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> The market for climate change-related services: New insights into corporate action on climate change

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ABSTRACT OF THESIS submitted by:

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In response to a wide range of identifiable drivers, including but not limited to the emergence of greenhouse gas regulation, companies are increasingly addressing the issue of climate change. Addressing the many risks and opportunities that climate change presents requires a wide range of skills and know-how. As a result, a sizeable market for climate change-related services has emerged to meet the needs of companies wishing to address the issue of climate change.

Through a structured observation of the market for climate change-related services, this thesis aims to determine the extent to which the structure of the market influences the ability of companies to effectively address climate change. The thesis finds that the market has been supplied by companies coming from a wide range of different competencies, approaching the realm of climate change-related services in a manner that complements their existing business. The effect of a fragmented market on a company's ability to address climate change is discussed using the critical realist approach to the ontological issue of *structure* and *agency*, generating new insights into corporate action on climate change.

Keywords: business, climate change, environment, services.

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1. INTRODUCTION

Corporate action on climate change is driven by a number of external factors, not limited to government regulation. Increasingly, companies are recognizing a wide range of risks and opportunities that climate change presents relevant to their business, and have adopted a correspondingly diverse set of approaches to addressing these. A sizeable market for expert services pertaining to climate change has arisen in order to meet the needs of companies seeking to address climate change. The thesis seeks to determine the extent to which the composition of this market influences the ability of companies to tackle climate change. It does so through a structured observation of this market through the period between January and April 2011, before using the critical realist approach to the ontological issue of *structure* and *agency* to discuss findings.

1.1 Background

A recently published research report produced by the MIT Sloan Management Review in collaboration with The Boston Consulting Group (Haanaes *et al.* 2011) found that companies' spending on sustainability has largely survived the global economic downturn, with nearly 60 percent of companies surveyed stating that their sustainability investments increased in 2010. The same holds true of sustainable and socially responsible investing (SRI), which has continued to grow more rapidly than conventional investment assets under professional management (Social Investment Forum 2010).

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Exclusively in terms of climate revenue, HSBC reports the figure to have stood at \$530 billion in 2009 (De Lima & Sumon 2010). The report measured the figure as the total reported revenues of 367 listed companies worldwide from 18 investable climate themes, and uncovered that the total climate revenue in the bank's index equals the GDP of Switzerland. Despite an 0.9 percent downturn compared to 2008, the report states that climate revenue has "clearly held up better than those across the wider economy" (De Lima & Sumon 2010).

The Global 500 Report of the Carbon Disclosure Project 2010 (CDP 2010) found that 48 percent of respondents are currently working on embedding climate change and carbon management into group business strategy. Spending on climate change appears to be on the rise: a survey conducted by Ernst & Young (E&Y 2010a) found that a large majority of companies intend to increase their spending on climate change initiatives between 2010 and 2012. Close to 50 percent of respondents stated that they anticipated to spend in the range of 0.5-5 percent of company revenue on climate change initiatives. As the survey was conducted on companies with annual revenues of over \$1bn, this represents anticipated annual spending of between \$5m and \$50m per company (E&Y 2010a).

Indeed, climate change appears to be establishing itself at the core of many companies' business strategies. The Ernst & Young survey (E&Y 2010a) revealed that two-thirds of responding companies have launched enterprise-wide climate change programs, while an additional 16 percent expect to follow suit over the next two years. Such programs often explicitly state emissions targets: the Global 500 Report uncovered that in 2010, 43 percent of responding companies stated absolute emissions targets, in comparison to 39 percent of companies citing intensity targets (CDP 2010). An example of this is Xerox, which has set itself a target of reducing total greenhouse gases from 2002 to 2012 by 25 percent. The company has already exceeded its targets, having cut greenhouse gas emissions by 31 percent between 2002 and 2009. According to the company, it has been able to do so by reducing energy consumption in its facilities and manufacturing operations as well as in its service and sales vehicle fleet (Xerox 2010a; Xerox 2010b). However, the company acknowledges that a significant part of this reduction is attributable to a decrease in production as a result of the downturn in the global economy. Xerox's total revenue was down 14 percent in 2009 from the previous year (Xerox 2010a; Xerox 2010b).

GlaxoSmithKline (GSK), a global pharmaceuticals, biologics, vaccines and consumer healthcare company, has chosen to pursue emissions reductions throughout its entire value chain. The company's new environmental strategy (GSK 2010) has set the target of achieving carbon neutrality across the company's entire value chain by 2050. The company appears to already be moving in the right direction, disclosing a reduction from 7.6 million tons to 6.9 million tons of CO₂ equivalent from 2009 to 2010. Meanwhile, the American Forest & Paper Association (AF&PA), whose members produce more than 75 percent of the U.S.'s pulp, paper, paper-based packaging and wood building materials, is focusing on paper recycling, seeking to increase the rate to over 70 percent by 2020. The association aims to reduce greenhouse gas emissions by a minimum of 15 percent, also by 2020 (AF&PA 2011).

As mentioned above, the Global 500 Report found that nearly half of the surveyed companies claim to currently be embedding climate change and carbon management into their respective group business strategies (CDP 2010). Companies are certainly establishing a good sense of present and potential impacts that climate change can have on their business and importantly, their bottom-line performance. As such, the issue appears to be treated with considerable attention. Ernst & Young's survey of executives indicates that the issue of climate change governance rests with C-suite executives or board members (E&Y 2010a). Indeed, it seems that companies across all industries agree that taking action on climate change and sustainability is currently an important aspect of remaining competitive (Haanaes *et al.* 2011). The drivers behind action are dominated by top-line and bottom-line considerations, which is often tackled with a pragmatic approach to investing. GlaxoSmithKline, mentioned above, estimates that its new environmental strategy can by reducing energy, materials and distribution costs, save the company f_100 million (\$161 million) a year by 2020 (GSK 2010). At the same time, climate change presents an opportunity for companies to meet associated changes in customer demand, something most companies identify as very important in their strategizing (E&Y 2010a). In the

past five years, the market for sustainable products has experienced significant expansion, growing at a much faster rate than markets for conventional products (Potts *et al.* 2010).

Ultimately, however, brand reputation appears to be the benefit to addressing sustainability and climate change that most companies recognize. The importance of brand-building is identified by all companies, an end to which developing a reputation for being sustainability-driven brings large dividends (Haanaes *et al.* 2010). According to Samsung Electronics,

A 1% decrease in brand value of the company due to unfavourable evaluations from investment organizations and/or NGOs caused by insufficient climate change response is equivalent to losing about \$200m. Samsung Electronics, (CDP 2010).

Carbon management, energy efficiency and climate change are now increasingly becoming high priorities for large companies. The opportunity to reduce energy costs and secure energy supply, and protect the company from risks such as damaged reputation, has seemingly lead to carbon management emerging as a strategic priority for many businesses (CDP 2010). Globally, companies are seizing commercial carbon opportunities, often not hesitating to act in advance of – or above and beyond – any policy requirements (CDP 2010).

Companies understand the implications of operating a business in a carbon-constrained world and are addressing the requirements that this entails. Companies are facing increasing pressure to measure and manage emissions impacts, develop and implement appropriate risk management strategies and provide for cost-effective compliance with regulatory requirements. Managing these risks can be done in a wide range of manners: harvesting internal energy efficiency opportunities, carbon trading and procurement, making improvements throughout the supply chain, looking at green IT, taking a lifecycle approach to managing natural resources, and understanding regulatory design. Thus the multitude of options combined with everstrengthening drivers for acting on climate change means that the demand for climate-change related services is high and likely to continue its rapid growth. This research recognizes that the demand for a wide assortment of expert climate change-related services is large and continues to grow. The thesis seeks to investigate the external factors that weigh in on a company's decision-making processes. While regulation and increased awareness of risks and opportunities play an important role in determining what climate change-related services a company is in the market for, this research addresses the question of whether or not the market itself constitutes such an external factor – and to what extent its current structure influences a company's ability to effectively address climate change.

1.2 Purpose and research questions

The purpose of this research paper is to investigate the current market for climate change-related services, as a distinct but related area to sustainability services. The thesis asks whether or not the current provision of services - which is found to be highly fragmented - has any substantial effect on the ability of companies to address climate change. The research addresses the following main question:

To what extent does the current market for climate change-related services affect the ability of companies to seize the opportunities and mitigate the risks presented by climate change?

Sub-questions to be addressed include:

- 1. What are the main drivers behind companies seeking to address climate change?
- 2. What is the current status of the climate change-related services market?
- 3. How have current service providers entered the emissions services market?
- 4. To what extent do companies themselves perceive the market for climate change-related services as a constraining factor?

1.3 Research justification

There is a large body of literature and research on the topic of the business approach to climate change. A significant body of research can be found focusing on the drivers behind corporate action on climate change, but the literature does not consider the potential of expert service provision as a constraining factor in the business approach to climate change.

This research provides a complimentary explanation to the often hesitant business approach to climate change, which is generally attributed to the individual agential capacity of companies. When addressing external forces or "structure", the emphasis in the current literature is generally on competitiveness and regulatory compliance. This research does not propose an alternate understanding, but rather complements current understandings with a focussed analysis of a specific constraint on companies, namely the current provision in the marketplace of climate change-related services.

1.4 Research methodology

The research methodology centers on an archival research of news pertaining to climate changerelated services through the period January – April 2011. While the thesis is not based on field research, the research methodology closely resembles that of non-participant observation in that it closely monitors the market for climate change-related services during a set time-period. Nonparticipant observation requires the observation of activities without taking part in them, thus distinguishing itself from the method of participant observation, in which the researcher will join and engage with a group while observing its activities. Both participant and non-participant observation can be done overtly or covertly. This archival research thereby closely resembles a covert non-participant observation, allowing for the observation of the 'natural' behaviour of companies engaged in the climate change-related services market, without attempting to be a direct market participant. The research methodology involved unstructured observation in the early stages of the research. This involved a general observation of companies and their approaches to sustainability issues, including but not exclusively pertaining to climate change. Information sources include academic analysis on the business approach to sustainability, Corporate Social Responsibility/Sustainability reports and news stories. The unstructured observation allowed for general theories and ideas to be formulated, without leaping to conclusions. The unstructured observation also provided a solid foundation from which a structured observation could be launched.

