCX 2010).

**Reporting/Communications Directly By Company**

Communication regarding carbon disclosure can be issued directly by the company to the general public or to a certain target audience through public relations, investor relations and consumer relations strategies. While there is greater latitude with regard to content and message, these communications are also subject to more scrutiny.

From a public relations perspective, the sustainability report and the company website are the two main forms of communicating carbon disclosure information. KPMG found in a study it co-authored with GRI that almost all companies report on climate change in their sustainability report (KPMG/GRI 2007). This is also the case with almost all of the sample carbon-intensive companies that are publicly held, publishing either Corporate Social Responsibility (CSR) reports or Sustainability reports and addressing climate change therein.

60% of the publicly held sample companies who are disclosure leaders in the non-carbon intensive sector publish CSR or sustainability reports and address climate change to some degree. 20% of the non-CDP companies in this section do likewise. None of the privately held companies in the study sample are issuing CSR or sustainability reports.

This is an important distinction as the companies in the three sample groups are similar types of companies.

The level of carbon emissions reporting contained in sustainability reports varies with the industry and the company. Where included, many sample companies have chosen to use the information they submitted to the Carbon Disclosure Project or other voluntary initiatives in which they participate. In some cases, the company reported just greenhouse gas emissions along with other environmental metrics, such as water usage and waste generation. In other instances, reduction goals and targets were published along with highlights of specific carbon reduction projects. As expected, this communication mechanism was not found to be used to convey potential risks of climate change either from a legal, physical or economic perspective.

While all companies included in the study have websites, the publicly held companies are the only ones who have sections devoted to greenhouse gas/carbon emissions. Of the publicly traded companies who are in our disclosure leader sample, 87% address the issue of climate change and greenhouse gas emissions to some degree on their website. 76% disclose their carbon emissions at the Scope 1 and Scope 2 level. 56% go beyond reporting emissions, outlining future reduction initiatives including, in some cases, work with suppliers to reduce Scope 3 emissions along the supply chain. 40% of companies in the non-CDP sample also addressed climate change in definitive ways on their websites.

Not surprisingly, the carbon-intensive sectors in this study go beyond reporting of emission disclosures, with the utilities and industrial sectors presenting the most

comprehensive websites. This may be due to the fact that both of these sectors have been subjected to close scrutiny by independent researchers and the media. Consequently, these sectors have had to consider their impact and response earlier than other sectors.

The sample companies comprising the technology sector in the non-carbon intensive group also have robust websites with regard to carbon disclosure. While direct impact on greenhouse gas emissions is typically low, companies in this sector often succeed by staying at the forefront of new issues. Many of these companies focus on providing "green" products and services, thus establishing brand image.

While many of the sample companies use an online sustainability report to convey their position and actions regarding greenhouse gas emissions, several have separate sections devoted specifically to climate change, greenhouse gas emissions and energy efficiency.

Investor relations also comprise an important component of a company's transparency. There is a recognized responsibility to accurately communicate with investors regarding issues of materiality that can affect the current and future business outlook. This practice has been further encouraged by the recent SEC guidance on the need to disclose risks as well as opportunities associated with climate change.

In this study, the disclosure practices of the publicly traded companies in the sample were based on a review of their annual reports and 10K filings. While some privately held companies do issue annual reports and communications to their individual investors, there are no public sources of this information from which to perform such an

evaluation. Table 11 addresses the number of publicly traded companies in each sample sector that mentioned climate change in either its annual report of 10 K filing.

| Industry Sector | Annual Report | 10-K Filing |
|---|---|---|
| **Basic Materials** | 5 of 7 | 5 of 7 |
| **Healthcare** | 2 of 7 | 2 of 7 |
| **Industrials** | 2 of 7 | 1 of 7 |
| **Oil&Gas/Energy** | 6 of 8 | 5 of 8 |
| **Utilities** | 7 of 7 | 7 of 7 |
| **Consumer Goods** | 2 of 7 | 0 of 7 |
| **Consumer Services** | 2 of 7 | 2 of 7 |
| **Financials** | 2 of 7 | 2 of 7 |
| **Technology** | 1 of 7 | 0 of 7 |

Table 11 – Climate Change "Mentions" by Publicly Traded Companies in Investor Relation Media

The sample companies were evaluated merely on whether there was reference to climate change in the annual report and 10K filing. While some companies were more comprehensive in their handling of the impact of climate change on their business, generally there was very little mention of climate change in these forms of disclosure. Consistent with previous research, companies who are more carbon-intensive, especially the utilities and basic materials groups, tend to more thoroughly characterize the materiality of climate change to their business.

For the most part, companies in this study are not using annual financial reports to share information regarding climate change. Out of the publicly traded companies in this study, only 33% are disclosing more than a mere mention in this particular forum. Of the

33% who are disclosing more information, the statements range from listing a few risks such as increased energy costs and more regulations to more thorough disclosures, such as physical threats to operations from changing climate and disruption of services from indirect sources. Several previous studies regarding the disclosure habits of S&P firms have been conducted and yield similar results regarding the general lack of disclosure pertinent to matters related to climate risk (Stanny and Ely 2008; CERES/EDF 2009).

However, lack of disclosing climate change information in an annual financial report does not necessarily indicate a lack of disclosure in general from a company. Some companies who do not mention climate change in its annual financial report are making such disclosures in their CSR/Sustainability reports. In addition, those companies that submit completed surveys to the Carbon Disclosure Project are addressing multiple risks and opportunities related to climate change. (PriceWaterhouseCoopers 2009). The predominant lack of reporting climate change information, which is otherwise publicly available, in annual financial reports appears to reflect a desire not to infer a direct relationship between climate change and financial performance.

To date, it has been even less common to for companies to report substantial climate change data in 10K filings. In this study, only 37% of the publicly traded companies are addressing both risks and opportunities of climate change in its filings. The reasons for not addressing climate change in 10 K filings may range from not identifying the materiality of the climate change with their business to not wanting to weaken their position with the investor community.

The one industry-wide exception to this trend is the utility industry. All seven of the public utility companies in the study have described to some degree both risks and opportunities in their annual reports and 10K filings. This includes those in the sample considered to be disclosure leaders as well as those in the sample that don not report to the CDP. Having come under greater scrutiny from both the federal government and non-governmental organizations for some time, it is likely they have been induced to address these issues sooner than lower profile industries.

However, with the recent SEC interpretive guidance on disclosing risks associated with climate change in effect, it will likely change the substance of climate change disclosures in this industry as well. While ahead of other industries in terms of the level of climate change disclosure, the utility companies have tended to report risk in general descriptions rather than specifics. In addition, more detailed information will be needed to adequately address a company's specific actions to minimize or reduce climate impact.

Another avenue of carbon disclosure is the communication that a company targets directly to its consumers through more traditional marketing and advertising strategies. While this method of disclosure is certainly a consideration in a company's overall climate communication strategy, it is not addressed within the scope of this study.

**Study Implications**

The results of this benchmarking study support the overall hypothesis that the scope and degree to which companies disclose carbon information is directly related to specific characteristics (i.e. profile) of the particular business and industry. Specific

research hypotheses developed to test the relationship between firm characteristics and carbon disclosure efforts were identified as being critical to determining the validity of the overall hypothesis and were answered as part of the benchmarking study. This is the subject of the following discussion.

### Multiple Avenues of Carbon Disclosure Identified

The benchmarking study identified multiple avenues of mandatory and voluntary carbon disclosure. These disclosure avenues can be categorized into five main groups. As shown in Table 12, these categories are regulatory, investment, collaborative, public oriented, and consumer focused.

These represent different ways in which companies can disclose information related to carbon emissions and climate change. While some disclosures are mandatory, most are voluntary. This information will be used in the following chapter as the foundation in the development of an effective carbon disclosure strategy that supports a company's overall business strategy based on its individual situation.

It should be recognized that this study reviewed the practices of a sample of companies across nine industry sectors, with the intent to improve our understanding of the scope of carbon disclosure across a broad landscape of industries who are engaged on some level in carbon disclosure and to identify key avenues of carbon disclosure. While the information gleaned from this study provides useful insight into the disclosure outlets and practices of companies from a broad range of sectors, the conclusions should not be misinterpreted as an overall statement of industry behavior within a particular sector or as a statement as to why companies do not disclose carbon information.

| Disclosure Avenues | Mandatory Or Voluntary | Example from Benchmarking Study |
|---|---|---|
| **Regulatory** | Mandatory | • EPA GHG Reporting Rule<br>• Mandatory Carbon Markets (RGGI, WCI and MGA)<br>• State Specific Reporting Rules |
| **Investment** | Mandatory and Voluntary | • Annual Reports<br>• 10K Filings |
| **Collaborative** | Voluntary | • Climate Registry, Climate Leaders, DOE 1605b, Climate Resolve, EnergyStar, Smartway,<br>• Trade Associations<br>• Coalitions |
| **Public Oriented** | Voluntary | • CSR or Sustainability Report<br>• Website |
| **Consumer Focused** | Voluntary | • Company Branding<br>• Advertising |

Table 12 – Carbon Disclosure Avenues

**Company Profile Influences Scope and Level of Carbon Information Disclosure**

Thorough review of the carbon disclosure practices of the companies sampled in the benchmarking study suggest there are at least four primary business/industry profile characteristics that influence the scope of disclosure: 1) ownership, 2) carbon emissions, 3) legal requirements and 4) market considerations. These categories were established from the working table of the benchmarking study appearing in Appendix J and based on the results of testing the supporting hypotheses. The following discussion highlights some of the pertinent results from the benchmarking study suggesting that these company characteristics influence the scope of carbon disclosure practices.

Based on the results of the benchmarking study, ownership of the company appears to influence the level of voluntary carbon disclosure information. Firms that are publicly owned are more likely than firms that are privately owned to publicly disclose carbon emissions and related information in several different disclosure avenues. As discussed previously, public companies are more likely to address carbon issues on their websites, publish sustainability reports and report to the Carbon Disclosure Project.

In addition, publicly held companies are consistently more engaged in voluntary carbon disclosure efforts than privately held companies. Results of this benchmarking study could not find evidence that any privately held company in the sample voluntarily disclosed carbon information on a public platform. However, 100% of the publicly held companies considered disclosure leaders in the sample voluntarily disclose carbon information on some level through at least one disclosure avenue. Additionally, 65% of the non-CDP responding companies in the benchmarking study also voluntarily disclose carbon information through at least one disclosure avenue

The amount of quantifiable carbon emissions also influences the carbon disclosure practices of firms. Firms that are carbon intensive will be more likely than firms that are non-carbon intensive to disclose carbon emissions and related information due to mandatory requirements. However, this study did not show this to be true relative to the voluntary disclosure of carbon related information. The data do not support a hypothesis that non-carbon intensive firms are less likely to voluntarily disclose carbon related information through voluntary disclosure initiatives than carbon intensive firms.

Both carbon intensive and non-carbon intensive firms in the benchmarking sample voluntarily disclose carbon information through outside agencies at a level less than 50%.. While 47% of carbon intensive firms in the disclosure leader sample voluntarily disclose through outside agencies (i.e. CDP or Climate Registry) 38% of non-carbon intensive firms do the same.

Voluntary disclosures through sustainability reports for disclosure leaders are 84% from carbon intensive and 70% from non-carbon intensive firms respectively. Including all companies in the carbon intensive sample (i.e. disclosure leaders, private companies and non-CDP responders) overall disclosure between carbon intensive and non-carbon intensive drops to 50% and 44%

Disclosure of carbon information through company websites differed somewhat with 62% of carbon intensive companies and 50% of non-carbon intensive companies reporting collectively as a group. It is likely, although not part of this study, that other characteristics such as ownership or market considerations play a more prominent role when it comes to influencing carbon disclosure than the level of carbon emissions from a firm.

The benchmarking study revealed that companies who respond to The Carbon Disclosure Project questionnaire are more likely to voluntarily disclose carbon information in other disclosure avenues than those who don't respond to the CDP. For example, 84% of CDP respondents in the sample disclosed carbon information on their company website compared to 36% of the non-CDP respondents in the sample. However, the results of the benchmarking study do not support the hypothesis that companies that

do not respond to CDP do not voluntarily disclose carbon information. As a matter of fact, of the sample of companies who do not respond to the CDP questionnaire 65% still voluntarily disclose information in at least one other voluntary disclosure avenue (i.e. annual report, sustainability report or company website.

Legal requirements certainly influence the scope and level of carbon disclosure from a mandatory perspective. Subjectivity to mandatory carbon emission reporting requirements is primarily a function of the industry sector (i.e. the state or region in which they are located (i.e. RGGI, WCI, etc.) and the amount of emissions generated.

The hypothesis that firms that are subject to legal requirements to report carbon related information are more likely to voluntarily disclose carbon information in other disclosure avenues than firms who do not have legal requirements to report carbon related information could not be validated as stated.

It was determined from the results of the study that firms with and without legal reporting requirements are equally likely to voluntarily disclose carbon information at some level. However, it can be noted that those companies with legal reporting requirements tend to report through more voluntary disclosure avenues (an average of four voluntary disclosure avenues per firm) than those who do not have legal requirements to report (an average of 2 voluntary disclosure avenues per firm).

The results of the benchmarking study also suggest that market considerations such as customer profile and target market can influence the voluntary disclosure practices of companies. Firms that sell products are slightly more likely to voluntarily disclose carbon related information than those firms who are service oriented.. For

example, 71% of companies in the consumer goods sector and 86% of companies in the technology sector disclose carbon information in their sustainability reports and company websites. 42% of sample companies in the financial services sector address carbon issues in their sustainability reports and company websites.

Possessing characteristics in multiple categories compounds the likelihood that firms will engage in some level of carbon disclosure. For example, the benchmarking study revealed that publicly-owned companies who are in carbon intensive sectors disclose a greater level of carbon information in more disclosure avenues (54% in 3 or more voluntary disclosure avenues) than publicly owned companies in non-carbon intensive sectors (18% in 3 or more voluntary disclosure avenues).

The above examples taken from the benchmarking study results support the hypothesis that company and industry characteristics influence carbon disclosure strategies. While not an exhaustive list of all possible characteristics of a company that may influence carbon disclosure strategy, ownership, level of carbon emissions, legal requirements and market considerations have broad based applications for consideration across all companies and industries. Company profile characteristics will be used as critical input for the development of the decision making framework discussed in the next chapter.

Recognition of these profile categories supports previous findings on carbon information disclosure. Reid and Toffel, for example, found that shareholder actions affect environmental disclosure (Reid and Toffel 2009). This would be consistent with what this benchmarking study suggests regarding the ownership influence of a company.

Another example of the consistency between results from the benchmarking study and prior research is the observation that those companies who already are mandated to disclose carbon information seem more likely to disclose carbon information through other voluntary disclosure avenues. Kolk explored this to some degree in research on the effect that corporate governance and accountability have on disclosures in sustainability reports and annual reports (Kolk 2008).

**Patterns of Carbon Information Disclosure Vary Across Company, Sector and Disclosure Outlet**

There was wide variability among companies and industry sectors in the benchmarking sample with regard to the type and level of carbon information disclosure activity. However many patterns of disclosure did emerge within industrial sectors and across the entire sample that will be useful in developing a decision-making framework. The following examples of disclosure patterns are indicative of the variability across the sample.