The structured observation placed greater control on sampling, seeking to answer the hypothesis that was formulated during the unstructured observation. Analysing the market for climate change-related services requires the examination of a vast number of companies and industries that are engaged in it. The research sought to overcome this obstacle by applying a set time-frame (January – April 2011) for data collection, delivering a "snap-shot" of activities currently taking place in a rapidly evolving market. The structured observation therefore pin-pointed sampling requirements in terms of timeframe and type of information source. In order to track developments in the market, news stories relating to corporate action on climate change from the stated timeframe were analysed, seeking to uncover particular types of behaviour. Finally, interviews were conducted with a number of companies in an effort to check on the reliability and validity of findings.

The research question, *To what extent does the current market for climate change-related services affect the ability of companies to seize the opportunities and mitigate the risks presented by climate change?* is appropriately addressed through the research methodology. The unstructured observation, which revolved around the topic of the business approach to climate change, allowed for the formulation of the research question and hypothesis. The structured observation approached the research question head-on by collecting data specifically pertaining to corporate action on climate change and associated demand for climate changerelated services. As a rapidly evolving market, the methodology allows for a "snap-shot" of current activity by collecting data within a set time-frame.

Examples of corporate action on climate change are highlighted throughout the thesis, but these are not just meant to serve as illustrations of key points. Rather, examples are drawn from the archival research and thus constitute the building blocks of the thesis research and key components of the hypothesis and analysis.

1.5 Scope and limitations

The area of climate change-related services is not a widely-used concept. Services that are included under this definition are elsewhere considered under the wider umbrella of sustainability services or environmental services. As a result, extracting information specific to climate change-related services can be difficult. In a broader sense, it is challenging to define the supply and demand of a range of services that are not widely grouped together under the rubric of "climate change-related services".

It is important to note that while numerous recent examples are drawn upon to lend support to argumentation, the purpose of this research is not to judge the performance of companies, but rather to reflect on the structural constraints imposed by the current supply of climate changerelated services.

Finally, while corporate responsibility and sustainability reports are widely published and easily accessible, the information within these reports generally do not disclose specifics regarding the company's use of external service providers. Where possible, further information was obtained through informal interviews, but a large number of companies declined to provide further information.

1.6 Target group

As an in-depth look into the supply of emissions services, this research is relevant to those who wish to gain a greater understanding of the constraints that exist on companies attempting to address climate change. This group may include the companies themselves, seeking better to understand their structural constraints and how they can affect them. Likewise, the research can be of strong relevance to service providers wishing to better understand their market. Finally, policy-makers may gain a deeper understanding of the reasons behind the business response to various drivers, such as regulation.

1.7 Outline

Section 1:

Section 1 provides a brief introduction of the topic under study and establishes research questions and justification. The section also outlines the research methodology and considers the scope and limitations of the research.

Section 2:

Section 2 identifies the drivers behind corporate action on climate change, presenting information obtained through the unstructured observation process. The unstructured observation process uncovered a wide range of drivers, grouping them under the three headings of *Increased regulation*, *Risk*, and *Opportunity*. While drivers do not necessarily fit more easily into one category than the other, the objective is to lay a solid foundation for a good understanding of the service requirements of companies. The examples that are drawn upon constitute the findings of the unstructured observation process. The comprehensive list is found in Annex 1. In broad terms, the section addresses the question of *why* companies act on climate change.

Section 3:

Section 3 follows up on the findings in Section 2, presenting the findings of the structured observation process. The section considers the drivers identified in the previous section and investigates how they have been manifested in concrete action and a supply of necessary services. The service needs are grouped into five inter-related categories, based on the findings of the structured observation process: (i) Energy Efficiency, (ii) Supply Chain Management, (iii) Life-Cycle Assessment, (iv) Information, and (v) Environmental Reporting. As with the previous section, the examples that are drawn upon constitute the findings of the structured observation process, the complete findings of which can be found in Annex 2. In broad terms, the section addresses the question of *what* services companies are currently seeking.

Section 4:

Section 4 brings the thesis together with an in-depth analysis of the climate change-related services market. A theoretical framework of *structure* and *agency* is introduced to provide a structured understanding of how companies as agents are affected by their structural constraints, including the current availability of climate change-related services. The section draws upon findings from corporate responsibility reports and interviews with companies, as well as observations of recent developments in the market. The section can be understood as answering the question of *how* companies are affected by the structure of the market.

Section 5:

Section 5 provides conclusions and a summary of findings.

2. IDENTIFYING DRIVERS

Sustainability has been a noble business initiative for many years now. However, increasing regulation on the local, national and international levels has made sustainability a priority for even more companies. The importance of complying with regulation means that to many companies, managing regulatory requirements has become the *de facto* definition of environmental management. However, companies are increasingly recognizing risks and opportunities associated with climate change, outside of regulatory requirements. This section presents the findings of the unstructured observation. The findings relate to the drivers behind corporate action on climate change and are grouped according to three categories: *Increased regulation; Risk; and Opportunity*.

2.1 Increased regulation

Complying with environmental and greenhouse gas regulation has become a large part of daily life for many companies, who are becoming more and more familiar with environmental compliance and regulations from the local through to the national level (Enviance 2011). While the future policy landscape to address climate change on the international level remains uncertain, developments on the national and regional levels are generating clarity as well as regulatory direction. In the European Union, the Emissions Trading Scheme (EU ETS) is now a permanent regulatory regime; in the United States, the Securities and Exchange Commission (SEC) has issued guidance, urging publicly traded companies to measure their GHG emissions and report on the material risks that they represent, while the Environmental Protection Agency (US EPA) has established mandatory GHG reporting for 10,000 companies and is moving towards greenhouse gas policy-making. Australia and Japan are moving towards emissions trading schemes, while Switzerland and New Zealand already have their own schemes in place. This growing trend in greenhouse gas regulation brings with it new costs and risks to companies, many of which must take into account regional variations, some of which are presented below.

2.1.1 China

China has begun to tackle the issue of climate change with impressive scale, scope and commitment. In fact, a report by Deutsche Bank (Fulton *et al.* 2011) found that on a federal level, the number of climate policies in China is twice as many as in the United States. Figure 1 illustrates the recent developments in climate change policy and the resulting expansion in renewable energy investment.

China renewable energy expansion



Figure 1: China renewable energy expansion and recent developments in climate change policy. Data from Fulton *et al.* 2011

As seen above, national targets have been set concerning non-fossil fuel use, including 15 percent non-fossil fuel use in total energy consumption by 2020. Capacity targets have also been set by sector for 2020:

- 27GW of biomass power, up from the current 3GW;
- 3GW of waste-to-energy power, compared to 1.5GW today;

- 20GW of solar PV power from 300MW today;
- and 150GW of wind power, up from 25.5GW today. In 2009, China installed more wind capacity than any other country (Fulton *et al.* 2011)

China is also currently planning significant growth in nuclear generation resources, from the approximate 11GW that was in place at the end of 2010, to an estimated 70-80GW by 2020. This, which accounts for five percent of 2020 generation capacity, is included in the target of 15 percent non-fossil fuel use in total energy consumption by 2020. In terms of transportation, the Chinese Ministry of Science and Technology has made suggestions that an approximate one million electric vehicles could be sold by 2020, from an estimated 40 million new vehicle fleet. And in order to accommodate this, China is also planning to install ten million charging stations by 2020. (Fulton *et al.* 2011).

2.1.2 European Union

The EU ETS has been in place since 2005 and is a major pillar of European climate change policy. It is also the world's largest multi-national emissions trading scheme. As of 2012, the ETS will be extended to include the aviation sector. The market will also cover the chemical and aluminium industries as of 2013 (Stearns & Krukowska 2011). The aviation sector will constitute the second-largest industry to be covered by the ETS. The EC announced that airlines will be held to a CO₂ limit of 213 million metric tons in 2012, to be reduced to 208.5 in 2013. (Stearns & Krukowska 2011) These limits will not only apply to European businesses, but also to foreign airlines that operate flights in Europe.

Next in line may be the shipping industry, as the EU is currently considering proposals for limiting the sector's carbon emissions, possibly through participation in the ETS. The EU has jumped into action on the issue due to the current inability of the International Maritime Organization (IMO) to agree on measures (Krukowska 2011). According to the European commission, global maritime transport is accountable for three percent of CO_2 discharges. Unchecked, emissions from ships are expected to more than double by 2050 (Krukowska 2011).

2.1.3 United States of America

Tracking 293 net binding and accountable climate policies for the Major Economies Forum (MEF) on Energy and Climate Change countries, a report by Deutsche Bank (Fulton *et al.* 2011) found that policy momentum has been strong on a global scale, "with Europe overall a core backbone, China strong, the US Federal level lagging, but key US states moving forward."

On the federal level, the EPA and its administrator Lisa Jackson are beginning to make inroads. The EPA affirms that it will eventually regulate 70 percent of US GHG emissions, which is not far off what the Waxman-Markey bill, which passed the House of Representatives in June 2009, would have covered (85 percent). (Trading Carbon 2010) The bill eventually died in the U.S. Senate. According to research by the World Resources Institute, state and federal policies will reduce U.S. emissions to 14 percent below 2005 levels by 2020, even in the absence of comprehensive federal cap-and-trade legislation (Bianco & Litz 2010). However, uncertainty around future federal policy is unhelpful when trying to secure investments, such as in the renewable energy sectors. Here, investments are frequently driven by government policy, as evidenced in several European countries. Exposure to government policy risk due to lack of transparency and uncertainty in policy-making, fails to provide investors with comfortable frameworks within which to mobilize capital (Fulton *et al.* 2011).