Basic climate change information, including acknowledgement of climate change as an issue, emissions data, and reduction goals and targets are more common and appear across multiple sectors and disclosure outlets. For example, whereas all industrial sectors in the sample had at least 50% of their companies submit data to the Carbon Disclosure Project, some industrial sectors such as utilities and technology exceeded a 70% response rate.

Climate opportunities have a tendency to be disclosed in communications to stakeholders, expressed in terms of new markets and products along with the potential to

reduce operating costs, and typically are disclosed through sustainability reports (71% of publicly owned companies) and company websites (87% of publicly owned companies).

Climate risks are much less commonly disclosed outside of required communication with investors such as annual and 10-K reports. The Carbon Disclosure Project was the only other disclosure avenue in the benchmarking study that reflected responses to climate risk and that response was low compared to the number of respondents (15% of sample companies that responded to CDP).

**Conclusions**

Based on the results of the benchmarking study, there are a number of decisions to be made regarding disclosure of carbon emissions for a firm. The crux of the decision making process involves determining not only whether to disclose carbon information publicly but also the "what, where, why, when and how".

It is suggested by the results of the study that company and industry characteristics play a large role in the development of a carbon disclosure strategy that fits the needs of a particular firm. Patterns as well as variability of disclosures among companies and industries underscore the potential benefit of having a decision-making framework that would serve as a model for companies to use in understanding their specific carbon information disclosure options.

The decision making framework for carbon information disclosure will be developed in part by using the results of the benchmarking study to outline the types of disclosure and develop an evaluation methodology that integrates the processes, linkages

and decisions that are general to the decision framework but can be tailored to a specific company based on their characteristics.

In the subsequent chapter a carbon information disclosure decision-making framework will be introduced as a tool to be used by companies to assist in the development of tailored carbon disclosure strategy.

# CHAPTER IV

## CARBON INFORMATION DISCLOSURE STRATEGY (CIDS) FRAMEWORK: A PRACTICAL COMPANY DECISION TOOL

### Introduction

As the debate over controlling greenhouse gas emissions through federal regulation continues, many companies are engaging in the first nationally mandated process requiring disclosure of GHG emissions. Closely following issuance of the EPA Greenhouse Gas Reporting Rule, which requires certain companies to track their greenhouse gas emissions beginning in January 2010 and reporting in 2011 (EPA 2009), is the interpretive guidance issued by the SEC in February 2010 (SEC 2010). This guidance requires publicly traded companies to disclose the risks and opportunities associated with climate change in their annual 10K filing.

Several organizations have been conducting some form of greenhouse gas accounting and disclosure for years pursuant to a state requirement or a regional initiative such as the Regional Greenhouse Gas Initiative (RGGI). Others have begun to calculate emissions "in-house" in an effort to establish a baseline for future regulations or as a precursor to developing their own internal greenhouse gas strategy.

Beyond the actual accounting of the carbon emissions produced by a company and its value chain, there are a host of other considerations regarding the impact and strategy surrounding the disclosure of these emissions and carbon-related impacts and initiatives. While some organizations will be required by law to make their carbon footprints public, others will not. In addition, it is likely, based on current and proposed reporting

frameworks, that those emissions required to be disclosed may not paint a complete picture of a company's true carbon footprint and related impacts.

As a company ponders its carbon strategy, a key question it faces is, "What is the preferred strategy to account for and disclose our carbon footprint and related activities?" While part of this answer will be driven by the regulations pertaining to a particular business, considerations such as brand value, shareholder and market demands, and competitor strategies may lead companies to voluntarily disclose additional carbon information. No doubt a company that aligns its carbon disclosure strategies with its overall business strategies will be most successful.

This chapter describes the development and potential use of a decision-support methodology (i.e., framework) for carbon information disclosure as experienced from the company perspective. The intent of this framework is to serve as a template or model for firms to use to understand carbon information disclosure issues and how they pertain to their business. By using the framework as a business planning tool, a carbon information disclosure strategy (CIDS) can be formulated that is consistent with the overall carbon strategy and business objectives. This tool does not presuppose that a decision has already been made to disclose carbon information.

The tool takes into account mandatory disclosure to regulatory agencies, voluntary disclosure through outside organizations, and voluntary disclosure directly from the company. The CIDS methodology, once developed, was peer reviewed by potential industry users, and then subsequently applied in a practical application to illustrate its use.

## Carbon Information Disclosure Strategy (CIDS) Methodology

Previously reported work performed by the author focused on benchmarking the carbon disclosure practices of sample companies representing various industry sectors. The result of that effort included an enumeration of available mandatory and voluntary disclosure outlets. By studying the specifics of carbon disclosure strategies of these companies across both carbon intensive and non-carbon intensive industries, observations were made about the avenues of carbon disclosure which form the basis of the CIDS methodology.

## CIDS Framework

Given the significance of carbon-related issues in the current regulatory and business landscape, it would be ill-advised for a company to remain unaware of the impact carbon plays in its current and future business. While the CIDS framework, presented in Appendix K, assumes that a company has already calculated its carbon footprint on some level, it is not a prerequisite for utilizing the process.

There is a clear distinction between accounting for and disclosing carbon information. Certainly a company could calculate its carbon footprint and develop a carbon strategy without disclosing it to the public beyond what is mandatory. Nonetheless, if the company has not already calculated its carbon footprint, it may determine a need to do so from stepping through the framework and concluding that it will be required to disclose emissions based on a mandatory program. A company may also decide that it is in its best interest to disclose carbon information to address investor

and consumer interests. Conversely, some companies may decide as a result of using the decision framework that voluntary disclosure of carbon information is not an action that is in their best interest to undertake at the present time.

The CIDS framework, as presented in Appendix K, is a variation of a swim lane flowchart, which is a common business process modeling tool. This particular format works well as each type of disclosure can be separated into visual components which illustrate the different thought processes that are required to determine the applicability of each disclosure mechanism.

The horizontal axis is divided into three categories based on the major types of carbon disclosure: mandatory disclosure to outside agencies, voluntary disclosure through outside organizations, and disclosures directly from the company. Each category is further subdivided into specific disclosure mechanisms.

The vertical axis partitions the process into the steps of the Plan-Do-Check-Act (PDCA) model. The successful implementation of the CIDS framework depends on proper understanding and evaluation of the applicability of each disclosure mechanism (Plan), disclosing according to the appropriate guidelines and protocols (Do), checking the process regularly for changes which affect disclosure (Check), and responding to those changes accordingly in a timely manner (Act). This process is dynamic to the extent that regulations and initiatives change as well as business goals and strategies. The CIDS framework is designed to be used periodically as a tool for continual improvement.

In the initial phase of the planning process, it is critical that a company understand the particular drivers of carbon disclosure that apply to its business situation. Drivers of

carbon disclosure are those factors that induce companies to disclose its greenhouse gas information. Three of the main drivers include regulations, investor and stakeholder requirements, and consumer influence.

The impact these drivers have on determining whether a company is likely to disclose is largely dependent on certain company characteristics (i.e., company profile). For example, carbon intensive companies are more likely to be regulated under the EPA GHG Reporting Rule than non-carbon intensive companies. Additionally, publicly held companies are now being held to stricter climate disclosure requirements by the SEC, whereas privately held companies do not have to disclose risks from climate change to the public.

Companies that operate on a global basis are apt to be more versed in climate disclosure pursuits than those companies whose activities are limited to the U.S. From the perspective of voluntary disclosure initiatives, high profile companies with a large customer base may benefit from credible and positive climate change disclosure, whereas disclosure may be less relevant for lower profile companies with fewer customers.

As shown in Figure 3, carbon information disclosure lies at the nexus of where business strategy, carbon strategy and environmental disclosure strategy intersect. Therefore, it is important to utilize cross-functional teams to assist in the assessment and implementation of carbon management strategies. This includes the process of utilizing the CIDS framework as a decision-support tool.

A company would ideally begin by determining what is mandatory to report and use that as the basis for further consideration of voluntary disclosure initiatives. This is where the CIDS framework begins, as discussed below.

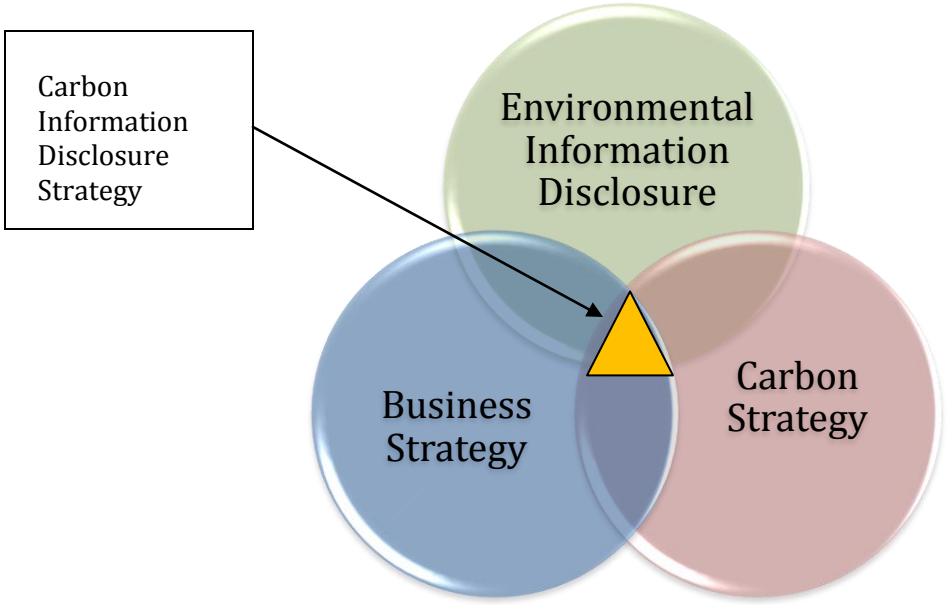


Figure 3 – Foundation of Carbon Information Disclosure Strategy

**Mandatory Disclosure To Outside Agencies**

Having a carbon management strategy is important not only in complying with regulations, but also in positioning companies to take advantage of a cap and trade program (Ernst & Young 2010). The principal government regulations and directives related to this section of the decision model are the EPA GHG Reporting Rule (EPA 2009), regional cap and trade programs (MGA 2010; RGGI 2010; WCI 2010), state reporting initiatives (PEW 2010) and SEC disclosures (SEC 2010). Due to the complexities that tend to be inherent with interpretation of regulations and agency guidance, it is recommended that experts in the field, such as attorneys and consultants, be involved in

the applicability determination and reporting process to ensure compliance with legal requirements.

The determination of mandatory disclosure requirements largely depend on the nature of the business. For example, the EPA GHG reporting rule can apply to direct emitters of greenhouse gases or suppliers of greenhouse gases. While a threshold emission limit is used as a bright line for applicability determination, some industries are included in the rule solely by virtue of the industrial classification they maintain.

While the deciding factor for disclosure in regional cap-and-trade programs and independent state reporting initiatives is dependent on type of business and threshold emissions, it is also a function of geographical location. Businesses must consider its operations in all states and make these determinations independently (by facility) in most cases. Therefore, some facilities within a company may be subject to greenhouse gas reporting while those located in states without reporting requirements will not. This adds to the inconsistency in reporting throughout an organization and is one reason why many companies have pushed for a federal reporting program.

More stringent guidance from the SEC on the disclosure of material climate risks and opportunities has publicly held companies focusing on current and future impacts of a carbon constrained operation from both the physical and economical perspective. The actual disclosure activity of this process should not be underestimated with regard to the level of resources required to account for and maintain emissions documentation. While this is true for all types of disclosure, it is especially important for mandatory reporting to

agencies where most of the operational impact occurs in the maintenance of monitoring equipment and in the implementation of initiatives to reduce emissions.

Each mandated program stipulates the use of its own reporting protocol with emission thresholds, scope definitions and verification requirements. While some programs are consistent with each other, the formal synchronization of mandatory programs has not occurred to date.

Another aspect to consider in the disclosure of mandatory information is accuracy and transparency. This is critical in programs where disclosures are being certified by company officials and sent to regulatory agencies. As is typical with most federally regulated programs, a comprehensive compliance management plan must be in place (Ernst & Young 2010). This can include written procedures, training, and monitoring equipment. As companies develop their carbon disclosure strategies, careful consideration must be given to assuring the quality of the data being disclosed through process and operational controls.

Periodic reviewing and updating of disclosure data should be conducted as required by the agency to which the disclosure is made. However, it is important to stay abreast of regulatory changes as well as changes to the business which may affect the mandatory disclosure requirements that are applicable. In some cases, even if a company is not currently required to disclose its data, it may still have to account for its emissions to prove that the company is operating at under the reporting threshold.

**Voluntary Disclosure Through Outside Organizations**

Once a company has determined its mandatory reporting requirements, it can then consider voluntary strategies with regard to public disclosure of carbon information. Whereas much of the data disclosed through regulatory programs is related to carbon emissions, public disclosures of carbon information vary from quantitative to qualitative in nature.

Types of information disclosed include basic climate change information such as the acknowledgement that climate change is a relevant issue, emission information, and reduction goals and targets. Voluntary disclosure methods also provide latitude in reporting climate opportunities, such as new products and services, as well as climate risks, including increased costs and business disruptions.

The next category of evaluation in the CIDS framework addresses voluntary disclosure through outside organizations. These organizations include government sponsored initiatives such as EPA Climate Leaders (Climate Leaders 2010), as well as non-profit groups like the Carbon Disclosure Project (CDP 2010), which focuses on greenhouse gas reporting and reductions. Coalitions and trade associations also provide outlets for the disclosure of a company's carbon information.

When considering whether to voluntarily disclose information regarding emissions and climate efforts, a company needs to contemplate its overall business strategy in conjunction with its carbon strategy to evaluate the benefit, if any, of disclosure. Exercises in determining carbon disclosure strategy are best served by including multiple disciplines within a company, such as operations, finance and

marketing. In addition, top management involvement in these decisions is key to ensuring that a company's carbon message, as delivered through carbon disclosure, is consistent with the strategy and focus of the company. Considerations influencing voluntary disclosure of carbon information include assessing the company's carbon strategy (i.e., relevance of disclosure), understanding expectations of stakeholders and customers, and competitor disclosure practices.

If a company has already calculated its carbon footprint under a mandatory reporting scheme, much of the background work may already be in place for reporting emissions voluntarily through outside organizations. However, it is important to understand the protocols upon which these reporting programs are based. Carbon footprints and emissions can vary depending on the protocol used and the program disclosure guidelines. Companies need to be cognizant that variations can result from differences in emission reporting methods and scope of the footprint calculation, such as whether suppliers are included in the overall emissions. Understanding these differences is important as questions of accuracy and transparency can arise both internal and external to the company.

While voluntary disclosure programs utilize reporting guidelines to maintain consistency among participants, there is broad flexibility in disclosure choices at the voluntary level. Most emission disclosures, for example, are aggregated and reported at the entity level as opposed to the facility level.

With the increased flexibility provided in voluntary disclosure mechanisms comes the tendency of a company to focus on the positive aspects associated with its carbon

strategies while playing down the commiserate risks. While this practice is not illegal, a company must be mindful to characterize its carbon strategy thoroughly and accurately so as to avoid the accusation of "greenwashing".

**Disclosure Directly From Company**

Once a company has established its strategy for disclosing carbon information through outside organizations, it can also consider an additional form of voluntary disclosure, disclosures directly from the company. This third category of the CIDS framework covers carbon information disclosure in annual CSR/Sustainability reports, company websites and marketing.

As websites have become a powerful tool for engaging potential consumers and investors, electronic communication has become a primary channel for carbon information disclosure. One of the main benefits of disclosure through this mechanism is the ability to update information in real time without having to wait for a new reporting period as with some of the formal disclosure methods.

There is considerable flexibility in determining what to disclose in sustainability reports and websites. If a company has already engaged in mandatory disclosure activities and/or voluntary initiatives with outside agencies, much data and information should be readily available. As with any type of voluntary disclosure, the manner in which carbon information is disclosed should be consistent with the company's carbon strategy.

Ideally, the CIDS framework should be followed in a sequential fashion, where a company begins by establishing its mandatory requirements and building reporting profiles on the specified protocols to satisfy regulatory guidelines. With this reporting profile as a foundation, the company can then evaluate voluntary initiatives, building its disclosure strategy around programs whose reporting guidelines synchronize with the work that has already been completed. This would help ensure consistency and prevent duplicitous efforts.

This approach may be easier said than done. Inaction on the part of federal government to enact climate change legislation has resulted in many states enacting their own regulations and programs. In addition, many coalitions and non-governmental organizations have formed initiatives to focus on a specific piece of the climate change issue. As a result, there are numerous programs with varying applicability to industry sectors, differing reporting thresholds, and dissimilar accounting protocols.

**Focus Group Review**

The CIDS framework, once fully drafted, was distributed to several industry experts to gain feedback on the substance of the framework as well as its ease of use. This focus group included representation from a multi-national, multi-industry manufacturer, a legal firm who represents businesses on regulatory and air permitting issues, and two consulting practices with manufacturing backgrounds who now advise clients regarding greenhouse gas issues.

Feedback from this focus group was very positive with respect to the logical flow and relevance of the decision tool. Respondents thought it would be very beneficial to companies to have a decision making process tool that incorporates the various disclosure themes in one comprehensive strategy. Participants also felt that the model did a thorough job of outlining the decision flow process visually using familiar business decision-making models. Addressing the process in terms of a continual improvement model (Plan, Do, Check, Act) was considered to be an important feature to convey this process as one that is dynamic and should be reviewed as business situations change.

It was noted that while this tool does a good job outlining the types of decisions that need to be made and variables to be considered, the decision model needs to be administered by someone with a good working knowledge of regulations. This is certainly a valid point and it has been stated in the dissertation that the success of this decision framework rests on having a cross-functional, knowledgeable team bringing various expertise to the table.

Another comment received was that this framework covers U.S disclosure schemes only and does not discuss international options for disclosure. While the scope of this research was limited to U.S. disclosure programs, it is understood that companies who operate on a global basis would want to consider international disclosure options in developing their carbon information disclosure strategy. This has been listed as an opportunity for future research.

Internal carbon information disclosure was mentioned as a type of disclosure that should also be considered in a company's strategy but is not addressed directly in the decision-making model. Examples of this type of disclosure would be internal

communication to executives, managers and team members regarding such information as carbon footprint, energy initiatives, etc.

Internal communication about carbon issues is a critical piece of the success of a company's overall climate strategy as it helps those who make decisions for the company understand the importance of these activities to the business and those who carry the operations more mindful of their impact. It has been suggested in research presented earlier in this dissertation that aligning a company's carbon information disclosure strategy with climate strategy and business strategy is crucial. A separate project studying the influence internal carbon information disclosure has on a company's ability to reduce their carbon footprint would be ideal for future research.

The comments received from the participants in this review have been effective in validating the relevance and usability of the CIDS framework. While several opportunities for improvement were noted that can be used to build upon the basic framework for future research, the model is a viable tool as presented in this dissertation.

**Practical Application of the CIDS Framework**

A hypothetical company, CD Solutions, Inc. (CDS), is used to illustrate the CIDS framework and how it could be used to help a company determine its carbon information disclosure strategy. The business profile for CDS was constructed by merging characteristics from several large chemical corporations and utilizing information from corresponding chemical industry profiles (Hoovers 2010).

CDS, a privately held chemical distribution company, has adopted a growth strategy based on acquisitions. In an effort to vertically integrate its operations and expand into new markets, CDS has recently acquired a company that manufactures industrial chemicals, such as dyes and pigments, which are used by other product manufacturers. A total of three manufacturing facilities comprised this acquisition. One of these plants produces titanium dioxide and is located in Utah. The other two facilities, one located in Wisconsin and the other in North Carolina, blend the titanium dioxide with other chemicals to manufacture dyes used in a variety of products.

Upon the completion of the acquisition, CDS pursued and was awarded several major contracts to supply pigments to two multi-national, multi-industry conglomerates. In addition, although its customer base is comprised predominantly of other manufacturers, CDS was able to close a five year deal with Wal-Mart to sell dyes and paints packaged for consumer use. As a result of forecasted rapid growth, senior company executives are considering taking CDS public through an IPO in the coming year.

As part of the CDS short-term and long-term strategic planning process, the CEO and other top executives recognize the importance that the carbon economy has on its business. A cross-functional team has been organized and tasked with developing a carbon information disclosure strategy that addresses the company's current carbon footprint, proactive initiatives that CDS is undertaking, and plans to perform a systematic review commensurate with regulatory and business change.

The CDS team begins its analysis of carbon information disclosure strategy by understanding the mandatory disclosure requirements that apply to company operations

as a result of acquiring the three manufacturing facilities. Using prior year carbon emissions data, the team is able to assemble sufficient information upon which to make a preliminary determination of reporting obligations (see Table 13).

| Facility | Type of Manufacturing | Industrial Classification | Location of Facility | $CO_2e$ (mtpy) |
|---|---|---|---|---|
| 1 | Titanium Dioxide | Basic Materials - Basic Chemical Manufacturing | Utah | 23,000 |
| 2 | Intermediate Chemicals | Basic Materials - Intermediate Chemical Manufacturing | Wisconsin | 36,000 |
| 3 | Intermediate Chemicals | Basic Materials - Intermediate Chemical Manufacturing | North Carolina | 24,000 |

Table 13 – CDS Manufacturing Facility Emissions Data

As a privately held chemical distributor, CDS had not previously been subject to greenhouse gas reporting under any existing regulatory programs. However, with the acquisition of the three manufacturing facilities, CDS must revisit this determination.

The EPA's Greenhouse Reporting Rule is designed to capture emissions from certain direct emitters and suppliers of greenhouse gases (EPA 2009). Upon acquiring the three manufacturing facilities, CDS has now become a direct emitter of greenhouse gases as defined by the EPA. By referencing the regulations, CDS determines that the titanium dioxide facility is subject to the reporting rule as titanium dioxide manufacturing is listed as a source category in Table 1 of the rule. This facility must report its emissions regardless of the size or amount of $CO_2e$ emitted annually. The blending plant in

Wisconsin, while not an emission source listed in Table 1 of the rule, will also need to report its emissions to EPA because it emits greater than 25,000 metric tons per year (mtpy) of $CO_2e$.

The facility located in North Carolina will not be required to submit its emissions to EPA because the facility is not a listed source category in Table 1 and it also emits less than 25,000 mtpy of $CO_2e$ annually. However, it is recommended that this facility internally account for its emissions using the methodology in the EPA rule in order to have objective evidence that it falls below the reporting threshold. Further, with annual emissions from this facility reaching the 24,000 mtpy mark, it could easily exceed the threshold in the future if facility changes are made or production increases.

The only regional cap-and-trade program that is currently in operation, the Regional Greenhouse Gas Initiative, does not affect CDS. However, two of the three new manufacturing facilities are located in states that have regional initiatives with effective dates in the next several years.

The titanium dioxide plant is located in Utah, which is a member of the Western Climate Initiative (WCI). Although CDS is currently under the reporting threshold for this facility, the company will need to keep close track of its emissions in 2011 and make an applicability determination at that point as reporting for WCI begins in 2012. Allowances for the Midwestern Regional GHG Reduction Accord will be allocated in 2012. Based on current $CO_2e$ emissions from the Wisconsin facility, it is likely that this facility will be required to participate in this program.

It is important to note that these regional programs were initiated in large part because states were tired of waiting for the enactment of federal regulations concerning the emission of greenhouse gases. While it is uncertain when a federal regulation will be instituted and what the particulars of a program might be, it is expected that some form of federal regulation beyond the current EPA GHG Reporting Rule will be enacted in the next few years.

The final determination for CDS on how it will disclose its emissions at the regional level will depend on the extent of federal regulatory activity at the time that the regional programs go into effect. It is anticipated that there will be a concerted effort to synchronize the regional schemes with a federal program to minimize redundant requirements on businesses.

On a state reporting level, North Carolina requires that facilities operating under Title 5 permits report their GHG emissions. Therefore, the CDS facility in North Carolina will have to report its GHG emissions to the state even though it is not currently required to report emissions under federal or regional programs.

The reporting threshold in Wisconsin is based on entities (not facilities) that emit greater than 100,000 $CO_2e$ annually, therefore CDS will not be required to report emissions for that facility. Utah does not have a separate reporting program at this time as they are members of the Western Climate Exchange and defer to reporting guidelines associated with the regional program.

Table 14 shows the outcome of the decision making framework as it applies to CDS for mandatory disclosure to outside agencies. It is important that CDS make these

decisions in consultation with legal professionals that are familiar with the particular tenets of each program.

| Facility | Type of Mfg. | Industrial Classification | Location of Facility | $CO_2e$ (mtpy) | EPA Rule | Regional Program | State Program |
|---|---|---|---|---|---|---|---|
| 1 | Titanium Dioxide | Basic Materials Basic Chemical Manufacturing | Utah | 23,000 | Yes | WCI | No |
| 2 | Intermediate Chemicals | Basic Materials - Intermediate Chemical Manufacturing | Wisconsin | 36,000 | Yes (> 25K mtpy $CO_2e$) from stationary combustion | MGA | No |
| 3 | Intermediate Chemicals | Basic Materials - Intermediate Chemical Manufacturing | North Carolina | 24,000 | No | No | Yes |

Table 14 – CDS Disclosure Framework for Mandatory Reporting

The third type of mandatory disclosure relates to requirements by the SEC for companies to disclose material risks and opportunities related to climate change to investors through financial reports. While this currently does not apply to CDS as a privately held firm, it must consider the implications of disclosing this information if it decides to go public. Three main issues related to climate change affecting CDS are energy cost and availability, environmental regulations, and disruption of business due to physical influences.

From a risk perspective, chemical manufacturing is sensitive to energy costs. The extraction of raw materials and processing require large amounts of energy that is dependent on petroleum, natural gas or coal. CDS has inherent risk tied to the price and

availability of energy, as do its competitors. Therefore, if CDS can pursue initiatives that reduce its dependency on energy, the company can minimize risk and capitalize on opportunities to reduce costs.

Environmental regulations also pose some risk to CDS. As regulations increase, the cost of compliance can also increase. Physical risks also exist, such as disruption to business from weather related occurrences that can interfere with the logistics chain.

Opportunities as a result of a carbon constrained economy also exist for CDS. The fields of alternative energy, water quality, and synthetic materials are all potentially affected by climate change, giving manufacturers of industrial chemicals an opportunity to enter new markets with new products.

Once CDS has established its mandatory disclosure requirements, the company has established a foundation from which to consider what voluntary disclosures, if any, would be beneficial to undertake. Voluntary disclosures in the CIDS framework are separated into voluntary disclosures through outside organizations and those made directly from the company. When evaluating the benefits of voluntary disclosure activities, CDS will want to lean heavily on its business strategy to guide the company in this phase of the decision making process

Voluntary disclosures through outside organizations include GHG reporting initiatives, coalitions and trade associations. Disclosing carbon information through these organizations will provide a platform for CDS to communicate its acknowledgement of climate change as a relevant business issue. It can also enable CDS become established as a good corporate citizen and align itself with industry peers to increase their voice in

influencing the future regulatory landscape. CDS has to decide whether the effort and resources required to actively participate in these initiatives has a positive payback for the company.

The CDS leadership views climate change issues as important to its future success because of the high cost of energy. It has implemented energy conservation programs at its facilities and is considering setting an internal GHG reduction goal to increase focus on energy savings.

After reviewing the voluntary initiatives that are available, CDS decides that the EPA Climate Leaders program would be best suited for its situation. Since the company is already considering a GHG reduction goal, this program is consistent with its business strategy. In addition, this program enters CDS into a partnership with EPA. This can pay off by increasing CDS' credibility.

CDS has watched the climate change debate from the sidelines until now. While the company recognizes this is an important issue to monitor, CDS does not have the resources or the desire to get directly involved in the lobbying aspects of climate change. For CDS, membership in the American Chemistry Council serves that purpose, while providing the added benefit of benchmarking and sharing of best practices among the membership.

The American Chemical Council (ACC) sponsors the Responsible Care program for member companies as a means for disclosing greenhouse gas information. As a group, Responsible Care companies agreed to reduce GHG emissions by 18% of 1990 levels by 2012. CDS has decided to wait until it has been involved in mandatory reporting for a

couple of before participating in this program. To the extent that the same information can be submitted to ACC as submitted to the federal government, the resource requirements would be minimal. However, if the accounting programs differ, significantly more expense would be associated with disclosure to this program.

Carbon information issued directly by the company provides the most flexibility with regard to disclosure timing and content. CDS has decided to use its website to acknowledge its corporate commitment to greenhouse gas reductions, including its corporate reduction goal. The company does not currently issue an annual sustainability report, but will likely do so once the company goes public. CDS must strike a balance in its voluntary reporting initiatives so that what is disclosed is relevant and accurate, while protecting competitive business information.

CDS has a highly concentrated customer base comprised mostly of other manufacturers. In that respect, typical marketing initiatives designed for consumer-oriented products are not needed. However, it is important for CDS customers to understand the GHG reduction initiatives and footprint of the company. CDS will want to rely on its sales and marketing professionals to help design a marketing program that complements its carbon disclosure strategy.

Many manufacturers are under requirements from stakeholders and other programs to reduce their emissions. In some instances, emissions both up and down the value chain are targeted, including suppliers. Wal-Mart, for example, has openly pledged to cut supply chain emissions by 20 million metric tons by 2015 (Environmental Leader 2010). Considering that CDS was just awarded a multi-year deal with Wal-Mart, it will

want to disclose information about its carbon footprint and reduction initiatives to Wal-Mart.

Now that CDS has utilized the CIDS framework to identify outlets for its carbon disclosure information, the company will need to establish a process for implementing its disclosure strategy and reviewing it periodically to ensure that it remains consistent with regulatory requirements and business objectives.

**Limitations**

The CIDS framework is designed to serve as a guide in determining desirable strategies for carbon disclosure. Some of the factors that should be considered when making the decision to disclose, especially with regard to the mandatory requirements, are more complex than can be comprehended in a process flow chart model such as the CIDS framework. It is therefore understood that the ultimate decision on disclosure should also rely on input from legal, financial and other expertise available to the company.

While the CIDS framework highlights the major categories of carbon disclosure and discusses major programs within each category, it is not intended to represent an exhaustive list of all carbon disclosure outlets that may be available to a particular business or industry. It is also important to recognize that the disclosure schemes addressed in the framework are limited to those in the U.S. International carbon disclosure programs are not considered.