While U.S. federal policy-making has been slow, individual states have made significant progress in tackling climate change. California, Texas and New Jersey have led the way in the adoption of clean technologies – possessing the country's highest installed capacity in wind and solar. In their tracking of net binding and accountable climate policies (i.e. not legally binding but significant statements of intended action), Fulton *et al.* (2011) found that the number of policies in California, New Jersey and Texas combined is nearly three times greater than the number at federal level. In California, the California Assembly approved in March 2011 a mandate for 33 percent of the state's electricity to come from renewable sources by 2020. This increase in the state's renewable portfolio standard (RPS) supersedes the current RPS which required 20 percent of electricity sources to be derived from renewable sources by the end of 2010. Utilities failed to meet the standard, with Pacific Gas & Electric obtaining 17.7 percent and Southern California Edison deriving 19.4 percent from renewable sources (Baker 2011). Worthy of mention, PG&E opposed the bill while Southern California Edison supported it (Environmental Leader 2011a). The state is also readying itself for the launch of its own cap-and-trade scheme, although at the time of writing, implementation could be delayed (Norin 2011).

New Jersey has set itself an 80 percent reduction target of greenhouse gas emissions from 2006 levels by 2050. The state is emphasising the development of offshore wind and has also passed a bill establishing tax incentives for certain businesses that are engaged in the manufacturing of wind energy equipment. Meanwhile, Texas intends to produce 5,880MW of renewable energy by 2015 and 10,000MW by 2025 (Fulton *et al.* 2011).

On the national level, risk management consultants DNV found that utilities are open to cap and trade legislation. Asked what type of federal-level regulations they would most like to see implemented, 71 percent of respondents preferred cap and trade. 50 percent cited energy efficiency incentives as their favoured potential federal action, while only 14 percent cited regulatory CO_2 limits, such as those currently being put in motion by the EPA (Rosnes *et al.* 2011). Crucially, however, many utilities responded that regardless of the type of regulation settled on, they would like to see it achieved sooner rather than later. Most of the utilities that were interviewed stated that they are concerned about the uncertainty surrounding CO_2 regulation as it is making it difficult to make critical investment decisions. (Rosnes *et al.* 2011). The survey also found that utilities do not see the potential effects of CO_2 regulation to be

entirely negative. Cited was the possibility for enhanced company reputation as a result of action on climate change legislation. More than half of the utilities surveyed also said that they expect demand for clean energy to create opportunities for increased revenue.

Fulton *et al.* (2011) find that "investment data shows that project investment in clean energy in the U.S. is not as large and is not growing as fast as other regions." While it has rebounded since the lows of 2009, China and Europe are far outpacing the United States. This said, the U.S. is still the primary area of focus for venture capital and expansion stage private equity investors. Venture capital firms have a strong tendency to invest in the United States, but generally seek to deploy clean technology worldwide, in areas with policy regimes that show more transparency and certainty (Fulton *et al.* 2011).

2.1.4 Rest of the world

Ostrom (2009) describes a "polycentric" approach to climate change when analyzing the current status of global action. While attempts to deal with climate change on the international level have to date been frustrated and ineffective, many argue that the inherent complexity of an issue such as climate change means that tackling the issue at an international level is a task fraught with diverse impediments and thus a lack of success is not unexpected (Keohane & Victor 2010; Ostrom 2009). Some even argue that while an international accord would provide the most cost-effective solution, a so-called polycentric regime is likely to sustain a more effective abatement overall (Barrett & Toman 2010). A polycentric regime is characterised by an absence of a multilateral legal core to the international governance of climate change. Thus a polycentric regime is best defined in terms of what it is *not*, but it is typically understood to include a combination of: (i) bilateral or regional agreements; (ii) domestically initiated programmes; and (iv) local, grassroots initiatives.

The above descriptions of developments in China, the European Union and the United States together constitute examples of a polycentric regime, and further examples from all around the world can be found. As previously mentioned, Australia and Japan are both (slowly) moving towards emissions trading schemes (UPI 2010; Business Green 2010). Switzerland (Federal Office for the Environment 2011) and New Zealand (Ministry for the Environment 2011) already have trading schemes in place. Cities around the world are also taking action, notably through the World Mayors Council on Climate Change (2011).

In the Asia-Pacific, a number of bilateral agreements are in force. The Indian Ministry of New and Renewable Energy (MNRE) has signed twelve bilateral Memorandums of Understanding on behalf of the government, focusing particularly on the provision of energy security. More significantly, the region-wide Asia-Pacific Partnership on Clean Development and Climate (APPCDC) comprises China, Australia, India, Japan, South Korea, Canada and the United States. The Partnership aims to reduce emissions through voluntary public-private partnerships through emphasis on cleaner technology development (Heggelund & Buan 2009). Small island developing countries have taken a very proactive stance, given the unique and significant threat posed by climate change to many islands. The Programme of Action for the Sustainable Development of Small Island Developing States was launched in 1994 and set climate change and sea level rise at the top of their list of concerns (UNGA 1994).

Regarding the remaining BRIC countries, Brazil turned its climate change commitments into national law shortly after the United Nations climate change conference in Copenhagen in 2009. The country's National Climate Change Policy (Ministry of Environment 2007) is far-reaching and industry-wide, presenting 32 emissions reducing activities currently being implemented. This includes the expansion of Brazil's capacity for hydro-electric power generation and the continuation of its National Ethanol Program. However, as the World Resources Institute (Robinson 2010) notes, many of the proposed activities are either "in an early stage of development, recommended rather than mandatory, or lacking specific targets or implementation measures." Meanwhile, there are signs emanating from Russia indicating that the country may be getting closer to implementing more ambitious domestic climate policies (Maron 2010).

2.2 Risk

As established in the preceding section, climate change-related regulations are becoming widespread around the world. Furthermore, companies are not only required to comply with legislation and regulation – existing and potential – set at local, national, regional and international levels, but also with indirect consequences of regulation and business trends (Enviance 2011).

However, drivers pushing companies to act on climate change go far beyond legislative and regulatory measures. Indeed, there is a real need for companies to shed the attitude that managing regulatory requirements is the *de facto* definition of environmental management. Instead, companies must examine how environmental efforts create business risk, as well as opportunity (Enviance 2011). A study by Enviance (2011) into public perception found that companies who calculate environmental risk generally only consider accident-related costs. The report argues that a number of factors are being neglected, such as the effect of a damaged public reputation on sales, stock price and company valuation. As the report notes, the instant availability of information in today's interconnected world leaves companies little space to hide their environmental shortcomings and transgressions. Indeed, the risks are great enough that some companies develop rather comprehensive sustainability strategies that are entirely driven by self-interest. In an interview, one senior sustainability executive insisted that their program was "not about responsibility" – instead, its purpose was exclusively to mitigate risk (Schatsky 2011).

What are some of the well-defined risks presented by climate change, outside of regulation? An obvious one is physical impact, another area that the SEC advises companies to report on

(Enviance 2011). Another tangible risk is presented by the changing demands of customers, who are becoming increasingly aware of their own personal impact on the environment. Failure to respond to this changing demand could mean lost revenue and a damaged reputation. Building a trusted brand is important to every company - Dow Chemical recently conducted a number of surveys of residents close to some of their plants in order to uncover perceptions about the company's impact on the local environment (Dow 2010). Not only does this reveal the company's concern for its public image, but the generally favorable results of the survey indicate the company's proactive approach to improving it. Returning to the American Forest & Paper Association (AF&PA), which has set targets for paper recycling and a reduction in greenhouse gas emissions of a minimum of 15 percent by 2020, it is important to note that good intentions don't always lead to good public image. Although the AF&PA has set targets for the future and already made progress towards achieving them, the association has not been fully successful in insulating itself from risk. Responding to the AF&PA's targets, the Dogwood Alliance, a network of 70 groups seeking to end unsustainable forestry practices in the southern United States, condemned the association's continued support of the Sustainable Forestry Initiative (Environmental Leader 2011b). According to the Alliance, the SFI "allows large-scale clearcutting, the conversion of natural forests to plantations, the use of toxic chemicals and [genetically engineered] trees, and the logging of endangered forests". (Dogwood Alliance 2011) The damage to reputation is only compounded when well-known companies such as Office Depot, Allstate and Symantec publicly announce that they will cease to use the SFI eco-label (Environmental Leader 2011c). While this does not constitute a climate-specific risk, it shows that making strong commitments in one area may do little to insulate you from risk in another.

In terms of some of the well-publicized environmental and societal consequences of climate change, these also have specific risks to business. Food security is a global concern and Lester Brown (2009) argues that food shortages lead to political collapse and failed states, threatening global security and the privilege of conducting business worldwide. A similar argument can be

made regarding the increasing scarcity of water, while the consequences of dwindling oil supplies are well-documented.

These risks are pervasive throughout supply chains and, indeed, companies with large supply chains may see their exposure to risk multiplied many times over. Many stakeholders see suppliers as an extension of a company. Therefore, the environmental shortcomings of a supplier can seriously compromise the reputation of a company and reduce brand value. With supply chains becoming increasingly large and complex, this is an intricate issue to handle and has led to many companies instituting supplier qualification programs and conducting regular audits in order to manage this risk. (E&Y 2010b) Suppliers that fail to meet expectations run the risk of losing business.

Shareholders are taking an increasingly strong stance on climate change, as evidenced by the surging number of climate and environmental resolutions being filed by shareholders in the United States (INCR 2011). Resolutions have been filed with a number of coal, oil and electric power companies, but also with companies in other sectors such as building, real estate, financial services and food firms (Environmental Leader 2011d). The list includes a number of high-profile companies such as Amazon, Dr. Pepper Snapple, Hershey and Time Warner. Resolutions press companies on issues such as water scarcity, sustainable palm oil sourcing, greenhouse gas emissions and renewable energy and have been filed by some of the United States' largest public pension funds and other institutional investors, many of them members of Ceres' Investor Network on Climate Change Risk (INCR) (INCR 2011).