In addition, the decision process is organized to begin with a theoretical "blank slate" and assumes that a company may be starting out without having disclosed any carbon information to date. In reality, many companies have engaged in various types of carbon disclosure for some time. Even so, the CIDS framework remains a resource for taking a holistic and systematic view of carbon information disclosure so as to improve upon existing strategies. Finally, this model does not address the particulars of carbon footprint accounting other than acknowledging the significance of using accounting tools that are consistent in their calculation methods.

**Conclusions**

The inevitability of a carbon constrained economy suggests that most businesses need to account for their carbon footprint and understand the implications in terms of legal, physical and business risk. Once accounted for, carbon footprints may be used as the foundation of a comprehensive carbon strategy to direct future decisions within a business related to minimizing risk and capitalizing on opportunities.

However, not every organization that calculates its carbon footprint and develops a carbon strategy needs to disclose this information publicly beyond what is mandatory. For certain companies, it may not be in their best interest to make all carbon information publicly available. Hesitancy to disclose can result from concerns about revealing information that could be perceived as putting the company at a competitive disadvantage, opening up the company for litigation or portraying the company in a bad

light. These same risks of disclosure can also be opportunities if a company has an effective carbon strategy.

Carbon information disclosure strategy is an integral part of a carbon market readiness plan. The CIDS framework is an internal management tool that can be used to plan and develop a disclosure strategy tailored to a company's business goals and carbon management objectives. This is a dynamic process and one that must be revisited as the regulatory landscape changes and as business conditions dictate. If utilized by a cross-functional group within the organization under top leadership support, the CIDS framework can be a valuable tool for establishing an effective a carbon information disclosure strategy.

# CHAPTER V

# RESEARCH CONTRIBUTIONS AND FUTURE DIRECTIONS

## Summary of Research Contributions

This dissertation has focused on the subject of carbon information disclosure from the perspective of the role it plays in an overall carbon strategy within a company. While prior research has focused on the benefits of creating a carbon strategy and incorporating it into a company's business approach, little attention has been devoted to holistic approaches to determine the preferred comprehensive carbon disclosure strategy from the firm perspective. The preponderance of carbon disclosure literature has focused on specific carbon disclosure schemes such as The Carbon Disclosure Project, SEC filings or sustainability reporting. In contrast, this research has taken a comprehensive approach to the subject of carbon disclosure from the viewpoint of the company and the disclosure mechanisms that are required and/or available to them through mandatory and voluntary channels.

From reviewing the current state-of-the-practice of carbon information disclosure, it was observed that carbon information disclosure has relevance to multiple disciplines within an organization, including finance, operations, marketing and senior management. Moreover, a company's business, carbon and environmental disclosure strategies overlap to form the foundation of its strategy for carbon information disclosure. Therefore, developing a successful carbon information disclosure strategy relies on input from

relevant stakeholders within the organization and consistency with overall business objectives.

From exploring different avenues of disclosure and associating those with sample companies and industry sectors, certain patterns of carbon disclosure strategy emerged. Notably, there are five main categories of carbon disclosure: regulatory, investment, collaborative, public-oriented, and consumer focused. The extent to which these avenues are utilized depends on characteristics of the company, industry and disclosure outlet. This also influences the type of carbon information that is presented and its corresponding level-of-detail.

The CIDS model was developed as an internal management tool to help develop a disclosure strategy tailored to a company's business goals and carbon management objectives. This decision-support framework offers the opportunity for a company to utilize a systematic approach in performing this function. Having such a tool available can help simplify what would otherwise by a resource intensive activity involving multiple disciplines within and outside of the organization. Moreover, a structured framework such as CIDS maintains a living process that can be adapted in the face of periodic review and updating that is necessary as business conditions change.

**Opportunities for Future Research**

Although this research has extended the state-of-the-art related to carbon information disclosure, it also provides opportunities for other work that either builds on

or is complementary to the dissertation. The following are suggestion for further research:

- Utilize the CIDS model to develop disclosure profiles for multiple industry classifications.
- Develop an empirical analysis tool based on the CIDS model to measure the effectiveness of particular carbon disclosure strategies in terms of key business indicators.
- Research aspects of internal carbon disclosure strategy (i.e., within the company) on the effectiveness and support of overall carbon strategy.
- Identify the barriers inhibiting privately held companies from disclosing carbon information to a relevant degree.
- Expand the decision making tool to include international carbon disclosure schemes.
- Explore opportunities to use this decision making framework in other environmental media such as water footprint disclosure.

## Appendix A

**CDP 2008 – Carbon Intensive and Non-Carbon Intensive Sectors**

**https://www.cdproject.net/CDPResults/67_329_142_CDP%20SP500%20Report%202008.pdf pp.68-89**

| **CARBON INTENSIVE** | Global Industry Classification Standard (GICS) – Industry Group/Industry | GICS Sector |
|---|---|---|
| Utilities | Industry Group – 5510 (Utilities) | 55 - Utilities |
| Raw Materials, Mining and Packaging | Industry Group – 1510 (Materials) | 15 - Materials |
| Chemicals & Pharmaceuticals | Industry – 151010 (Chemicals)<br>Industry – 352020 (Pharmaceuticals) | 15 – Materials<br>35 - Healthcare |
| Construction and Building Products | Industry – 201020 (Building Products)<br>Industry – 201030 (Construction) | 20 – Industrials |
| Manufacturing | Industry Group – 2010 (Capital Goods) | 20 – Industrials |
| Oil & Gas | Industry Group – 1010 (Energy | 10 - Energy |
| Transport & Logistics | Industry Group – 2030 (Transportation)<br>Industry – 203010 (Logistics) | 20 - Industrials |
| **NON-CARBON INTENSIVE** | | |
| Financial Services | Industry Group – 4010 (Banks); 4020 (Diversified Financials) | 40 - Financials |
| Hospitality, Leisure, and Business Services | Industry Group – 2530 (Consumer Services)<br>Industry – 253010 (Hotels, Restaurants & Leisure) | 25 – Consumer Discretionary |
| Retail and Consumer | Industry Group – 2550 (Retail); 3010 (Food & Staples Retailing) | 25 – Consumer Discretionary<br>30 – Consumer Staples |
| Technology, Media and Telecommunications | Industry Group – 2540 (Media); 4510 (Software); 4520 (Technology equipment) ; 5010 (Telecommunications Services) | 25 – Consumer Discretionary<br>45 – Information Technology<br>50- Telecommunication |

## Appendix B
## Cross Reference of Sectors Across Sample Sources

| | **CDLI** https://www.cdproject.net/en-US/Results/Pages/leadership-index.aspx *S&P uses Global Industry Classification Standard (GICS)* | **DJSI** www.sustainability-indexes.com/07_htmle/indexes/djsistoxx_methodology.html *DJSI uses Industry Classification Benchmark (ICB) – Industry used* | **Newsweek** http://greenrankings.newsweek.com *ICB Super Sectors used* |
|---|---|---|---|
| | **Carbon Intensive** | | |
| C | Materials (15) | Basic Materials (1000) | Basic Materials (1000) |
| C | Health Care (35) | Health Care (4000) | Health Care (4000)<br>Pharmaceuticals (4570) |
| C | Industrials (20) | Industrials (2000) | General Industrials (2720)<br>Industrial Goods (2700)<br>Transport and Aerospace(2710) |
| C | Energy (10) | Oil & Gas (0001) | Oil & Gas (0500) |
| C | Utilities (55) | Utilities (7000) | Utilities (7500) |
| | **Non-Carbon Intensive** | | |
| NC | Consumer Staples (30) | Consumer Goods (3000) | Food and Beverage (3500)<br>Consumer Products/cars (3300) |
| NC | Consumer Discretionary (25) | Consumer Services (5000) | Media, Travel and Leisure (5500)<br>Retail (5300) |
| NC | Financials (40) | Financials (8000) | Banks and Insurance (8300 and 8500)<br>Financial Services (8700) |
| NC | | Telecommunications (6000) | |
| NC | Information Technology (45) | Technology (9000) | Technology (9500) |

**Non-carbon-intensive sectors in CDP 2008**: Financial Services; Hospitality, Leisure and Business Services; Retail & Consumer; and Technology, Media and Telecommunications.

**Equivalent non-carbon-intensive sectors in CDP 2009:** Consumer Discretionary, Consumer Staples, Financials, Information Technology, and Telecommunications

# Appendix C

## Carbon Disclosure Leadership Index - 2009

### https://www.cdproject.net/en-US/Results/Pages/leadership-index.aspx#s&p500

USA: S&P 500 (2009)
Geographic market index for the 500 largest US companies (measured by market capitalization)

| Sector | Company | Disclosure Rating |
|---|---|---|
| Consumer Discretionary | Carnival | 87 |
| | News Corporation | 75 |
| | Stanley Works | 75 |
| | Limited Brands | 74 |
| Consumer Staples | Wal-Mart Stores | 89 |
| | Dean Foods | 87 |
| | Colgate-Palmolive | 77 |
| | H.J. Heinz | 75 |
| Energy | Chevron | 88 |
| | Spectra Energy | 88 |
| | Hess | 86 |
| | Anadarko Petroleum | 79 |
| | Transocean | 79 |
| Financials | Comerica | 91 |
| | Simon Property Group | 86 |
| | Hartford Financial Services | 81 |
| | Allstate | 79 |
| | Bank of New York Mellon | 78 |
| | Franklin Resources | 77 |
| | JPMorgan Chase | 74 |
| Health Care | Allergan | 85 |
| | Schering-Plough | 85 |
| | Biogen Idec | 83 |
| | Johnson & Johnson | 83 |
| | Pfizer | 75 |
| Industrials | Boeing | 87 |
| | Burlington Northern Santa Fe | 85 |
| | Eaton | 85 |
| | United Parcel Service | 82 |
| Information Technology | Cisco Systems | 88 |
| | Hewlett-Packard | 86 |
| | Advanced Micro Devices | 82 |
| | EMC | 82 |
| | Intel | 78 |
| | Autodesk | 77 |
| | IBM | 77 |

| | | |
|---|---|---|
| | LSI | 76 |
| Materials | Praxair | 83 |
| | PPG Industries | 81 |
| | E.I du Pont de Nemours | 80 |
| | Air Products & Chemicals | 74 |
| Utilities | PG&E | 88 |
| | Public Service Enterprise Group | 88 |
| | Pepco | 87 |
| | Xcel Energy | 85 |
| | DTE Energy | 84 |
| | FPL Group | 82 |
| | Consolidated Edison | 79 |
| | Entergy | 78 |

## APPENDIX D

**Dow Jones Sustainability Index (as of 12/31/2009)**

**http://www.sustainability-indexes.com/djsi_protected/djsi_na/SAM_DJSIUS_Components.pdf**

| **Carbon Intensive** | |
|---|---|
| **Basic Materials** | **Alcoa, Inc** |
| | **Dow Chemical Co.** |
| | **E.I. DuPont de Nemours & Co.** |
| | **Newmont Mining Corp.** |
| | **Praxair Inc.** |
| | |
| **Health Care** | **Abbott Laboratories** |
| | **Allergan Inc.** |
| | **Baxter International, Inc** |
| | **Becton Dickinson & Co.** |
| | **Bristol-Meyers Squibb Co** |
| | **Genzyme Corp.** |
| | **Humana Inc.** |
| | **Johnson & Johnson** |
| | **Life Technologies Corp** |
| | **Medronic Inc** |
| | **Merck & Co Inc** |
| | **Millipore Corp** |
| | **Quest Diagnostics Inc** |
| | **UnitedHealthcare Group** |
| | |
| **Industrials** | **3M Co** |
| | **Accenture Ltd.** |
| | **Agilent Technologies Inc** |
| | **Boeing Co.** |
| | **Caterpillar Inc.** |
| | **Cummins Inc** |
| | **FedEx Corp** |
| | **General Electric Co.** |
| | **IMS Health Inc** |
| | **Manpower Inc** |
| | **MeadWestvaco Corp** |
| | **R.R. Donnelley & Sons Inc** |
| | **Rockwell Collins Inc** |

| | |
|---|---|
| | **United Parcel Service Inc** |
| | **United Technologies Corp.** |
| | |
| **Oil & Gas** | **Chevron Corp.** |
| | **Conoco Phillips** |
| | **El Paso Corp** |
| | **FMC Technologies** |
| | **Hess Corp** |
| | **Noble Corp** |
| | **Occidental Petroleum Corp** |
| | **Schlumberger Ltd.** |
| | **Smith International Inc.** |
| | |
| **Utilities** | **Consolidated Edison, Inc** |
| | **Duke Energy Corp** |
| | **Entergy Corp** |
| | **Exelon Corp** |
| | **FPL Group Inc** |
| | **PG&E Corp** |
| | **Pinnacle West Capital Corp** |
| | **Progress Energy Inc** |
| | **Public Service Enterprise Group Inc** |
| | **Spectra Energy Corp** |
| | |
| **Non-Carbon Intensive** | |
| **Consumer Goods** | **Campbell Soup Co.** |
| | **Coca-Cola Co.** |
| | **Eastman Kodak Co.** |
| | **Ford Motor Co.** |
| | **General Mills Inc** |
| | **H.J. Heinz Co** |
| | **Johnson Controls Inc** |
| | **Kimberly-Clark Corp** |
| | **Kraft Foods Inc. CI A** |
| | **Nike Inc** |
| | **PepsiCo Inc** |
| | **Proctor & Gamble Co** |
| | **Reynolds American Inc** |
| | **Whirlpool Corp** |
| | |

| | |
|---|---|
| **Consumer Services** | **AmerisourceBergen Corp** |
| | **Cardinal Health Inc** |
| | **DeVry Inc** |
| | **Dun & Bradstreet Corp** |
| | **Gap Inc** |
| | **H&R Block Inc** |
| | **J.C. Penny Co Inc** |
| | **Kohl's Corp** |
| | **Limited Brands Inc** |
| | **Macy's Inc** |
| | **McDonald's Corp** |
| | **McKesson Corp** |
| | **Office Depot Inc** |
| | **Safeway Inc** |
| | **Staples Inc** |
| | **Starbucks Corp** |
| | **Target Corp** |
| | **Time Warner Inc** |
| | **Walgreen Co** |
| | **Walt Disney Co.** |
| | **Whole Foods Market Inc.** |
| | |
| **Financials** | **Allstate Corp** |
| | **Bank of New York Mellon Corp** |
| | **Chubb Corp** |
| | **Citigroup Inc** |
| | **Goldman Sachs Group Inc** |
| | **JPMorgan Chase & Co** |
| | **MasterCard Inc. CI A** |
| | **Morgan Stanley** |
| | **NYSE Euronext** |
| | **Plum Creek Timber Co. Inc. REIT** |
| | **ProLogis** |
| | **State Street Corp** |
| | **Travelers Cos. Inc** |
| | **Unum Group** |
| | |
| **Telecommunications** | **Verizon Communications Inc** |
| | |
| **Technology** | **Advanced Micro Devices Inc** |

| | |
|---|---|
| | **AOL Inc** |
| | **Applied Materials Inc.** |
| | **Autodesk Inc** |
| | **Cisco Systems Inc** |
| | **Dell Inc** |
| | **Hewlett-Packard Co.** |
| | **Intel Corp** |
| | **International Business Machines Corp** |
| | **Microsoft Corp** |
| | **Motorola Inc** |
| | **Symantec Corp** |