2.2.1 Risks by sector

"All companies are in business to make money. Beyond that, corporate purpose begins to diverge significantly," explains David Schatsky of Green Research (2011). Companies have a wide range of stakeholders with a multitude of opinions and concerns; companies face different conditions, be it in terms of raw materials and natural resources, regulatory frameworks, or a host of other issues. Companies also have very diverse environmental impacts. And likewise, companies identify a diverse range of risks arising from climate change. For a general overview, the Carbon Disclosure Project (2010) considers some of the risks to be identified in various sectors:

Consumer sector

- A likely increase in regulatory requirements, resulting in higher compliance costs and energy prices.
- Increasing frequency of extreme weather events, which may cause disruption and damage to operations and supply chains as well as increased cost of materials.
- Reputational risk to brand image and competitiveness if perceived by consumers as less sustainable than competitors.

Financial sector

- Commercial and financial risks resulting from exposure of investee companies to increased regulation or physical disruption to operations and supply chain.
- Uncertainty of national and international future climate regulation creates a risk to making investment decisions.

Industrial sector

- Increased regulatory requirements such as cap and trade systems.
- Market risks, including demands from customers for lower carbon products and services.

• Extreme weather events could modify sites infrastructures, locations and availability of goods and services.

Information Technology sector

- Increasing regulatory pressures to reduce and report on emissions.
- Increased utilities and material costs as a result of regulatory and physical changes from climate change.

Materials sector

- Increased costs due to regulation.
- Business disruptions caused by extreme weather events.

Telecommunications sector

- Risk of damage to service-availability due to severe weather, such as network disruption.
- Increased cost of energy and fuel due to climate regulation.

The risks identified do not necessarily apply better to one sector than another; indeed, all sectors face risks from increased compliance costs and the potential for damaged reputation. Climate change poses risks for all sectors. In the same manner, many of these risks can be flipped upside down to present opportunities. Indeed, they often seem to be two sides of the same coin. For example, climate change does not just represent a risk to reputation, but if acted on appropriately and in a timely manner, can be utilised to enhance reputation as a leader in the field and increase profit margins. The following section seeks to identify some of these opportunities.

2.3 Opportunity

In the book *Blessed Unrest*, Paul Hawken (2008) tells an enlightening account of millions of organizations worldwide, acting the part of white blood cells in the world's immune system, gradually spreading to drive change up the political ladder. The message of the book is that change trickles up, rather than down, and that civil society can no longer rely on trickle-down politics to effect desired change. Increasingly, many companies appear to be adopting the same viewpoint – realizing that waiting for clarity from policymakers can lead to missed opportunities.

The 2010 Carbon Disclosure Project (CDP) responses appear to suggest that a shift is occurring from a business approach to climate change that is dominated by risk, to one that rather embraces opportunity. The responses showed that nearly nine of ten respondents identified "significant opportunities" arising from climate change, as a result of regulatory, physical or commercial drivers, while slightly fewer than eight in ten respondents identified at least one significant risk (CDP 2010). The CDP 2011 Supply Chain report (CDP 2011) finds that suppliers also increasingly perceive climate change as a business opportunity, with drivers such as brand management, product differentiation and employee motivation highlighted. The MIT Sloan report (Haanaes *et al.* 2011) found that all companies recognize the brand-building benefits of developing a good reputation of acting on sustainability. In terms of concrete action, the CDP (2010) found that the main area of focus is currently energy efficiency improvements, driven by cost saving potential.

Developing efficient products or building a portfolio of carbon assets can represent new revenue opportunities for companies wishing to act on climate change: "Viewing climate change activities as an investment rather than an expense can open doors to hidden opportunities." (E&Y 2010a) The report by Ernst & Young further found that there is a growing level of interest in undertaking revenue-generating climate change initiatives, with nearly half of executives surveyed stating that they intend to explore new ventures in 2011.

According to the State of Sustainability Initiatives (SSI) Review 2010 (Potts *et al.* 2010), the market for sustainable products has experienced a significant expansion over the last five years. Indeed, according to the National Marketing Institute (Ottman 2011), 83 percent of consumers are today some shade of "green" – in the process transforming "what used to be a fringe market that appealed to a faction of eco-hippies to a bona fide \$290 billion industry ranging from organic foods to hybrid cars, ecotourism to green home furnishings."



Figure 2: Green purchasing behaviour in the United States. Data: Ottman 2011

It appears that companies providing consumer goods cannot any longer depend on a "dark green" consumer base to purchase their sustainable products. The market has expanded, attracting a much wider base of consumers that companies must engage – a consumer base constituting 30 percent of the U.S. market, according to research by brand consulting firm

BBMG (2011). While the wider base will help sustainable brands and products enter the mainstream, the report finds that it will also force companies to speed up their adoption of environmental initiatives. According to the research, these consumers are interested in sustainability, but are also practical in their purchasing habits. "New Consumers", as BBMG labels the group, are "defined less by demographics than by shared values"; are twice as likely to try new things; enjoy sharing their opinions online; and reward or punish companies based on corporate practices. Even during the recession, 25 percent are still willing to pay a premium for sustainable alternatives (BBMG 2011). Summarizing the results of the research, BBMG's Chief Strategy Officer Raphael Bemporad stated:

For brands to take sustainability to scale, they can no longer rely on the dark green consumer. Instead, they need to engage New Consumers, who are just as concerned about the environment but also realistic about factors like price, performance, convenience, health and safety.

H&M appears to be making a sincere attempt at taking a share of this new opportunity. According to the retailer, it will debut a range of environmentally friendly fashion this spring (Environmental Leader 2011e). "The Conscious Collection", available to men, women and children, is manufactured from sustainable materials including organic and recycled fibres. H&M is definitely seeking to repair a somewhat tarnished reputation as its environmental credentials were heavily damaged when it was caught destroying new, unsold garments in January 2010. The retailer has since pledged to donate all unsold clothing to charity (Dwyer 2010). Regaining the trust of consumers is vital: BBMG (2011) found that once "New Consumers" find a product they believe that they can trust, they become fiercely loyal.

Companies like H&M are inspecting their supply chain, which can provide plentiful opportunity to leverage environmental impact and improve their image, competitive advantage and reduce both cost and waste (E&Y 2010b). Transportation and logistics are also a common target area for improvement. GPS navigation has in recent years allowed for optimizing routes. Some companies like UPS (Environmental Leader 2011f) are also incorporating hybrid and alternative energy vehicles into their fleets in a further effort to reduce their greenhouse gas emissions.

2.3.1 Opportunities by sector

As with the previous section on climate change risk, let us consider some of opportunities that can be identified in various sectors:

Consumer sector

- As mentioned above, increasing environmental awareness among consumers has lead to a greater demand for low-carbon products.
- Cost savings can be found through energy efficiency measures in operations, particularly pertaining to buildings, utilities and transportation.

Financial sector

- New revenue streams are being established through financing climate change mitigation and adaptation. This includes low-carbon technologies and renewable energy, carbon markets and energy efficiency.
- Increased revenue opportunities from climate-related products and services, such as emissions trading and consulting services.
- Demand for risk transfer due to climate change provides a business opportunity for the insurance sector.

Industrial sector

• Revenue streams can be increased from a growing demand for energy efficiency products and services.

 A competitive advantage is to be had for those early-movers that can adapt their businesses to new legislation, improve cost management and reputation with customers. Opportunities may also arise from carbon trading by selling surplus permits, for example under the EU ETS.

Information Technology sector

- There is a need to integrate carbon considerations into a host of products, such as performance management systems, smartgrids and carbon trading applications.
- Dematerialisation, replacing hardware with software.

Materials sector

- An increased demand for resources and products to growing markets in the low-carbon economy.
- A competitive advantage is to be obtained by companies that can pioneer efficient, low-cost, low-carbon processes.

Telecommunications sector

• Demand for virtual interaction may increase in light of new regulations aiming to curb carbon emissions. (CDP 2010)

Reckitt Benckiser, a household and cosmetic product manufacturer selling approximately six billion items a year including products under the Clearasil, Finish and Calgon brands, has recently announced that it is more than halfway to achieving its 2020 carbon reduction goal, two years after setting the target (Environmental Leader 2011g). Reckitt Benckiser has been targeting the entire lifecycle carbon output of its products, including production, travel and emissions embedded in raw materials and packaging. The company also has its own carbon offset project
(Reckitt Benckiser 2011). As the biggest contributor to the carbon output of Reckitt Benckiser's products is in fact consumer use, accounting for 70 percent of emissions, the company has also concerned itself with how consumers use their products and dispose of them. Therefore, the company's efforts to reduce its emissions have even included an online campaign which instructs customers on how to most efficiently use their products. This platform for communicating with its customers provides a further example of a company that is grasping the opportunity to build relationships with customers, through appealing to their sense of environmental responsibility.

3. SERVICE NEEDS

In the previous section we presented the findings of the unstructured observation, uncovering some of the major drivers behind corporate action on climate change and grouping them into three broad categories of *Increased regulation*, *Risk* and *Opportunity*. Section 3 presents the findings of the *structured observation*, which focused in on how the previously identified drivers have manifested themselves in concrete action, and the supply of expert services that has emerged in response to the resulting demand.

3.1 Energy efficiency

3.1.1 Focus on energy efficiency

The results of the Carbon Disclosure Project 2010 (CDP 2010) found that energy efficiency is the main area of focus of companies acting on climate change. A 2010 study by Gartner (cited in Clark 2011) also found that the environmental initiatives of companies tend to focus on energy efficiency, but the study moreover uncovered that energy efficiency is considered a higher priority than other initiatives, including the reduction of greenhouse gas emissions. This highlights the stark reality that energy efficiency improvements are very much an opportunity for businesses. "Doing more with less" can be applied to business without an ounce of environmental concern – energy efficiency simply makes good business sense. The benefit of being perceived to be acting on climate change when improving efficiency and cutting costs is an added bonus. As Dave Laybourn of Lime Energy points out (2011),

It is much easier to talk to executives about energy dollars instead of BTUs and kilowatt-hours [...] With competing and confusing messages about climate change, cap and trade, sustainability, green supply chain, etc., the simple message of saving money remains the compelling reason to save energy.

If we return to the discussion of drivers, we quickly recognize that the service area of energy efficiency is more or less non-dependent on regulation. Little incentive is required from government to act on something that makes good business sense. A recent poll by Harris Interactive on behalf of Schneider Electric (Environmental Leader 2011h) found that 88 percent of executives feel a "moral responsibility" to cut energy use, "beyond simply the ethical imperative to follow regulatory requirements." Unsurprisingly, the majority (61 percent) of respondents cited cost savings as being their strongest motivator – well beyond the 13 percent who claimed it to be environmental concerns. Passing up on the opportunity to increase energy efficiency just doesn't make sense.

Examples exist virtually *ad infinitum* of companies saving vast amounts of money through energy efficiency improvements. Recent examples include U.S. telecommunications company AT&T, who as recently as March 2011 announced that they had found \$44m in annualized energy savings through implementing over 4,000 energy efficiency projects at its facilities in 2010 (EL 2011i). Energy efficiency is not a concern that is held exclusively by large multinational companies and the industrialized world - in fact, a 2010 study by Johnson Controls (cited in PR Newswire 2010) found that energy management is a higher priority in regions like China and India than it is in Europe or North America. Globally, investments in energy efficiency and management constitute the vast majority of climate revenue (De Lima & Sumon 2010) and despite regulatory uncertainty, this investment seems destined to rise (Norton Rose 2010). Indeed, in the utility sector alone, nine out of ten executives expect budgets for energy efficiency to increase by at least ten percent; 22 percent of respondents expecting increases of 20 percent or more. In February 2011, Dow Chemical announced that it is investing \$100m in energy efficiency and conservation improvements through an internal competition - encouraging its business units and manufacturing sites to get pro-active and present projects; the capital being awarded to the projects anticipated to have the greatest impact in key performance areas (Environmental Leader 2011j).

3.1.2 Energy and carbon management software

A significant service need that has emerged is that of energy and carbon management software. A report by analyst firm Verdantix (2011a) has found that the spending of large U.S. companies on carbon and energy management software is likely to grow to \$558m in 2014 – constituting a quadrupling of the sector's value in 2010. According to the study, the market will experience a 51 percent compound annual growth rate between 2010 and 2014, starting from a base of \$108m. The study believes that growth will be fuelled by improved economic conditions and an overall increase in the spending of companies on sustainability. The sectors leading the spending list in 2011 will be oil and gas, telecommunications and utilities (see Figure 3 below). AT&T, mentioned above to have found \$44m in annualized savings, realized \$614,000 a year of savings by deploying desktop power management software on 169,000 computers (Environmental Leader 2011i).



Figure 3: Spending on energy and carbon management software Data: Verdantix 2011a

A 2010 report by Verdantix (2010) identified CA Technologies, CarbonSystems, Enablon, Enviance, Hara, IHS, ProcessMAP, SAP, TRIRIGA and Verisae as the top ten leaders in the market.

The software provided typically allows companies to achieve energy and cost savings by monitoring, measuring and analyzing resource efficiency and tracking greenhouse gas emissions. United Natural Foods (UNF), a national distributor of natural, organic and specialty foods in the United States, recently selected Hara's Environmental and Energy Management software to allow them to achieve energy efficiency and greenhouse gas reductions (Environmental Leader 2011k). Hara's platform will allow UNF to aggregate data, establish baselines and track reduction targets across facilities including warehouses, factories and offices. The software also enables UNF to track and prioritize cost-saving energy and environmental initiatives such as waste diversion, renewable energy credits and use of on-site renewable energy. A further example is that of a new assessment service for IT energy audits, recently launched by Orange Business Services (EL 2011I). Helping companies to understand the composition of their energy budget, the service monitors and manages how much energy is being consumed by devices and systems, including desktops, laptops, monitors, servers, copiers, lighting systems and heating, venting and air conditioning (HVAC). Orange claims that the service can allow companies to reduce energy consumption and carbon emissions by up to 60 percent (Environmental Leader 2011).

3.1.3 Clean energy

Many companies are also making significant investments in clean energy. Wind remains the main sub-sector in cleantech energy generation, but solar has recently been attracting more investment than any other sub-sector (Norton Rose 2010). A survey by Norton Rose (2010) found that political and regulatory support from governments, including financial incentives, are crucial to the continuing growth of the cleantech sector. In this regard, Europe is perceived as offering the greatest incentives for investment. The purchase of renewable energy credits (RECs) is becoming increasingly popular among large, energy-intensive companies. Intel recently increased its annual green power purchases by 75 percent (Environmental Leader 2011m) and ranks top in the U.S. EPA's ranking of Green Power Partnership companies (US EPA 2011a). The company will purchase 2.5bn kWh of RECs in 2011. Kohl's, the only other company on the EPA's list using over one billion kWh of green energy is one of fourteen organizations in the top 50 to buy RECs covering 100 percent or more of their energy use (US EPA 2011a). The others buying 100 percent green energy include Whole Foods, the World Bank Group and financial services company ING. Combined, the top 50 uses over 13.5bn kWh of green power a year, relative to 19.2bn kWh across all Green Power partners (US EPA 2011b).

Companies are also taking more direct approaches to investing in clean energy. Intel, in addition to purchasing 2.5bn kWh of RECs, has also recently installed nine solar installations across the United States and in Israel, generating a combined 3.8m kWh per year (Environmental Leader 2011m). Home furnishings retailer IKEA has solar energy systems already operational throughout the United States and plans further solar rooftop installations in New Jersey and Massachusetts (Environmental Leader 2011n). The company is also installing a geothermal system in one of its shops in Colorado (Environmental Leader 2010a) and plans to build a wind farm to supply electricity to its seventeen shops throughout Sweden (Pfalzer 2011). Similarly, U.K supermarket retailer Tesco has installed wind turbines at three of its grocery distribution centers. According to the company, the turbines will prevent emissions of approximately 3,200 tons of CO_2 every year (Business Green 2011). The company plans to achieve carbon neutrality by 2050, but has seen its targets blown out of the water by rivals Co-Operative Group, who hope to go carbon neutral as early as 2012 (The Co-Operative Group 2011).

Airports are also getting in on renewable energy generation, often being in possession of good potential for using undeveloped land. For example, Indianapolis International Airport is at the time of writing looking to develop a 10MW solar array on hundreds of acres of undeveloped land (Environmental Leader 2011o). The installation is expected to generate enough electricity for 6,000 homes – and generate revenue of over \$190m over 30 years for the airport. Already, airports in Denver and Fresno have installed solar power facilities near runways on land unsuitable for development (Environmental Leader 2011o).

3.1.4 Transportation and logistics

Transportation and logistics is a further target area for improvement and constitutes another service area. Savings can be made through route optimization, which in the past decade has been made easier through GPS navigation. Furthermore, many companies are adding hybrid and alternative energy vehicles to their fleets (E&Y 2010b). FedEx, the global logistics services company, has reduced its aviation emissions intensity by over eight percent while increasing vehicle efficiency by 14.1 percent (FedEx 2009). Competitors United Parcel Service (UPS) has invested in trucks running on liquefied natural gas (LNG) and expects the new vehicles to produce 25 percent fewer greenhouse gas emissions than the diesel trucks they are replacing. The company now has nearly 2,000 vehicles running on alternative fuel, including 1,100 running on LNG or compressed natural gas (CNG) (Environmental Leader 2011f).

CEU eTD Collection

In Section 2 we briefly discussed the EU's recent efforts to curb the emissions of the shipping industry. Perhaps in partial response to impending legislation, the Danish shipping company Maersk Line has recently unveiled plans to build a fleet of container ships that will emit 50 percent fewer emissions compared to the industry average. According to the company, the fleet will be the world's largest and most energy efficient, saving approximately 2.5 tonnes of CO_2 per container on a one-way trip between Rotterdam and Shanghai (Environmental Leader 2011p). In the aviation sector, which will as of 2012 be included in the EU ETS, Boeing believes that

biofuels will be essential to the industry's progress in addressing greenhouse gases. Antonio de Palmas, Boeing's President for EU and NATO relations, explained in an interview with EurActiv (2011) that although the basic technology for using biofuels is in place, further research is required to optimize efficiency. Availability of biomass is according to de Palmas the industry's biggest challenge:

Clearly, we don't know how much biomass with be available in – let's say – two years from now. And based on that, airlines cannot predict that they can have 'X' amount of biofuels available for their operations in 2013.

In the meantime, Boeing unveiled in February 2011 the new 747-8 Intercontinental passenger jet, which according to the company provides sixteen percent better fuel economy and also produces sixteen percent less carbon emissions per passenger than its predecessor, the 747-400. Some airline companies are applying innovative thinking to the challenge of reducing emissions: easyJet is applying a nano-technology coating on eight of its aircraft during a twelve-month trial, in a creative effort to improve fuel efficiency. According to the company, the coating could trim fuel consumption down by two percent (GreenBiz 2011). Such initiatives are welcome news to a global transportation sector that as a whole is lagging behind other industries in terms of setting goals to reduce carbon emissions.

Brand image, which was discussed above as a major driving force for companies to act on climate change, often relates to rival efforts of companies in one sector or industry. The car rental industry has for some time proven an encouraging example of environmental initiatives driven by the opportunity to differentiate – and the risk of falling behind (Environmental Leader 2007).

3.1.5 Facilities

Buildings in Europe and the United States are widely cited to be responsible for approximately 40 percent of energy consumption. As such, facilities have become the target for improvements

such as more efficient lighting, heating, ventilation and air conditioning (HVAC). Indeed, a large green building market has emerged. In the United States alone, the market is projected to increase from \$71.1bn to \$173.5bn from 2010 to 2015 (Environmental Leader 2010b).