**APPENDIX E**

**Newsweek Green Rankings 2009**

**http://greenrankings-origin.newsweek.com/**

| Industry Sector | Company | Newsweek Ranking Profile |
|---|---|---|
| Carbon Intensive | | |
| Basic Materials | Praxair | http://greenrankings.newsweek.com/companies/view/praxair |
| | Eastman Chemical | http://greenrankings.newsweek.com/companies/view/eastman-chemical |
| | Celanese | http://greenrankings.newsweek.com/companies/view/celanese |
| | Alcoa | http://greenrankings.newsweek.com/companies/view/alcoa |
| | Dow Chemical | http://greenrankings.newsweek.com/companies/view/dow-chemical |
| | Southern Copper | http://greenrankings.newsweek.com/companies/view/southern-copper |
| | DuPont | http://greenrankings.newsweek.com/companies/view/dupont |
| | Lubrizol | http://greenrankings.newsweek.com/companies/view/lubrizol |
| | Ecolab | http://greenrankings.newsweek.com/companies/view/ecolab |
| | Commercial Metals | http://greenrankings.newsweek.com/companies/view/commercial-metals |
| | | |
| Health Care | Baxter International | http://greenrankings.newsweek.com/companies/view/baxter-international |
| | Medtronic | http://greenrankings.newsweek.com/companies/view/medtronic |
| | Becton Dickinson | http://greenrankings.newsweek.com/companies/view/becton-dickinson |
| | Medco Health Solutions | http://greenrankings.newsweek.com/companies/view/medco-health-solutions |
| | United Health Group | http://greenrankings.newsweek.com/companies/view/unitedhealth-group |
| | Boston Scientific Corp | http://greenrankings.newsweek.com/companies/view/boston-scientific-corporation |
| | Quest Diagnostics | http://greenrankings.newsweek.com/companies/view/quest-diagnostics |
| | Zimmer Holdings | http://greenrankings.newsweek.com/companies/ |

| | | |
|---|---|---|
| | | **view/zimmer-holdings** |
| | **Varian Medical Systems** | **http://greenrankings.newsweek.com/companies/view/varian-medical-systems** |
| | **Cigna** | **http://greenrankings.newsweek.com/companies/view/cigna** |
| **Pharmaceuticals** | **Johnson & Johnson** | **http://greenrankings.newsweek.com/companies/view/johnson-johnson** |
| | **Bristol-Myers Squibb** | **http://greenrankings.newsweek.com/companies/view/bristol-myers-squibb** |
| | **Allergan** | **http://greenrankings.newsweek.com/companies/view/allergan** |
| | **Pfizer** | **http://greenrankings.newsweek.com/companies/view/pfizer** |
| | **Hospira** | **http://greenrankings.newsweek.com/companies/view/hospira** |
| | **Abbott Laboratories** | **http://greenrankings.newsweek.com/companies/view/abbott-laboratories** |
| | **Wyeth** | **http://greenrankings.newsweek.com/companies/view/wyeth** |
| | **Life Technologies** | **http://greenrankings.newsweek.com/companies/view/life-technologies** |
| | **Eli Lilly** | **http://greenrankings.newsweek.com/companies/view/eli-lilly** |
| | **Genzyme** | **http://greenrankings.newsweek.com/companies/view/genzyme** |
| | | |
| **General Industrials** | **ITT** | **http://greenrankings.newsweek.com/companies/view/itt** |
| | **3M** | **http://greenrankings.newsweek.com/companies/view/3m** |
| | **Eaton** | **http://greenrankings.newsweek.com/companies/view/eaton** |
| | **Owens-Corning** | **http://greenrankings.newsweek.com/companies/view/owens-corning** |
| | **General Electric** | **http://greenrankings.newsweek.com/companies/view/general-electric** |
| | **Sunoco** | **http://greenrankings.newsweek.com/companies/view/sonoco** |
| | **Masco** | **http://greenrankings.newsweek.com/companies/view/masco** |
| | **Ball** | **http://greenrankings.newsweek.com/companies/view/ball** |
| | **Weyerhauser** | **http://greenrankings.newsweek.com/companies/view/weyerhaeuser** |

| | | |
|---|---|---|
| | **Jacobs Engineering** | **http://greenrankings.newsweek.com/companies/view/jacobs-engineering** |
| **Industrial Goods** | **Agilent Technologies** | **http://greenrankings.newsweek.com/companies/view/agilent-technologies** |
| | **Pall** | **http://greenrankings.newsweek.com/companies/view/pall** |
| | **First Solar** | **http://greenrankings.newsweek.com/companies/view/first-solar** |
| | **AECOM Technology** | **http://greenrankings.newsweek.com/companies/view/aecom-technology** |
| | **Caterpillar** | **http://greenrankings.newsweek.com/companies/view/caterpillar** |
| | **Accenture** | **http://greenrankings.newsweek.com/companies/view/accenture** |
| | **Cummins** | **http://greenrankings.newsweek.com/companies/view/cummins** |
| | **Nalco Holding** | **http://greenrankings.newsweek.com/companies/view/nalco-holding** |
| | **Cooper Industries** | **http://greenrankings.newsweek.com/companies/view/cooper-industries** |
| | **Waste Management** | **http://greenrankings.newsweek.com/companies/view/waste-management** |
| **Transport and Aerospace** | **United Technologies** | **http://greenrankings.newsweek.com/companies/view/united-technologies** |
| | **United Parcel Service** | **http://greenrankings.newsweek.com/companies/view/united-parcel-service** |
| | **FedEx** | **http://greenrankings.newsweek.com/companies/view/fedex** |
| | **Rockwell Collins** | **http://greenrankings.newsweek.com/companies/view/rockwell-collins** |
| | **Lockheed Martin** | **http://greenrankings.newsweek.com/companies/view/lockheed-martin** |
| | **Burlington Northern Santa Fe** | **http://greenrankings.newsweek.com/companies/view/burlington-northern-santa-fe** |
| | **CSX** | **http://greenrankings.newsweek.com/companies/view/csx** |
| | **Raytheon** | **http://greenrankings.newsweek.com/companies/view/raytheon** |
| | **Boeing** | **http://greenrankings.newsweek.com/companies/view/boeing** |
| | **Northrop Grumman** | **http://greenrankings.newsweek.com/companies/view/northrop-grumman** |
| | | |
| **Oil and Gas** | **Marathon Oil** | **http://greenrankings.newsweek.com/companies/** |

| | | |
|---|---|---|
| | | **view/marathon-oil** |
| | **Smith International** | **http://greenrankings.newsweek.com/companies/view/smith-international** |
| | **Schlumberger** | **http://greenrankings.newsweek.com/companies/view/schlumberger** |
| | **Baker Hughes** | **http://greenrankings.newsweek.com/companies/view/baker-hughes** |
| | **Devon Energy** | **http://greenrankings.newsweek.com/companies/view/devon-energy** |
| | **Halliburton** | **http://greenrankings.newsweek.com/companies/view/halliburton** |
| | **Williams** | **http://greenrankings.newsweek.com/companies/view/williams** |
| | **EOG Resources** | **http://greenrankings.newsweek.com/companies/view/eog-resources** |
| | **El Paso** | **http://greenrankings.newsweek.com/companies/view/el-paso** |
| | **Conoco Phillips** | **http://greenrankings.newsweek.com/companies/view/conocophillips** |
| | | |
| **Utilities** | **PG&E** | **http://greenrankings.newsweek.com/companies/view/pge** |
| | **Pepco Holdings** | **http://greenrankings.newsweek.com/companies/view/pepco-holdings** |
| | **Northeast Utilities** | **http://greenrankings.newsweek.com/companies/view/northeast-utilities** |
| | **NiSource** | **http://greenrankings.newsweek.com/companies/view/nisource** |
| | **Consolidated Edison** | **http://greenrankings.newsweek.com/companies/view/consolidated-edison** |
| | **Centerpoint Energy** | **http://greenrankings.newsweek.com/companies/view/centerpoint-energy** |
| | **Sempra Energy** | **http://greenrankings.newsweek.com/companies/view/sempra-energy** |
| | **Spectra Energy** | **http://greenrankings.newsweek.com/companies/view/spectra-energy** |
| | **Oneok** | **http://greenrankings.newsweek.com/companies/view/oneok** |
| | **Exelon** | **http://greenrankings.newsweek.com/companies/view/exelon** |
| | | |
| **Non-Carbon Intensive** | | |
| **Food and** | **Coca Cola** | **http://greenrankings.newsweek.com/companies/** |

| | | |
|---|---|---|
| **Beverage** | **Enterprises** | **view/coca-cola-enterprises** |
| | **Coca Cola** | **http://greenrankings.newsweek.com/companies/view/coca-cola** |
| | **Brown Forman** | **http://greenrankings.newsweek.com/companies/view/brown-forman** |
| | **Molson Coors Brewing** | **http://greenrankings.newsweek.com/companies/view/molson-coors-brewing** |
| | **HJ Heinz** | **http://greenrankings.newsweek.com/companies/view/hj-heinz** |
| | **General Mills** | **http://greenrankings.newsweek.com/companies/view/general-mills** |
| | **Kellogg** | **http://greenrankings.newsweek.com/companies/view/kellogg** |
| | **PepsiCo** | **http://greenrankings.newsweek.com/companies/view/pepsico** |
| | **Campbell Soup** | **http://greenrankings.newsweek.com/companies/view/campbell-soup** |
| | **Sara Lee** | **http://greenrankings.newsweek.com/companies/view/sara-lee** |
| **Consumer Products/cars** | **Nike** | **http://greenrankings.newsweek.com/companies/view/nike** |
| | **Johnson Controls** | **http://greenrankings.newsweek.com/companies/view/johnson-controls** |
| | **Avon Products** | **http://greenrankings.newsweek.com/companies/view/avon-products** |
| | **Procter & Gamble** | **http://greenrankings.newsweek.com/companies/view/procter-gamble** |
| | **Estee Lauder** | **http://greenrankings.newsweek.com/companies/view/estee-lauder** |
| | **Colgate Palmolive** | **http://greenrankings.newsweek.com/companies/view/colgate-palmolive** |
| | **Clorox** | **http://greenrankings.newsweek.com/companies/view/clorox** |
| | **Whirlpool** | **http://greenrankings.newsweek.com/companies/view/whirlpool** |
| | **Ford Motor Co.** | **http://greenrankings.newsweek.com/companies/view/ford-motor** |
| | **Kimberly Clark** | **http://greenrankings.newsweek.com/companies/view/kimberly-clark** |
| | | |
| **Media, Travel and Leisure** | **Starbucks** | **http://greenrankings.newsweek.com/companies/view/starbucks** |
| | **McDonald's** | **http://greenrankings.newsweek.com/companies/view/mcdonald-s** |

| | | |
|---|---|---|
| | **Walt Disney** | **http://greenrankings.newsweek.com/companies/view/walt-disney** |
| | **Marriott International** | **http://greenrankings.newsweek.com/companies/view/marriott-international** |
| | **Starwood Hotels & Resorts** | **http://greenrankings.newsweek.com/companies/view/starwood-hotels-resort** |
| | **McGraw Hill** | **http://greenrankings.newsweek.com/companies/view/mcgraw-hill** |
| | **Wyndham Worldwide** | **http://greenrankings.newsweek.com/companies/view/wyndham-worldwide** |
| | **Time Warner** | **http://greenrankings.newsweek.com/companies/view/time-warner** |
| | **Las Vegas Sands** | **http://greenrankings.newsweek.com/companies/view/las-vegas-sands** |
| | **Darden Restaurants** | **http://greenrankings.newsweek.com/companies/view/darden-restaurants** |
| **Retail** | **Kohl's** | **http://greenrankings.newsweek.com/companies/view/kohl-s** |
| | **Staples** | **http://greenrankings.newsweek.com/companies/view/staples** |
| | **Gap** | **http://greenrankings.newsweek.com/companies/view/gap** |
| | **JC Penny** | **http://greenrankings.newsweek.com/companies/view/jc-penney** |
| | **Macy's** | **http://greenrankings.newsweek.com/companies/view/macy-s** |
| | **Wal-Mart** | **http://greenrankings.newsweek.com/companies/view/wal-mart** |
| | **Best Buy** | **http://greenrankings.newsweek.com/companies/view/best-buy** |
| | **Whole Foods Market** | **http://greenrankings.newsweek.com/companies/view/whole-foods-market** |
| | **Limited Brands** | **http://greenrankings.newsweek.com/companies/view/limited-brands** |
| | **Target** | **http://greenrankings.newsweek.com/companies/view/target** |
| | | |
| **Banks and Insurance** | **Wells Fargo** | **http://greenrankings.newsweek.com/companies/view/wells-fargo** |
| | **Citibank** | **http://greenrankings.newsweek.com/companies/view/citigroup** |
| | **Travelers** | **http://greenrankings.newsweek.com/companies/view/travelers** |
| | **JPMorgan Chase** | **http://greenrankings.newsweek.com/companies/view/jpmorgan-chase** |

| | | |
|---|---|---|
| | **Unum Group** | **http://greenrankings.newsweek.com/companies/view/unum-group** |
| | **Northern Trust** | **http://greenrankings.newsweek.com/companies/view/northern-trust** |
| | **Allstate** | **http://greenrankings.newsweek.com/companies/view/allstate** |
| | **US Bancorp** | **http://greenrankings.newsweek.com/companies/view/us-bancorp** |
| | **Ace** | **http://greenrankings.newsweek.com/companies/view/ace** |
| | **PNC Group** | **http://greenrankings.newsweek.com/companies/view/pnc-group** |
| **Financial Services** | **State Street** | **http://greenrankings.newsweek.com/companies/view/state-street** |
| | **American Express** | **http://greenrankings.newsweek.com/companies/view/american-express** |
| | **CB Richard Ellis Group** | **http://greenrankings.newsweek.com/companies/view/cb-richard-ellis-group** |
| | **Franklin Resources** | **http://greenrankings.newsweek.com/companies/view/franklin-resources** |
| | **BNY Mellon** | **http://greenrankings.newsweek.com/companies/view/mellon** |
| | **Capitol One Financial** | **http://greenrankings.newsweek.com/companies/view/capital-one-financial** |
| | **Morgan Stanley** | **http://greenrankings.newsweek.com/companies/view/morgan-stanley** |
| | **Goldman Sachs Group** | **http://greenrankings.newsweek.com/companies/view/goldman-sachs-group** |
| | **Charles Schwab** | **http://greenrankings.newsweek.com/companies/view/charles-schwab** |
| | **Invesco** | **http://greenrankings.newsweek.com/companies/view/invesco** |
| | | |
| **Technology** | **Hewlett-Packard** | **http://greenrankings.newsweek.com/companies/view/hewlett-packard** |
| | **Dell** | **http://greenrankings.newsweek.com/companies/view/dell** |
| | **Intel** | **http://greenrankings.newsweek.com/companies/view/intel** |
| | **IBM** | **http://greenrankings.newsweek.com/companies/view/ibm** |
| | **Applied Materials** | **http://greenrankings.newsweek.com/companies/view/applied-materials** |
| | **Cisco Systems** | **http://greenrankings.newsweek.com/companies/view/cisco-systems** |

| | | |
|---|---|---|
| | **Sun Microsystems** | **http://greenrankings.newsweek.com/companies/view/sun-microsystems** |
| | **Sprint Nextel** | **http://greenrankings.newsweek.com/companies/view/sprint-nextel** |
| | **Adobe Systems** | **http://greenrankings.newsweek.com/companies/view/adobe-systems** |
| | **Advanced Micro Devices** | **http://greenrankings.newsweek.com/companies/view/advanced-micro-devices** |