Figure 4: Projected US total green building market value Data: Environmental Leader 2010b

Convenience chain 7-Eleven has unveiled plans to open 100 "eco-friendly" stores in Japan (Krieger 2011). The stores will be equipped with light-emitting diodes (LEDs) and roof-mounted photovoltaic panels. The company says that it aims to eventually make the same changes across all of its stores in Japan.

Energy service companies (so-called ESCOs) in the United States experienced a rapid rise in the 1990s as a result of the deregulation of energy markets. ESCOs typically analyse properties, implement energy savings projects and also maintain the systems that they put in place.

3.1.6 Energy-efficient products

A further service area relates to the boom in development of energy efficient products, such as Boeing's 747-8 Intercontinental passenger jet. The IT sector in particular is making significant inroads into energy efficiency, as well as the automotive industry which is under particularly high public scrutiny. IT company Dell has since 2008 cut its customers laptop- and desktop-related energy costs by 25 percent or more. The company has achieved these results by integrating energy-efficient technologies including circuit designs and transitioning to LED displays throughout its product line of laptops. According to the company, their 15-inch LED displays consume 43 percent less power at maximum brightness compared to cold cathode fluorescent lamp (CCFL) technology (Environmental Leader 2010c). Competitors Hewlett-Packard claim to have achieved a 50 percent improvement in product energy efficiency, when comparing a range of HP products from 2005 with its latest models (Environmental Leader 2011q).

3.2 Supply chain management

As discussed in Section 2, a number of forces can be identified, encouraging companies to expand sustainability programs to their supply chains. Increased regulation compelling greenhouse gas tracking, changing customer preferences leading to demand for differentiated products, various supply chain risks towards reputation and brand value, and the potential to reduce costs, are all good examples.

In a large number of sectors, the biggest part of a company's environmental footprint is found throughout the supply chain, outside of the direct control of the company. Activities with large impacts often include processing, packaging and transportation. Indeed, according to the Carbon Disclosure Project (CDP 2011), over 50 percent "of an average company's carbon emissions are typically from the supply chain rather than within its own four walls." For a retailer like Staples, an office supply chain store with over 2,000 shops worldwide in 26 countries, the figure is over 90 percent (Buckley 2011). The supply chain is for many companies the area with greatest potential for significant impact.

As we have seen, the drivers behind supply chain management go far beyond reducing costs and helping the environment. Instead, it now has a strategic role to play in an increasingly competitive landscape (E&Y 2010b). As a result, the accuracy in monitoring, measuring and reporting results to stakeholders is becoming increasingly important (E&Y 2010b). For companies that have instituted some form of green supplier program, new processes to track and monitor the compliance of suppliers is necessary (E&Y 2010b). Long-term scenario planning may also be required to account for the potential adverse effects of climate change in susceptible areas.

While we have established that drivers are in place to motivate companies to green their supply chains, how do they go about motivating their suppliers? A number of differentiated levers must be used, depending on supply and demand. Ultimately, suppliers respond much better to business drivers than appeals to pure altruism, but companies must be aware of the power dynamic between themselves and their supplier. Redesigning products, reducing demand for carbon intensive purchases and working collaboratively with suppliers to cut emissions are all examples of potential levers. Most drastically, companies can also threaten to cease doing business with a supplier. Internally, companies can extend responsibility for carbon management to employees, setting climate change targets and issuing incentives towards achieving these (CDP 2010).

Previously mentioned Staples is challenging 23 of its key suppliers in what they call a "Race to The Top", encouraging suppliers to compete in finding ways to reduce emissions and waste (Buckley 2011). The company has also enrolled in the Rainforest Alliance's SmartSource program, thus committing itself to analyzing and improving the environmental and social footprint of its paper products (Rainforest Alliance 2009). The company is also rewarding its most successful suppliers – recently bestowing on Domtar its Staples Supplier Soul Award (Environmental Leader 2011r). Walmart, which has set itself a voluntary target of reducing its

emissions by 20Mt by 2015, as a major customer of thousands of suppliers, has through its target given strong incentives for environmental and social action in a wide range of industries – whose companies will require services to assess their facilities and implement effective emission reduction activities. In the automotive industry, Honda has extended its environmental purchasing guidelines to cover its suppliers globally (Honda 2011). Its revised guidelines include product fuel efficiency and the management of greenhouse gas emissions throughout all areas of corporate activities. Finally, Procter & Gamble (P&G) has launched a sustainability scorecard to measure the performance of its suppliers, in similar fashion to Walmart's sustainability index. The scorecard assesses P&G's suppliers on energy and water use, waste disposal and greenhouse gas emissions. P&G hopes that its rating system will encourage environmental improvements in much the same way that Walmart's sustainability index affected them: it has been estimated that Walmart's packaging initiative cost P&G as much as \$200m (Neff 2007). P&G's global supply chain represents approximately 75,000 businesses – all of whom are also encouraged to apply the scorecard within their own supply chains.

Despite strong incentives to reducing emissions throughout the supply chain – and the considerable power of large companies such as Walmart and P&G – supplier carbon reduction does still not meet global reduction requirements, according to the Carbon Disclosure Project (CDP 2010). In its annual survey, it was found that only one third of responding suppliers have set a target for carbon reductions – and that these targets are way off the mark. However, in comparison to 2009, suppliers have shown improvement in terms of reporting and board level responsibility. Crucially, there also appears to be a shift in understanding carbon management as a cost and revenue opportunity, as opposed to a risk management activity (CDP 2010).

3.3 Life-cycle assessment

The ever-growing list of companies implementing one form or another of green supplier program has placed focus on the cradle-to-grave lifecycle impact of products and services.

Companies seeking to slash their carbon footprint are increasingly interested in investigating each step of the lifecycle of their products and services, from the sourcing of materials to final disposal (E&Y 2010b).

Verdantix (2011b) reports that over a dozen suppliers have entered the LCA software market over the past two years and investors put over \$20m into new ventures and growth capital for existing players in 2010. Despite this, demand for LCA software has so far been unstable; the market suffering from lack of direction and low price points. However, demand is expected to increase in the short-term due to regulations on Scope 3 emissions reporting.

The green shoots of demand for product LCA solutions are just starting to poke through a muddy patch in the market. Growth will continue to evolve slowly in 2011 until more powerful market drivers boost demand in 2012. Our research suggests that product LCA software will remain a niche market. Rodolphe d'Arjuzon, Director, Verdantix (Environmental Leader 2011s)

The report identifies Europe as the leader for setting standards for product sustainability; regulations such as the EU's Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) and France's Bilan Carbone, have made strong contributions in advancing the LCA software market. As we discussed regarding their supply chain management, large companies have an important role to play in terms of stimulating demand. Unilever has already for some time been performing product LCA studies on a number of its products (Verdantix 2011b). The trend in tracking lifecycle emissions has also given rise to a set of international guidelines. In 2009, the World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD) developed a product lifecycle accounting and reporting standard. The guidelines provide companies with a consistent method to inventory emissions associated with individual products throughout their entire lifecycles (E&Y 2010b).

Asheen Phansey of DS Solid Works (Environmental Leader 2011t) argues that manufacturers should use the most rigorous lifecycle assessment tools available to them as soon as possible.

Lori Gustavus (2011) of Carbonostics agrees, but stresses the importance of screening products lifecycles for embedded carbon in order to identify hotspots – avoiding the risk of making negligible impacts despite significant investments.

The Sustainable Apparel Coalition, launched in March 2011, includes nearly 30 manufacturers, a number of non-profit organisations and the U.S. EPA. Among the manufacturers are Nike, JC Penney and Levi's. The aim of the coalition is to reduce the environmental and social impacts of apparel and footwear products and the coalition has already established an Apparel Index, which members and their suppliers were scheduled to begin testing in April 2011. While the index is not meant for consumers due to the complexity of calculating a clear and readily understandable scoring system, it is hoped that it will drive improvements throughout the industry. The index employs indicators covering the entire life cycle of apparel, ranging from materials and manufacturing through to packaging, transportation and end of life. Environmental categories include energy, greenhouse gases, water quality, water use, toxics, waste, land use and air emissions (Environmental Leader 2011u).

The potential benefits to conducting an LCA are not held exclusively by companies. Governments can also find significant savings from conducting thorough analyses of the lifecycle impacts of several options. The U.S. Interstate Highway System, built in the years following the Second World War, is sixty years later in need of investment. The system, which was built for a country that at the time had a population of 150 million Americans, is now required to support a population twice as large. It is estimated that the country's traffic and bad roads waste 10.6 billion litres of fuel every year, representing a large source of greenhouse gas emissions that could be avoided (Becken 2011). The Massachusetts Institute of Technology's (MIT) Concrete Sustainability Hub has conducted research that suggests that from a lifecycle perspective, paving with concrete will create significantly higher fuel savings for passenger vehicles than paving with asphalt – and achieve noteworthy reductions in carbon emissions over the life time of the roads (Becken 2011).

3.4 Data collection

Strongly related to supply chain management and life cycle assessment is the issue of data collection, which is imperative to the successful implementation and execution of both. The area of data collection and its accuracy is one that still requires improvement. The Carbon Disclose Project (2010) finds that most suppliers report a level of uncertainty in their emissions reporting, due in particular to data gaps, assumptions, extrapolation and measurement constraints. For the supplier, it is also challenging to allocate emissions to a single customer.