**APPENDIX F**

**CDLI, DJSI and Newsweek Rankings**

**Represents company chosen for benchmarking study**

| | CDLI 2009 | DJSI (12/21/09) | Newsweek |
|---|---|---|---|
| Materials | Air Products & Chemicals | Alcoa, Inc | Alcoa |
| | E.I du Pont de Nemours | Dow Chemical Co. | Celanese |
| | PPG Industries | E.I. DuPont de Nemours & Co. | Commercial Metals |
| | Praxair | Newmont Mining Corp. | Dow Chemical |
| | | Praxair Inc. | E.I. DuPont de Nemours & Co. |
| | | | Eastman Chemical |
| | | | Ecolab |
| | | | Lubrizol |
| | | | Praxair |
| | | | Southern Copper |
| | | | |
| Health Care | Allergan | Abbott Laboratories | Abbott Laboratories |
| | Biogen Idec | Allergan Inc. | Allergan |
| | Johnson & Johnson | Baxter International, Inc | Baxter International |
| | Pfizer | Becton Dickinson & Co. | Becton Dickinson |
| | Schering-Plough | Bristol-Meyers Squibb Co | Boston Scientific Corp |
| | | Genzyme Corp. | Bristol-Myers Squibb |

| | | | |
|---|---|---|---|
| | | Humana Inc. | Cigna |
| | | Johnson & Johnson | Eli Lilly |
| | | Life Technologies Corp | Genzyme |
| | | Medronic Inc | Hospira |
| | | Merck & Co Inc | Johnson & Johnson |
| | | Millipore Corp | Life Technologies |
| | | Quest Diagnostics Inc | Medco Health Solutions |
| | | UnitedHealthcare Group | Medtronic |
| | | | Pfizer |
| | | | Quest Diagnostics |
| | | | United Health Group |
| | | | Varian Medical Systems |
| | | | Wyeth |
| | | | Zimmer Holdings |
| | | | |
| Industrials | Boeing | 3M Co | 3M |
| | Burlington Northern Santa Fe | Accenture Ltd. | Accenture |
| | Eaton | Agilent Technologies Inc | AECOM Technology |
| | United Parcel Service | Boeing Co. | Agilent Technologies |
| | | Caterpillar Inc. | Ball |
| | | Cummins Inc | Boeing |
| | | FedEx Corp | Burlington Northern Santa Fe |
| | | General Electric Co. | Caterpillar |

| | | | |
|---|---|---|---|
| | | IMS Health Inc | Cooper Industries |
| | | Manpower Inc | CSX |
| | | MeadWestvaco Corp | Cummins |
| | | R.R. Donnelley & Sons Inc | Eaton |
| | | Rockwell Collins Inc | FedEx |
| | | United Parcel Service Inc | First Solar |
| | | United Technologies Corp. | General Electric |
| | | | ITT |
| | | | Jacobs Engineering |
| | | | Lockheed Martin |
| | | | Masco |
| | | | Nalco Holding |
| | | | Northrop Grumman |
| | | | Owens-Corning |
| | | | Pall |
| | | | Raytheon |
| | | | Rockwell Collins |
| | | | Sunoco |
| | | | United Parcel Service |
| | | | United Technologies |
| | | | Waste Management |
| | | | Weyerhauser |
| | | | |
| Oil & Gas/Energy | Anadarko Petroleum | Chevron Corp. | Baker Hughes |

| | | | |
|---|---|---|---|
| | Chevron | Conoco Phillips | Conoco Phillips |
| | Hess | El Paso Corp | Devon Energy |
| | Spectra Energy | FMC Technologies | El Paso |
| | Transocean | Hess Corp | EOG Resources |
| | | Noble Corp | Halliburton |
| | | Occidental Petroleum Corp | Marathon Oil |
| | | Schlumberger Ltd. | Schlumberger |
| | | Smith International Inc. | Smith International |
| | | | Williams |
| | | | |
| Utilities | PG&E | Consolidated Edison, Inc | PG&E |
| | Consolidated Edison | Duke Energy Corp | Centerpoint Energy |
| | DTE Energy | Entergy Corp | Consolidated Edison |
| | Entergy | Exelon Corp | Exelon |
| | FPL Group | FPL Group Inc | NiSource |
| | Pepco | PG&E Corp | Northeast Utilities |
| | Public Service Enterprise Group | Pinnacle West Capital Corp | Oneok |
| | Xcel Energy | Progress Energy Inc | Pepco Holdings |
| | | Public Service Enterprise Group Inc | Sempra Energy |
| | | Spectra Energy Corp | Spectra Energy |
| | | | |
| | | | |
| | | | |
| Consumer Goods | Colgate-Palmolive | Campbell Soup Co. | Avon Products |
| | Dean Foods | Coca-Cola Co. | Brown Forman |

| | | | |
|---|---|---|---|
| | H.J. Heinz | Eastman Kodak Co. | Campbell Soup |
| | Wal-Mart Stores | Ford Motor Co. | Clorox |
| | | General Mills Inc | Coca Cola |
| | | H.J. Heinz Co | Coca Cola Enterprises |
| | | Johnson Controls Inc | Colgate Palmolive |
| | | Kimberly-Clark Corp | Estee Lauder |
| | | Kraft Foods Inc. CI A | Ford Motor Co. |
| | | Nike Inc | General Mills |
| | | PepsiCo Inc | HJ Heinz |
| | | Proctor & Gamble Co | Johnson Controls |
| | | Reynolds American Inc | Kellogg |
| | | Whirlpool Corp | Kimberly Clark |
| | | | Molson Coors Brewing |
| | | | Nike |
| | | | PepsiCo |
| | | | Procter & Gamble |
| | | | Sara Lee |
| | | | Whirlpool |
| | | | |
| Consumer Services | Carnival | AmerisourceBergen Corp | Best Buy |
| | Limited Brands | Cardinal Health Inc | Darden Restaurants |
| | News Corporation | DeVry Inc | Gap |
| | Stanley Works | Dun & Bradstreet Corp | JC Penny |
| | | Gap Inc | Kohl's |
| | | H&R Block Inc | Las Vegas Sands |

| | | | |
|---|---|---|---|
| | | J.C. Penny Co Inc | Limited Brands |
| | | Kohl's Corp | Macy's |
| | | Limited Brands Inc | Marriott International |
| | | Macy's Inc | McDonald's |
| | | McDonald's Corp | McGraw Hill |
| | | McKesson Corp | Staples |
| | | Office Depot Inc | Starbucks |
| | | Safeway Inc | Starwood Hotels & Resorts |
| | | Staples Inc | Target |
| | | Starbucks Corp | Time Warner |
| | | Target Corp | Wal-Mart |
| | | Time Warner Inc | Walt Disney |
| | | Walgreen Co | Whole Foods Market |
| | | Walt Disney Co. | Wyndham Worldwide |
| | | Whole Foods Market Inc. | |
| | | | |
| Financials | Allstate | Allstate Corp | Ace |
| | Bank of New York Mellon | Bank of New York Mellon Corp | Allstate |
| | Comerica | Chubb Corp | American Express |
| | Franklin Resources | Citigroup Inc | BNY Mellon |
| | Hartford Financial Services | Goldman Sachs Group Inc | Capitol One Financial |
| | JPMorgan Chase | JPMorgan Chase & Co | CB Richard Ellis Group |
| | Simon Property | MasterCard Inc. CI A | Charles Schwab |

| | | | |
|---|---|---|---|
| | Group | | |
| | | Morgan Stanley | Citibank |
| | | NYSE Euronext | Franklin Resources |
| | | Plum Creek Timber Co. Inc. REIT | Goldman Sachs Group |
| | | ProLogis | Invesco |
| | | State Street Corp | JPMorgan Chase |
| | | Travelers Cos. Inc | Morgan Stanley |
| | | Unum Group | Northern Trust |
| | | | PNC Group |
| | | | State Street |
| | | | Travelers |
| | | | Unum Group |
| | | | US Bancorp |
| | | | Wells Fargo |
| | | | |
| Technology | Advanced Micro Devices | Advanced Micro Devices Inc | Adobe Systems |
| | Autodesk | AOL Inc | Advanced Micro Devices |
| | Cisco Systems | Applied Materials Inc. | Applied Materials |
| | EMC | Autodesk Inc | Cisco Systems |
| | Hewlett-Packard | Cisco Systems Inc | Dell |
| | IBM | Dell Inc | Hewlett-Packard |
| | Intel | Hewlett-Packard Co. | IBM |
| | LSI | Intel Corp | Intel |
| | | IBM | Sprint Nextel |
| | | Microsoft Corp | Sun Microsystems |

| | | | |
|---|---|---|---|
| | | **Motorola Inc** | |
| | | **Symantec Corp** | |

## Appendix G

## Privately Held Firms by Sector

http://www.forbes.com/lists/2009/21/private-companies-09_Americas-Largest-Private-Companies_Rank.html

| | | |
|---|---|---|
| **Carbon Intensive** | | |
| | | |
| **Basic Materials** | **Koch Industries** | **www.kochind.com** |
| | **Hexion Specialty Chemicals** | **www.hexion.com** |
| | **Renco Group** | **www.rencogroup.net** |
| | | |
| **Health Care** | **Bausch & Lomb** | **www.bausch.com** |
| | **Medline Industries** | **www.medline.com** |
| | | |
| **Industrials** | **Sequa** | **www.sequa.com** |
| | **Amsted Industries** | **www.amsted.com** |
| | | |
| **Oil & Gas/Energy** | **Sinclair Oil** | **www.sinclairoil.com** |
| | **Ergon** | **www.ergon.com** |
| | | |
| **Utilities** | **Tenaska Energy** | **www.tenaska.com** |
| | **Energy Future Holdings** | **www.energyfutureholdings.com** |
| | | |
| **Non Carbon Intensive** | | |
| | | |
| **Consumer Goods** | **Dollar General** | **www.dollargeneral.com** |

| | | |
|---|---|---|
| | **US Foodservice** | **www.usfoodservice.com** |
| | | |
| **Consumer Services** | **Ingram Industries** | |
| | **Belk** | **www.belk.com** |
| | | |
| **Financials** | **Edward Jones** | **www.edwardjones.com** |
| | **Fidelity Investments** | **www.fidelity.com** |
| | | |
| **Technology** | **CDW** | **www.cdw.com** |
| | **Avaya** | **www.avaya.com** |

## APPENDIX H

## CDLI Non-Responders (2009 Questionnaire)

| Carbon Intensive | CDLI-2009 NON-Responders | DJSI | Greenrankings |
|---|---|---|---|
| Basic Materials | AK Steel Holding | no | no |
| | CF Industries Holdings | no | no |
| 5 | Nucor | no | no |
| | Pactiv | no | no |
| | Titanium Metals | no | no |
| Healthcare | AmerisourceBergen | no | no |
| | Barr Pharmaceuticals | no | no |
| 18 | Cephalon | no | no |
| | Coventry HealthCare | no | no |
| | Covidien | no | no |
| | DaVita | no | no |
| | DENTSPLY International | no | no |
| | Express Scripts | no | no |
| | IMS Health | no | no |
| | Intuitive Surgical | no | no |
| | King Pharmaceuticals | no | no |
| | Laboratory Corp of America | no | no |
| | Mylan | no | no |
| | Patterson Companies | no | no |
| | St. Jude Medical | no | no |
| | Tenet Healthcare | no | no |
| | Varian Medical Systems | no | no |
| | Watson Pharmaceuticals | no | no |
| Industrials | Cintas | no | no |
| | Dover | no | no |
| 18 | Dun & Bradstreet | no | no |
| | Equifax | no | no |
| | Expeditors International of Washington | no | no |
| | Fastenal | no | no |
| | Flowserve | no | no |
| | Goodrich | no | no |

| | | | |
|---|---|---|---|
| | Jacobs Engineering | no | YES |
| | L-3 Communications Holdings | no | no |
| | Manitowoc | no | no |
| | Monster Worldwide | no | no |
| | PACCAR | no | no |
| | Precision Castparts | no | no |
| | R.R. Donnelly & Sons | YES | no |
| | Republic Services | no | no |
| | Stericycle | no | no |
| Oil & Gas/Energy | Cameron International | no | no |
| | CONSOL Energy | no | no |
| 13 | Ensco International | no | no |
| | Massey Energy | no | no |
| | Murphy Oil | no | no |
| | Nabors Industries | no | no |
| | National-Oilwell Varco | no | no |
| | Noble Corporation | YES | no |
| | Peabody Energy | no | no |
| | Pioneer Natural Resources | no | no |
| | Southwestern Energy | no | no |
| | Sunoco | no | no |
| | Tesoro | no | no |
| Utilities | Dynegy | no | no |
| 4 | Integrys Energy Group | no | no |
| | Nicor | no | no |
| | PPL | no | no |
| Non-Carbon Intensive | | | |
| Consumer Goods | Archer Daniels Midland | no | no |
| | CVS Caremark | no | no |
| 7 | D.R. Horton | no | no |
| | Dr. Pepper Snapple Group | no | no |
| | Lorillard | no | no |
| | Phillip Morris International | no | no |
| | Tyson Foods | no | no |
| Consumer | Abercrombie & Fitch | no | no |

| | | | | |
|---|---|---|---|---|
| Services | | | | |
| | | Amazon.com | no | no |
| | 24 | Apollo Group | no | no |
| | | AutoNation | no | no |
| | | AutoZone | no | no |
| | | Coach | no | no |
| | | DIRECTV Group | no | no |
| | | Expedia | no | no |
| | | Fortune Brands | no | no |
| | | GameStop | no | no |
| | | Gannett | no | no |
| | | Goodyear Tire & Rubber | no | no |
| | | Harley-Davidson | no | no |
| | | Harman International Industries | no | no |
| | | International Game Technology | no | no |
| | | Jones Apparel Group | no | no |
| | | Lennar | no | no |
| | | Loews | no | no |
| | | Newell Rubbermaid | no | no |
| | | Polo Ralph Lauren | no | no |
| | | RadioShack | no | no |
| | | Scripps Networks Interactive | no | no |
| | | V.F. Corporation | no | no |
| | | Wynn Resorts | no | no |
| Financials | | Affiliated Computer Services | no | no |
| | | American Capital | no | no |
| | 30 | Apartment Investment & Management | no | no |
| | | Avalon Bay Communities | no | no |
| | | Boston Properties | no | no |
| | | CIT Group | no | no |
| | | Developers Diversified Realty | no | no |
| | | E*TRADE Financial | no | no |
| | | Equity Residential | no | no |
| | | Federated Investors | no | no |
| | | First Horizon National | no | no |
| | | HCP | no | no |
| | | Host Hotels & Resorts | no | no |
| | | Intercontinental Exchange | no | no |

| | | | |
|---|---|---|---|
| | Invesco | no | no |
| | KeyCorp | no | no |
| | Kimco Realty | no | no |
| | Leucadia National | no | no |
| | Lincoln National | no | no |
| | MBIA | no | no |
| | NASDAQ OMX Group | no | no |
| | National City | no | no |
| | NYSE Euronext | no | no |
| | People's United Financial | no | no |
| | PNC Financial Services | no | no |
| | Public Storage | no | no |
| | Regions Financial | no | no |
| | SLM | no | no |
| | Torchmark | no | no |
| | Vornado Realty Trust | no | no |
| Technology | Akamai Technologies | no | no |
| | Amphenol | no | no |
| 18 | BMC Software | no | no |
| | Century Tel | no | no |
| | Ciena | no | no |
| | Citrix Systems | no | no |
| | CSC | no | no |
| | Electronic Arts | no | no |
| | Frontier Communications | no | no |
| | Harris | no | no |
| | Linear Technology | no | no |
| | MEMC Electronic Materials | no | no |
| | Microchip Technology | no | no |
| | Novell | no | no |
| | salesforce.com | no | no |
| | SanDisk | no | no |
| | Verisign | no | no |
| | Western Union | no | no |

## APPENDIX I
## Benchmarking Study Sectors and Companies

| **Carbon Intensive** | | |
|---|---|---|
| Basic Materials | Alcoa | www.alcoa.com |
| | DuPont | www.dupont.com |
| | Eastman Chemical | www.eastman.com |
| | PPG | www.ppg.com |
| | Praxair | www.praxair.com |
| | Koch Industries | www.kochind.com |
| | Renco Group | www.rencogroup.net |
| | AK Steel Holding | www.aksteel.com |
| | Pactiv | www.pactiv.com |
| | | |
| Health Care | Abbott Labs | www.abbott.com |
| | Allergan | www.allergan.com |
| | Eli Lilly | www.lilly.com |
| | Johnson& Johnson | www.jnj.com |
| | Schering-Plough | www.merck.com |
| | Baush&Lomb | www.bausch.com |
| | Medline Industries | www.medline.com |
| | King Pharmaceuticals | www.kingpharm.com |
| | Tenet Healthcare | www.tenethealth.com |
| | | |
| Industrials | Boeing | www.boeing.com |
| | Burlington Northern Santa Fe | www.bnsf.com |
| | Caterpillar | www.cat.com |
| | Jacobs Engineering | www.jacobs.com |
| | United Parcel Service | www.responsibility.ups.com |
| | Sequa | www.sequa.com |
| | Amsted Industries | www.amsted.com |
| | Fastenal | www.fastenal.com |
| | Goodrich | www.goodrich.com |
| | Stericycle | www.stericycle.com |
| | | |
| Oil & Gas/ | Chevron | www.chevron.com |
| Energy | ConocoPhillips | www.conocophillips.com |
| | Smith International | www.smith.com |
| | Marathon Oil | www.marathon.com |
| | Transocean | www.deepwater.com |
| | Sinclair Oil | www.sinclairoil.com |
| | Ergon | www.ergon.com |
| | Murphy Oil | www.murphyoilcorp.com |
| | Peabody Energy | www.peabodyenergy.com |
| | Sunoco | www.sunocoinc.com |
| | | |
| Utilities | PG&E | www.gpecorp.com |

| | | |
|---|---|---|
| | Consolidated Edison | www.conedison.com |
| | Exelon | www.exeloncorp.com |
| | Northeast Utilities | www.nu.com |
| | Xcel Energy | www.xcelenergy.com |
| | Tenaska Energy | www.tenaska.com |
| | Energy Future Holdings | www.energyfutureholdings.com |
| | Dynegy | www.dynegy.com |
| | Integrys Energy Group | www.integrysenergy.com |

| **Non-Carbon Intensive** | | |
|---|---|---|
| Consumer Goods | HJ Heinz | www.heinz.com |
| | Campbell Soup | www.campbellsoup.com |
| | Estee Lauder | www.elcompanies.com |
| | General Mills, Inc | www.generalmills.com |
| | Wal-Mart | www.walmartstores.com |
| | Dollar General | www.dollargeneral.com |
| | US Foodservice | www.usfoodservice.com |
| | | |
| Consumer Services | Limited Brands | www.limitedbrands.com |
| | McDonald's | www.mcdonalds.com |
| | McGraw Hill | www.mheducation.com |
| | Stanley Works | www.stanleyworks.com |
| | Staples, Inc | www.staples.com |
| | Ingram Industries | www.ingrambook.com |
| | Belk | www.belk.com |
| | | |
| Financials | Allstate | www.allstate.com |
| | American Express | www.americanexpress.com |
| | Goldman Sachs | www.goldmansachs.com |
| | Hartford Financial | www.thehartford.com |
| | JPMorgan Chase | www.jpmorganchase.com |
| | Edward Jones | www.edwardjones.com |
| | Fidelity | www.fidelity.com |
| | | |
| Technology | Advanced Micro Devices | www.amd.com |
| | IBM | www.ibm.com |
| | Sun Microsystems | www.sun.com |
| | Dell Inc | www.dell.com |
| | Autodesk | www.autodesk.com |
| | CDW | www.cdw.com |
| | Avaya | www.avaya.com |
| | | |

# Appendix J – Benchmarking Study Data

## Appendix K – Carbon Information Disclosure Strategy (CIDS) Framework

## REFERENCES


111th Congress. (2009). "H.R. 2454." Retrieved Jul 8, 2009, from http://www.govtrack.us/congress/bill.xpd?bill=h111-2454&tab=summary.

Abkowitz, M. D., M.A. Cohen, S.S. Buck, D.W. Case, P.A. Drake. (1999). "Environmental Information Disclosure and Stakeholder Involvement: Searching for Common Ground." Corporate Environmental Strategy. Vol. 6., No. 4: 415-424.

ACC. (2010). "American Chemistry Council." from www.americanchemistry.org

ACC. (2009). ACC Supports EPA's Establishment of Greenhouse Gas Reporting System, American Chemical Council., September 22, 2009. Available at www.americanchemistry.com/s_acc/sec_news_article.asp?CID=206&DID=10242

Adams, C. A. and G. R. Frost. (2008). "Integrating sustainability reporting into management practices." Accounting Forum. Vol. 32., Issue 4: 288-302.

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

Anderson, D. R. (2006). "The Critical Importance of Sustainability Risk Management." Risk Management Vol. 53., Issue 4: 66-71.

API. (2010). "American Petroleum Institute." from www.api.org

API. (2009). "Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry". American Petroleum Institute. Available at www.api.org/ehs/climate/new/upload/2004_COMPENDIUM.pdf

ARRA (2009). "American Reinvestment and Recovery Act of 2009". Available at www.recovery.gov

Arthur D Little. (2003). "The Business Case for Corporate Responsibility." Arthur D. Little. Available at www.adl.com/uploads/tx_extthoughtleadership/Business_Case_for_Corporate_Responsibility_02.pdf

Arthur D Little (2007). "The Carbon Margin: Translating Carbon Exposure into Competitive Advantage." Available at http://www.adlittle.us/ssr-publications.html?&no_cache=1&category=16&page=0&MP=5-345

ATAC. (2010). "Air Transport Action Group." From www.atag.org

Badal, A. (2005). "Using Interdisciplinary Thinking to Improve Strategy Formulation: A Managerial Perspective". International Journal of Management. Sep. 2005. Vol. 22, No. 3, pp. 365-375.

Barger, T. S. (2008). "Harnessing the Perfect Storm: Business Executives in Mid-Size Companies Are Seizing Green Opportunities." The Conference Board – Executive Action 273. Report No: A-0273-09-EA.

BCG. (2009). "The Business of Sustainability: Imperatives, Advantages and Actions". Boston Consulting Group. September 2009. Available at www.bcg.com/documents/file29480.pdf

Beierle, T. (2003). "The Benefits and Costs of Environmental Information Disclosure: What Do We Know About Right-to-Know?" Washington, D.C., Resources for The Future. RFF Discussion Paper 03-05.

Bodansky, D., E. Diringer. (2007). "Towards An Integrated Multi-Track Climate Framework", Pew Center on Global Climate Change. Available at www.pewclimate.org/multi-trackBortz, C. (2007). "Conversation: Alyson Slater." Harvard Business Review: Climate Business/Business Climate. Oct 1, 2007. Pp. 7-8.

Bohanec, M., B. Zupan, and V. Rajikovic. (2000). "Applications of Qualitative Multi-attribute Decision Models in HealthCare". Int J Med Inform. September, 2000. Vol. 58-59. Pp. 191-205.

Bowler, S. (1990). "The Politics of Climate: A Long Haul Ahead." New Scientist. London: Oct 27, 1990. Vol. 128, No. 1740, 20.

Brancato, C. K. (1997). "Communicating Corporate Performance: A Delicate Balance", The Conference Board, Special Report No. 1188-97-RR.

BSR. (2008,). "Climate Change Issue Brief." Retrieved February 28, 2009, from www.bsr.org/insight/issue-brief-details.cfm?DocumentID=48802.

Business Roundtable. (2010). "Climate RESOLVE." from www.businessroundtable.org/initiatives/growth/climate/resolve

Butner, K., D. Geuder, J. Hittner. (2008). "Mastering Carbon Management: *Balancing trade-offs to optimize supply chain efficiencies"*. IBM Institute for Business Value. Somers, NY. Available at www.-05.ibm.com/de/automotive/downloads/mastering-carbon-management.pdf

Campbell, L. (2009). "Many businesses can no longer fight the inevitability of North America's groundbreaking climate legislation: How will this impact your business?", ERM, June 23, 2009. from http://www.erm.com/News-Events/News/Many-businesses-can-no-longer-fight-the-inevitability-of-North-Americas-groundbreaking-climate-legislation-How-will-this-impact-your-business/

Carbon Disclosure Project. (2008). "Making Advances in Carbon Management: Best practice from the Carbon Information Leaders" A Joint CDP and IBM Study, Carbon Disclosure Project. Available at https://webadmin.cdproject.net/CDPResults/Joint_CDP_IBM_study_June08.pdf

Carbon Principles. (2010). "The Carbon Principles." From www.carbonprinciples.org

Carbon Trust. (2008). "Climate change - a business revolution?, Carbon Trust. Available at www.carbontrust.com/publications/CTC740_business_rev%20v5.pdf

Cartwright, W., J. L. Craig. (2006). "Sustainability: aligning corporate governance, strategy and operations with the planet." Business Process Management Journal. Vol. 12., Issue 6: 741-750.

Case, D. W. (2001). "The Law and Economics of Environmental Information as Regulation." ELR News & Analysis. Vol. 31: p. 10773-10789.

CCX. (2010). "Chicago Climate Exchange - Overview." from http://www.chicagoclimatex.com/content.jsf?id=821

CDLI. (2010). "Carbon Disclosure Leadership Index". Carbon Disclosure Project. From https://www.cdproject.net/en-us/results/pages/leadership-index.aspx

CDP. (2008). "Carbon Disclosure Project Report 2008 – S&P 500". Pp.65-91. Available at https://www.cdproject.net/CDPResults/67_329_142_CDP%20SP500%20Report%202008.pdf

CDP. (2010). "Carbon Disclosure Project." Retrieved February 10, 2010, from www.cdproject.net

Cerin, P. (2002). "Communication in Corporate Environmental Reports". _Corporate Social Responsibility and Environmental Management. Vol. 9, Issue: 1, pp. 42-65.

CERES. (2010). "Coalition for Economically Responsible Economies." from www.ceres.org

CERES/EDF. (2009). "Climate Risk Disclosure in SEC Filings: An Analysis of 10-K Reporting by Oil and Gas, Insurance, Coal, Transportation and Electric Power Companies." T. C. Library, Written for CERES and EDF by The Corporate Library. Available at www.ceres.org/Document.Doc?id=473

Clarkson, P. , Y. Li, G. Richardson, F. Vasvari (2007). "Revisiting the relation between environmental performance and environmental disclosure: An empirical analysis." Accounting, Organizations and Society. Available at www.rotman.utoronto.ca/greenaccounting.pdf

Clarkson, P., X. Fang, Y. Li, G. Richardson (2010). "The Relevance of Environmental Disclosures for Investors and Other Stakeholder Groups: Which Audience Are Firms Speaking To?. Available at www.business.uts.edu.au/accounting/seminars/aut10may10clarkson.pdf

Climate Leaders. (2010). from http://www.epa.gov/climateleaders/

Climate Leaders. (2009). Climate Leaders: Setting The Standard In Greenhouse Management. EPA. From www.epa.gov/stateply/documents/brochure.pdf

Climate Registry. (2010). Retrieved February 12, 2010, from http://www.theclimateregistry.org/

Climate Resolve. (2010) from www.businessroundtable.org

Climate Savers. (2010) from www.climatesaverscomputing.org

Cogan, D. and E. McAteer. (2008). "2008 ESG Background Report: Global Climate Change." Riskmetrics Group. Available at www.riskmetrics.com/node/135623

Cohen, M. A., and V. Santhakumar. (2006). "Information Disclosure as Environmental Regulation - A Theoretical Analysis". Available at SSRN: http://ssrn.com/abstract=922487

Cohen, M. A., S. A. Fenn and S. Konar. (1995). "Environmental and Financial Performance: Are They Related?" Vanderbilt University & Investor Responsibility Research Center. Available at http://sitemason.vanderbilt.edu/files/d/dLwFkQ/Environmental%20and%20Financial%20Performance.pdf

Cowan, S., and D. Gadenne. (2005). "Australian corporate environmental reporting: a comparative analysis of disclosure practices across voluntary and mandatory disclosure systems". Journal of Accounting and Organizational Change. Vol. 1, Issue: 2. pp. 165-179.

CSR (2010). "CSR Insight Metrics Report". May 2010. Available at www.csr-insight.com

DJSI. (2010). Dow Jones Sustainability Index. Retrieved February 11, 2010, from www.sustainability-index.com

DOE. (2010). "Climate Vision: Voluntary Reporting Guidelines." Retrieved February 11, 2010, from http://www.climatevision.gov/1605b.html

DOI. (2007) "Department of Interior: Methodology for Business Transformation - Toolkit: Guidance and Templates". Available at www.doi.gov//ocio/architecture/mbt/guidance.htm

Doran, K. L., E. L. Quinn and M. G. Roberts. (2009). "Reclaiming Transparency in a Changing Climate: Trends in Climate Risk Disclosure by the S&P 500 from 1995 to the Present", Center for Energy & Environmental Security. Available at www.ceres.org/Document.Doc?id=474

EEI. (2010). "Power Partners." Edison Electric Institute. From http://www.eei.org/ourissues/TheEnvironment/Climate/Pages/DomPolicyInitiatives.aspx.

EICC. (2010). "Electronics Industry Citizenship Coalition." From www.eicc.info

EL. (2009). "Criticism Ramps Up Against Cap-And-Trade Systems." Environmental Leader: Energy & Environmental News for Business. June 11, 2009. From www.environmentalleader.com/2009/06/11/criticism-ramps-up-against-cap-and-trade-systems

Ellerman, A.D., P. Joskow. (2008) "The European Union's Emissions Trading System in perspective". PEW. Available at www.pewclimate.org/docUploads/EU-ETS-In-Perspective-Report.pdf

Energy Star. (2010) Retrieved on January 15, 2010 from www.energystar.gov

Enkvist, P., T. Naucler, J. Oppenheim (2008). "Business Strategies for Climate Change." McKinsey Quarterly April 2008. Vol.2: 24-33.

Environmental Leader (2010). "Wal-Mart Pledges to Cut Supply Chain Emissions 20M Metric Tons by 2015." Environmental Leader: Energy & Environmental News for Business February 26, 2010. From www.environmentalleader.com/2010/02/26/walmart-pledges-to-cut-supply-chain-emissions-20m-metric-tons-by-2015

EPA. (2009). "Mandatory Greenhouse Gas Reporting Rule." 40 CFR Part 98, from http://www.epa.gov/climatechange/emissions/downloads09/GHG-MRR-FinalRule.pdf.