Some sectors are better than others in terms of collecting data. A poll by software provider Enviance found that among energy and utility companies, the majority have no systems in place to measure carbon emissions (Environmental Leader 2011v). Worse, perhaps, are small to medium businesses (SMBs) who often do not have the capacity to effectively manage vast quantities of data. Stuart McComb (2011), drawing from his experience in Australia, notes that while data collection and reporting is very much on the agenda of companies, they often tend to take a back seat to the day-to-day business. He finds that data collection is often relegated to a reactive management approach and that sustainability responsibilities are often given to inexperienced employees: "Largely these sustainability responsibilities are not part of their job description or performance reviews and they tend not to have a great knowledge of the field of sustainability and GHG reporting." Such an approach to data undermines the companies' abilities to drive good business practice and find significant financial returns.

Maersk Line recently claimed to be the first shipping company to have its greenhouse gas emissions data independently verified (Environmental Leader 2011w). This said, while the Carbon Disclosure Project (2011) found that 61 percent of respondents have their emissions data verified, it noted with caution that this can mean a wide range of things: from a rigorous and comprehensive examination to a simple series of interviews.

3.5 Information

The need for accurate and reliable information is self-evident and largely taken for granted. To discuss the service area of information provision, we examine the financial industry, which has a particular interest in sound information across the board – and very specific requirements depending on the financial service.

If we begin by considering asset allocation, we can determine that the traditional approaches that inform decision-makers do not account for climate change risk. Strategic Asset Allocation (SAA), which is a key component of the portfolio management process, can by some estimates account for over 90 percent of the variation in portfolio returns over time (Guyatt *et al.* 2011). These traditional approaches rely on the analysis of historical, quantitative data – a method by which it is largely infeasible to account for climate change risk. Particularly considering the lack of clarity in the current climate policy environment, as well as uncertainty around the full economic consequences of climate change, historic precedent contributes little when trying to predict future performance. Rather, to account for climate change risk, the addition of qualitative, forward-looking inputs are required (Guyatt *et al.* 2011).

According to research by consulting firm Mercer (Guyatt *et al.* 2011), climate policy could be responsible for up to 10 percent of overall portfolio risk; presenting a significant risk to be managed by investors. According to the report, investors should diversify across sources of risk as opposed to across traditional asset classes, presenting a completely new approach for investors:

The short-term horizon of traditional equity and bond investments means that it will be more difficult for investors to price in long-term risks around climate change compared to some of the more climate sensitive assets. Consequently, the traditional way of

The report concludes that climate risks could in fact best be managed by increased allocation to assets more sensitive to climate change. The report argues that under some scenarios, it is likely that the best manner in which to manage portfolio risk associated with climate change is to increase exposure to those assets with a higher sensitivity to climate change: "...selected investments in climate-sensitive assets, with an emphasis on those that can adapt to a low-carbon environment, could actually reduce portfolio risk in some scenarios." Recognizing this opens up the prospect of investors interests aligning themselves to serve their financial interests as well as tackle the challenge of climate change by increasing investment in mitigation and adaptation efforts (Guyatt *et al.* 2011). An example of an institutional investor that is addressing climate change risk is the California State Teacher's Retirement System which, holding \$131.9bn in assets, has instructed its active equity and fixed-income managers to factor climate risk into investment decisions (Burr 2010).

It is imperative to financial institutions that they have access to reliable information to aid them in managing climate risks in their business portfolios. The information required is of a wide variety – ranging from predictions to analyses and interpretation. To assist them in their decisionmaking process, the information also needs to be appropriate to the duration of contracts, regions where customers hold assets or undertake operations, and the hazards that are material to the operations of borrowers, investees and the insured. A survey by the UNEP Finance Initiative and the Sustainable Business Institute (SBI) asked 60 financial service providers about the information requirements of the financial sector (UNEP FI 2011).

Taking into account the degree of uncertainty regarding the potential physical impacts and economic consequences of climate change, the financial sector remains uncertain about the implications of climate change-related risks and how they will affect financial firms and their clients. There is a real need to reduce this uncertainty, requiring a large input of information in order to make reliable predictions. On the basis of such information, financial institutions would better be able to improve risk identification, assessment and management systems. This information will need to be customised according to the needs of the financial institution, on the basis of factors such as type, location and customer base. The UNEP survey found that financial institutions consider location to play a particularly important role, not only in terms of predictions regarding physical impacts of climate change, but also in terms of the subjective perception of climate change risks by companies, which can in part be explained by differences in the extent to which climate change is already apparent in different parts of the world (UNEP FI 2011).

Financial service providers currently rely on a variety of sources for the information that they require on climate change: in-house research, academic research, consultants, seminars, international organisations, government agencies and the media. Insurance companies tend to obtain information from insurance associations and reinsurance companies. The insurance sector as a whole has developed it own in-house weather models. Despite this, the UNEP survey found that financial institutions desire more user-friendly information, with current sources often providing information that is not specific enough to base decisions on. The survey also found that there is a lack of consistency in the perception of the quality of data, suggesting a "wide range of different information needs about the impact of climate change" (UNEP FI 2011).

Half of the respondents to the UNEP survey feel that the level of information today on historical weather data and climate change predictions is insufficient. This view is echoed in a report by the U.K. government's Committee on Climate Change (2010), which found that businesses in the United Kingdom feel that they have inadequate access to useful weather data and climate projections, thereby preventing them from properly managing climate change risk. The UNEP survey found that another strong concern of financial institutions is the lack of sector-specific

information. A lack of knowledge of how different client segments and economic sectors will be affected by climate change prevents financial service providers from assessing whether or not appropriate adaptive measures are being taken.

3.5.1 Insurance

The financial service of insurance and reinsurance requires the precise identification, quantification and pricing of risk. Climate change creates new demand for risk transfer, and further space for new insurance markets and products. Indeed, providing risk transfer products, including covering the losses from natural disasters, is a traditional business area for insurance companies who are experts at identifying, quantifying and pricing weather-related risks. However, changing climate patterns create new challenges, not least due to changing variations in the frequency, intensity and regional occurrence of extreme weather events (UNEP FI 2011). According to the UNEP survey, insurers are already recording significant variations from historical experience and data and expect these changes to only increase in the future.

Of the eleven insurers surveyed, the UNEP FI (2011) survey found that ten have already recorded an increase in weather-related damages, while all respondents expect these to increase further. Eight respondents reported an accumulation of this type of risk while nine expect them to increase. Seven of the eleven have recorded a demand for additional risk transfer capacity and all but one expect demand to continue to rise. The survey also found that the majority are already seeing amendments to existing insurance products and the development of new insurance products. In both cases, respondents expect this trend to continue. The response of insurance companies, including the modification and development of new products, is still at an early stage. However, it does indicate that the insurance industry "is taking a systematic and proactive stance" on climate change (UNEP FI 2011). Indeed, changing climate and in turn increased weather-related risks can be seen as very much an opportunity for the insurance sector, opening up new markets and providing space for new insurance products. Insurance companies best

positioned to seize new opportunities brought about by climate change will be those that are able to identify, quantify and price risk – their ability to do so being enhanced through access to reliable and relevant information.

3.5.2 Lending

Providing financing to households, public agencies, individuals firms, specific projects etc. requires credit risk assessment and due diligence. This said, the identification and management of climate change-related risks are not competences that are traditionally found in banks. The UNEP FI (2011) survey found that lenders often rely on insurers to accept these types of risks on their behalf. The survey found that less than half of respondents (from a sample of 35 lending institutions) feel that credit transactions are today affected by an accumulation of risk, changing risk patterns or increased credit losses, as a result of the direct, physical effects of climate change. However, the vast majority responded that they believe that they will increase in importance (UNEP FI 2011). Meanwhile, two-thirds of respondents considered reputational risks to be relevant already today. Approximately one-quarter of respondents claimed to "systematically always" integrate the direct, physical effects of climate change and risk management procedures. Over one-third claimed to do so "but only in exceptional cases." A further one quarter responded that they plan "to do so in the future." (UNEP FI 2011)

3.5.3 Asset management

The physical effects of climate change have as yet not in any systematic way turned into significant financially relevant consequences. As a result, the asset management branch is somewhat less familiar with climate change as a risk to their business. Much the same can be said of lenders, who as we discussed, have not made it a regular business practice to integrate climate change in their operations.

When an asset manager buys shares or bonds of a listed company, often a multinational corporation, it is not always feasible to analyse the physical risks of the many locations that the

company operates in. Consequently, asset managers will generally rely on highly aggregated information or self-reporting by companies (UNEP FI 2011). At the present time, asset managers seem to rarely integrate the direct effects of climate change when conducting their due diligence and picking stocks. While some respondents claimed to incorporate sustainability performance or environmental impact of a firm during their investment process, aspects of climate change are generally only a small element of corporate sustainability performance indicators.

The UNEP FI survey (2011) of financial institutions found that climate change impacts are of high relevance to the financial sector and that information needs to be improved to enable the sector to improve its ability to calculate risks. Therefore, greater climate expertise is required, specifically the translation of scientific knowledge into user-oriented and applied information as well as consulting services. The survey found a strong demand for applied research and information that is tailored to specific sectors and geographies, rather than actual scientific information about climate change. In addition, insurance companies are also highly interested in studies about the market potential for new and/or modified insurance products (UNEP FI 2011).

The demand for information services has presented a significant opportunity for applied research institutes and other information providers, risk management and adaptation consultants, environmental experts, financial analysts etc. Clearly, climate expertise is becoming a factor in competition and success within the financial sector and the demand is being met by a host of suppliers from different backgrounds and expertise.

3.6 Environmental reporting

The accuracy with which companies monitor, measure and report the results of their climate change actions is becoming increasingly important to a wide range of stakeholders. Companies are becoming very aware of this growing demand, particularly for the transparent reporting of climate change business strategies, initiatives and performance. Establishing effective monitoring, reporting and verification systems (MRV) has become of utmost importance in response to regulatory requirements and stakeholder expectations (E&Y 2010a). Environmental reporting as a method of communication with stakeholders also presents opportunities: a chance to distinguish from competitors and gain a competitive advantage. In the construction industry, companies are already finding that pre-qualifications and tenders are increasingly including criteria relating to climate change, such as the embodied carbon of materials used (Westaway 2011).