EPA-2. (2009). "Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act" December 7, 2009. Available at www.epa.gov/climatechange/endangerment.html.

EPA. (2008). "Inventory of U.S. greenhouse gas emissions and sinks: 1990-2006" from www.epa.gov/climatechange/emissions/usgginventory.html

Ernst & Young. (2010). "Carbon Market Readiness - Accounting, compliance, reporting and tax considerations under state and national carbon emissions programs." Available at www.ey.com/Publication/vwLUAssets/Carbon_market-readiness-Is-your-company-prepared/$FILE/Carbon_market_readiness.pdf

Esty, D. C. and A. S. Winston. (2009). Green To Gold: How Smart Companies Use Environmental Strategy to Innovate, Create Value, and Build Competitive Advantage. John Wiley & Sons.

Fagotto, E., M. Graham, (2007). "Full Disclosure: Using Transparency to Fight Climate Change." Issues in Science and Technology Vol.23. Issue 4: 73-79.

Ferraro, P. J., T. Uchida. (2005). "Investor Reactions to Information disclosure: Can Providing Public Information About Firms' Pollution Improve Environmental Performance?" Water Policy Working Paper #2005-014. Available at www.h2opolicycenter.org/pdf_documents/water_workingpapers/2005-014.pdf

FP (2009). "Obama's Copenhagen Speech". _Foreign Policy. December 18, 2009. Available at www.foreignpolicy.com/articles/2009/12/18/obamas_copenhagen_speech_0.

Frey, S. D., D. J. Harrison, E. H. Billett. (2006). "Ecological Footprint Analysis Applied to Mobile Phones." Journal of Industrial Ecology Vol. 10 (Number 1-2): p. 199-216.

Friend, G., S. Russell. (2003). "Truth & Transparency: The why and how behind world-class corporate environmental reporting." Green@work. Jan/Feb 2003. Pp. 26-33.

GBN. (2007). "Acting On Climate Change: A Strategic Workshop for Business Leaders - Workshop Summary." Global Business Network. Available at www.gbn.com/articles/pdfs/GBN%20Acting%20on%20Climate%20Change.exec%20summary.pdf

GEMI. (2010). "Global Environmental Management Initiative". Retrieved on January 17, 2010 from www.gemi.org

GICS. (2010). "Global Industry Classification Standard ". Developed by Standard & Poor's Available at http://www.standardandpoors.com/indices/gics/en/us

Grayson, D., A. Jin, M. Lemon, M. Rodriguez, S. Slaughter, and S. Tay. (2008). " A New Mindset for Corporate Sustainability", Sponsored by British Telecommunications and Cisco. Available at http://www.connectworld.com/PDFs/white_papers/a_new_mindset_wp_en.pdf

GRI. (2009). "G3 Reporting Framework." Retrieved November 13, 2009 from http://www.globalreporting.org/reportingframework.

GRI. (2010). "Carrots and Sticks – Promoting Transparency and Sustainability: An update on trends in Voluntary and Mandatory Approaches to Sustainability Reporting". A report by UNEP, KPMG, GRI, UCGA. Available at www.globalreporting.org/NR/rdonlyres/08D0C5D6-3B19-4BA2-9F12-540F66F73C5E/4198/Carrots2010final.pdf

Hart, S. (1992). "An Integrative Framework for Strategy-Making Processes". Academy of Management Review. Vol. 17, No. 2, pp. 327-351.

Ho, L.T., and G. Lin. (2004). "Critical Success Factor Framework for the Implementation of Integrated-Enterprise Systems in the Manufacturing Environment". International Journal of Production Research. Vol. 42, No. 17, pp. 3731-3742.

Hoffman, A. J. and J. G. Woody. (2008). Climate Change: What's Your Business Strategy? (Memo to the CEO). Boston, Harvard Business School Publishing Corporation.

Hoovers. (2010). Hoovers Business and Industry Database. From www.hoovers.com

ICB. (2010). "Industry Benchmark Classification". Dow Jones Indexes. Available at http://www.icbenchmark.com/docs/Structure_Defs_English.pdf

IEA, (2004). "Decision-Making Framework: Annex 31 – Energy Related Environmental Impact of Buildings". International Energy Agency. Available at www.annex31.org

Kaswan, A. (2007). "The Domestic Response to Global Climate Change: What Role for Federal, State, and Litigation Initiatives?" University of San Francisco Law Review 42: 39-110.

Kenney, B. (2008). "The 'What, Why, How and When' of Carbon Footprinting." Industry Week. May 1, 2008. Pp. 48-55. Available at www.industryweek.com/articles/the_what_why_how_and_when_of_carbon_footprinting_16138.aspx

Kolk, A. (2008), "Sustainability, Accountability and Corporate Governance: Exploring Multinationals' Reporting Practices". Business Strategy and the Environment, Vol. 17, No. 1, pp. 1-15, 2008. Available at SSRN: http://ssrn.com/abstract=899852

Kolk, A., D. Levy, and J. Pinkse. (2008). "Corporate Responses in an Emerging Climate Regime: The Institutionalization and Commensuration of Carbon Disclosure". European Accounting Review. Vol. 17, No. 4, pp. 719-745

Kolwey, N. (2007). "Voluntary Climate-Change Programs", E Source Company, LLC.

KPMG. (2008). "KPMG International Survey of Corporate Responsibility Reporting 2008". Available at www.kpmg.com/CN/en/IssuesAndInsights/ArticlesPublications/Pages/Corporate-responsibility-survey-200810-o.aspx

KPMG/GRI. (2007). "Reporting the Business Implications of Climate Change in Sustainability Reports," Global Reporting Initiative and KPMG Global Sustainability Services. Available at http://www.kpmg.no/site.asp?id=403778&process_mode=mode_doc&doc_id=44904

Lee, T. M., P. D. Hutchison (2005). "The Decision To Disclose Environmental Information: A Research Review and Agenda." Advances in Accounting Vol. 21: 83-111.

Lindblom, C. (1959). "The science of "muddling through." Public Administration Review. Vol. 19, No. 2, pp. 79-88.

Lippard, Ben (2009). "Second Circuit Opinion on Connecticut v. American Electric Power – Nuisance Claims Against Companies Emitting GHGs". Vinson & Elkins Climate Change Report. October 15, 2009 – Issue 12.

Manufacturing Leadership Board. (2008). Reducing Manufacturing's Carbon Footprint. Issue Brief. Corporate Executive Board.

Matthews, H. S., C. Hendrickson, C. L. Weber (2008). "The Importance of Carbon Footprint Estimation Boundaries." Environmental Science & Technology Vol.42(16): 5839-5842.

McKinsey (2010). "How Companies Manage Sustainability: McKinsey Global Survey Results". McKinsey Quarterly. March 2010. Available at : www.mckinseyquarterly.com/How_companies_manage_sustainability_McKinsey_Global_Survey_results_2558

McPeak, C., N. Tooley. (2008). "Do Corporate Social Responsibility Leaders Perform Better Financially?" The Journal of Global Business Issues Vol.2(2): 4.

MGA. (2007). "Midwestern Regional GHG Reduction Accord." from www.midwesterngovernors.org/govenergynov.htm.

Miller, K. (1992). "A Framework for Integrated Risk Management in International Business". Journal of International Business Studies. Vol. 23, Issue 2, pp. 311-331

Mounteer, T., K. Welsh, M. Lukens, J. Allmon. (2008). "Disclosing Effects of Climate Change in Energy, Financial Companies' 10-Ks." EHS Strategies - The Business Impacts of Climate Change. BNA. March 2, 2008.

NEGC. (2001). "New England Governors/Eastern Canadian Premiers - Climate Change Action Plan." from www.negc.org/environment.html.

Newsweek (2009). "2009 Green Rankings." Newsweek Issue: September 28, 2009. Available at http://greenrankings.newsweek.com

Okereke, C. (2007). "An Exploration of Motivations, Drivers and Barriers to Carbon Management: The UK FTSE 100". European Management Journal. Vol. 25, No. 6, pp. 475-486.

PEW. (2010). "What's Being Done In The States." Retrieved February 8, 2010, from http://www.pewclimate.org/states-regions.

Pohle, G., J. Hittner. (2008). "Attaining Sustainable Growth Through Corporate Social Responsibility." IBM Institute for Business Value. Available at http://www-935.ibm.com/services/us/gbs/bus/pdf/gbe03019-usen-02.pdf

Porter, M. E. and F. L. Reinhardt. (2007). "A Strategic Approach to Climate." Harvard Business Review. Climate Business/Business Climate. October 2007: 22-26.

Price Waterhouse Coopers. (2009). Carbon Disclosure Project Report 2008 S&P 500, Written for Carbon Disclosure Project. Available at www.cdproject.net/en_US/Results/Pages/overview.aspx

Reid, E, and M. Toffel (2009). "Responding to Public and Private Politics: Corporate Disclosure of Climate Change" (Harvard Business School Technology & Operations Mgt. Unit Research Paper No. 09-019. Available at SSRN: http://ssrn.com/abstract=1237982, Responsible Care. (2010). "Responsible Care Program." Retrieved February 10, 2010, from http://www.americanchemistry.com/s_responsiblecare/sec.asp?CID=1298&DID=4841

RGGI. (2003). "Regional Greenhouse Gas Initiative." from www.rggi.org.

Roulac, S. (1996). “The Strategic Real Estate Framework: Processes, Linkages, Decisions”. The Journal of Real Estate Research. Vol. 12, No. 3, pp. 323-346.

Rugman, A. and A. Verbeke. (1998). “Corporate Strategies and Environmental Regulations: An Organizing Framework”. Strategic Management Journal. Vol. 19, pp. 363-375.

S. 1733. (2009). “Clean Energy Jobs and American Power Act” sponsored by Sens. John Kerry (D-Mass.) and Barbara Boxer (D-CA). Available at http://kerry.senate.gov/cleanenergyjobsandamericanpower/intro.cfm

SAM. (2010). “Sustainable Asset Management – Dow Jones Sustainability Indexes”. Available at www.sam-group.com/htmle/djsi/indexes.cfm

Sand, P. H. (2002). The Right to Know: Environmental Information Disclosure by Government and Industry. 2nd Transatlantic Dialogue on "The Reality of Precaution: Comparing Approaches to Risk and Regulation". Warrenton, VA.

Schuchard, R., R. Sapru and E. Stewart. (2007). “Beyond Neutrality: Moving Your Company Toward Climate Leadership”, Business for Social Responsibility. Available at www.bsr.org/reports/BSR_Beyond-Neutrality

SEC. (2010). Commission Guidance Regarding Disclosure Related to Climate Change; Final Rule. United States, 17 CFR Parts 211, 231 and 241. From http://www.sec.gov/rules/interp/2010/33-9106.pdf

Smartway. (2010). from www.epa.gob/smartway

Smick, E. (2006). “U.S. Companies and Greenhouse Gas Regulations.” Council on Foreign Relations. Available at www.cfr.org/publication/11462/us_companies_and_greenhouse_gas_regulations.html

Sneirson, J. F. (2009). "Green is Good: Sustainability, Profitability, and a New Paradigm for Corporate Governance." Iowa Law Review Vol.94: 37.

Solomon, A., and L. Lewis (2002). “ Incentives and Disincentives for Corporate Environmental Disclosure”. Business Strategy and the Environment Vol. 11. Pp 154-169.

Solomon, J. (2007) “Corporate Governance and Accountability”. John Wiley & Sons, 2nd Edition

Stender, L., V. Vainieri and R. Gusciora. (2006). "State of New Jersey - Global Warming Response Act." From www.state.nj.us/globalwarming

Stanny, E. , K. Ely. (2008). "Corporate Environmental Disclosures about the Effects of Climate Change." Corporate Social Responsibility and Environmental Management Vol.15: 338-348.

Stephan, M., M. E. Kraft , T. D. Abel. (2005). “Information Politics and Environmental Performance: The Impact of the Toxics Release Inventory on Corporate Decision Making”. 2005 Annual Meeting of the American Political Science Association. Washington, D.C Available at www.allacademic.com/meta/p41198_index.html

Stone, M. (2006). "Governor Bill Richardson Signs Historic Climate Change Executive Order." Press Release - State of New Mexico December 28, 2006.

Taplin, J., D. Bent and D. Aeron-Thomas. (2006). "Developing a Sustainability Accounting Framework to Inform Strategic Business Decisions: A Case Study From the Chemicals Industry". Business Strategy and the Environment. July 2006. Vol. 15, pp. 347-360.

Tinsley, S. (2002). "EMS Models For Business Strategy Development". Business Strategy and the Environment. Nov/Dec 2002. Vol. 11, No. 6, pp. 376-390.

UNFCCC. (2008). "Kyoto Protocol." from http://unfccc.int/kyoto_protocol/items/2830.php

UNFCCC (2010). "United Nations Framework Convention on Climate Change – COP 15, CMP 5". From http://unfccc.int/2860.php

US-DOE. (2010). "US-Department of Energy – Climate Vision: 1605(b)." from www.climatevision.gov/1605b.html.

US-EPA. (2008). "US-EPA Climate Leaders." from www.epa.gov/climateleaders.

US-CAP. (2010). "US Climate Action Partnership". From www.us-cap.org

US Supreme Court No. 05-1120 (2007) *"Massachusetts et al. v. Environmental Protection Agency et al."* April 2, 2007. Available at www.law.cornell.edu/supct/html/05-1120.ZS.html

Verrechia, R., (2001) "Essays on Disclosure" Journals of Accounting and Economics Vol. 22. Pp 97-180.

Waage S., K. Armstrong, and L. Hwang (2010) "Future Expectation of Corporate Environmental Performance: Emerging Ecosystem Services, Tools and Applications" Business for Social Responsibility. March 2010. Available at http://www.bsr.org/reports/BSR_Future_Expectations_Corporate_Environmental_Performance.pdf

Waage S., and E. Stewart. (2006). "A Three-Pronged Approach to Corporate Climate Strategy", Business for Social Responsibility. Available at www.bsr.org/reports/BSR_Climate-Change-Report.pdf

Walden, W. D. and A. J. Stagliano. (2004). "An Assessment of the Quality of Environmental Disclosure Themes." Advances in Environmental Accounting and Management Vol. 2: 137-165.

WCI. (2010). "Western Climate Initiative." from www.westernclimateinitiative.org

White, A., M. Kernan. (2004). "Corporate Environmental Governance". Innovest Group.

Wiener, J. B. (2007). "Think Globally, Act Globally: The Limits of Local Climate Policies." University of Pennsylvania Law Review Vol. 155: 1961-1979.

Wynn, G. (2008). "EU Considers Carbon Tariff". Reuters. January 4, 2008

Young, B., C. Suarez, K. Gladman (2009). "Climate Risk Disclosure in SEC Filings: An Analysis of 10-K Reporting by Oil and Gas, Insurance, Coal, Transportation and Electric Power Companies". The Corporate Library. Sponsored by CERES and Environmental Defense Fund. Available at http://www.ceres.org/Document.Doc?id=473

Zacaroli, A. C. (2008). "Legal Developments Related to Greenhouse Gas Emissions." BNA - Environment Reporter 39 (No. 26).