A poll commissioned by the Global Reporting Initiative (GRI) found that the vast majority of readers of sustainability reports find that sustainability reporting as an activity in itself is a good indication that a company is improving its performance on sustainability measures (Environmental Leader 2011x). The poll also found that 60 percent of report readers feel that reading such a report influences them positively in their commitment and connection to an organisation. Over half of the respondents use sustainability reports in aiding investment and purchasing decisions. Clearly, there is a lot to be gained from reporting accurately on sustainability – even though 65 percent of companies producing sustainability reports claim that the improvement of internal processes is the main driver behind reporting.

A survey by Ernst & Young (2010a) found that 64 percent of respondents already provide reporting of the greenhouse gas emissions data in an annual corporate social responsibility (CSR) report or sustainability report – and this number is expected to increase, particularly in response to stakeholder demands and regulatory requirements. The Carbon Disclosure Project (CDP), currently in its tenth year, is a high-profile, third-party measure of how companies are responding to climate change. 3,000 organizations from around the world voluntarily measure and disclose their greenhouse gas emissions. The CDP's annual questionnaire is sent out to companies around

the world on behalf of 534 institutional investors as of 2010, holding \$64 trillion in assets under management. The profile of the CDP was significantly enhanced in 2010 when Google added the CDP scores of companies to the "key statistics and ratios" section of its Finance pages. A new initiative by the CDP called the CDP Supply Chain program is a collaboration of approximately 50 global companies who have agreed to engage their suppliers in their greenhouse gas reporting – thus expanding the initiative to even more companies and organisations (CDP 2010). The CDP offers a global framework within which to report greenhouse gas emissions, and allows companies to benchmark their efforts against peers (E&Y 2010a). In 2010, 82 percent of the 500 largest companies in the world responded to the CDP questionnaire, an increase from 77 percent in 2008. The number has increased every year since the CDP's inception, reflecting increasing recognition not only of the influence of the CDP, but also of climate change as a significant concern to stakeholders (Christensen 2011).

The CDP questionnaire asks companies to provide the details of their greenhouse gas emissions performance trends, their goals for reducing emissions over time, information about their climate change governance, assessment of risks and opportunities related to climate change, and the company's strategy for addressing these (Christensen 2011). These responses are then evaluated by the use of a pre-defined scoring method and the scores are made public. The top scoring companies of each sector receives a place on the Carbon Disclosure Leadership Index. While the CDP has until recently given scores based exclusively on the quality and completeness of companies' disclosures, the CDP in 2010 introduced a new performance score which assesses a company's commitment to and achievement of performance improvement in relation to climate change. This score takes into account factors such as the integration of climate change risks and opportunities into business strategy, the implementation of emission reduction targets and the verification of emissions data. A corresponding Carbon Performance Leadership Index has been established to highlight sectoral leaders. The establishment of this index is an important move in

evolving the CDP from a program driving transparency, to one that induces meaningful action to achieve emissions reductions.

However, the task of producing environmental reports and disclosing emissions is a challenging one for environmental managers from all sectors and businesses. Transparent reporting increasingly requires the reporting of enormous amounts of data, as discussed in the section above. As Michel Gelobter of Hara explains, environmental monitoring used to focus largely on significant events and confined measures of pollution. Nowadays, however, companies find themselves needing to measure outputs in the millions of tons and bring together information from all aspects of their operations, from all around the world. The variety of measures to track are increasing too, now including greenhouse gas emissions, energy use, waste output and water use (cited in Environmental Leader 2011y). EMD Millipore, an international biosciences company that has been listed among the S&P 500 since the early 1990s, has set up an environmental management system with Hara that enables it to look at data by country, region, campus and even by specific building, covering a variety of metrics. The system's contribution is invaluable to the ease of accurate and transparent reporting. On the other hand, it is not clear how accessible such environmental management systems are to smaller companies. As we mentioned above, data collection and environmental reporting often suffer from a reactive management approach within SMBs. Mike Kissinger (2011) of Tech Networks of Boston notes that: "The current market for corporate social responsibility (CSR) and environmental reporting tools is primarily focused on large firms. Smaller firms, many of which have extremely limited staff time and budgets, struggle to solicit and disclose CSR and environmental information." Kissinger further highlights that there exists no clear standard method by which small companies can report on their environmental and social programs.

In recent news at the time of writing, Puma has announced that it plans to produce the first-ever Environmental Profit and Loss (EP&L) statement, designed to measure "the full economic impact of the brand on ecosystem services." (King 2011) The EP&L project is part of an environmental initiative by parent company PPR Group. Other brands under the group include Gucci and Yves Saint Laurent.

4. ANALYSIS

The results of the unstructured observation were presented in Section 2, with which we established the key drivers – regulations, risks, opportunities – behind corporate action on climate change. Section 3 presented the results of the structured observation, as we identified some of the service needs of companies, based on these drivers. This section aims to analyse the relationship between the demand of companies for climate change-related services, and the current supply of such services in the marketplace. We introduce the ontological issue of *structure* and *agency* to guide us through a complex relationship, and seek to closely examine how the agential capacity of companies – i.e. their ability to act on climate change – has been affected by the current structure of the market for climate change-related services.

4.1 A fragmented market

Sections 2 and 3 have established that a significant demand has emerged for climate changerelated services. Certainly, some companies are able to draw on internal expertise, but the wide range of needs that comes with a sincere commitment to addressing climate change through various initiatives, means that virtually no company can tackle these issues without external sourcing. The global reach of large corporations poses additional challenges for the effective execution of enterprise-wide strategies: an Ernst & Young survey found that three out of four global executives surveyed believe that executing their climate change goals in the next two years will be challenging (Ernst & Young 2010a). However, on the whole, as evidenced by the 2010 Carbon Disclose Project report (CDP 2010), it is clear that carbon management continues to rise as a strategic priority for many businesses, driven by the risks and opportunities that we identified above. As a result, the demand for climate change-related services has surged and it seems cogent to presume that the needs and demands for such services are bound to increase in the short and long term as a result of stricter regulation and increasing pressure from civil society. We have established that addressing climate change requires a wide range of skills and know-how and our structured observation of the market in the period of January – April 2011 has identified a number of service needs related to energy efficiency, supply chain management, life-cycle assessment, data collection, information needs and environmental reporting. While this thesis focuses on the findings from its structured observation, it should be recognized that the range of climate change-related services extends far beyond the list established in Section 3. Services not explicitly discussed herein include various forms of strategic consulting, pertaining for example to the management of ESCOs and capacity building. Other service areas include those related to the development of emissions reduction projects, such as the production of Project Design Documents and the establishment of new methodologies.

It is clear that the management of climate change requires a wide range of skills and know-how. What we can also determine from the many examples we have used to illustrate the climate change-related services market, is that as an essentially new area of operations, various niches along the value chain are being approached by companies from a wide range of different competencies, be it engineering, consulting, tax and accounting, equipment manufacturing or quality assurance. Microsoft, it should be no surprise, is approaching the climate change-related services market by developing software for commercial energy management (Kanellos 2011). Companies seeking to claim a slice of the climate change-related services market are doing so from their own backgrounds and business models. This is no doubt a natural development to a new and growing market, but how does this market structure affect the ability of companies to address climate change-related services are forced into either inefficiently managing multiple service providers, or entrusting their needs to a single under-scoped or –scaled service provider. What we have uncovered is a fragmented market where demands have been addressed by a variety of service providers coming from different backgrounds and competencies.

4.2 Structure and agency

The topic of structure and agency is a central ontological issue within sociology, political science and other social sciences. The relationship between structure and agency is applied here as a theoretical framework, allowing an in-depth exploration of the relationship between companies wishing to act on climate change – and the service providers meeting a new demand. In this section, the "agent" refers to the company acting on climate change, while service providers are one of many factors involved in shaping an agent's "structure".

Structure and agency logically entail one another. Indeed, we can only envision the concept of structure in reference to the agential capacity of someone or something. In other words, "structure only exists by virtue of the constraints on, or opportunities for, agency that it affects." (Hay 1995) There are a number of positions within the structure and agency debate, which can roughly be divided into four camps: intentionalism, structuralism, structuration theory and critical realism.

	'Insider' account (agency-centred)	'Outsider ' account (structure-centred)
Simple view of structure-agency	Intentionalism	Structuralism
Dialectical view of structure-agency	Structuration theory	Critical realism / strategic-relational approach

Figure 5: Positions within the structure and agency debate Source: Hay 1995

4.2.1 Structuralism

The structuralist viewpoint emphasises structure in the structure-agency relationship. Typically applied, it seeks to render an account of social and political events in terms of *unobservable* social and political structures. If we apply this to the context of a company seeking to act on climate change, we can understand their actions as being largely out of their control. The company's hand is forced, so to speak, into acting on climate change by the drivers mentioned above –

regulation, competition – and their ability to do so is largely determined by in-house expertise and services available in the marketplace.

Structuralism provides a simple view of the structure-agency relationship (see figure), in that it applies a monocausal view of the relationship between the two. It sees structure as largely constraining or even *determining* the agential capacity of agents (Hay 1995). There is therefore no scope for taking into account an agent's motivations – a company's intentions, strategies and actions – as these are simply viewed as products of the agent's structural landscape.

Over the years, structuralism has encountered a large number of highly valid criticisms, including:

- 1. It systematically underestimates the activity of agents, denying any notion of autonomy or an agent's ability to have an effect or make a difference.
- 2. Structuralism sees all agents as being passive dupes of structures beyond our comprehension, over which we have no influence.
- 3. Structuralism entails a deterministic and teleological view of social and political development, thus encouraging fatalism and passivity.
- 4. A fundamental flaw within the structuralist explanation is that if structuralist thought is correct, it should be impossible to express the structuralist position. Being able to express the structuralist position, i.e. show understanding of the structures imposed on us, necessarily implies a level of agential capacity. (Hay 1995)

Although structuralism points towards what we are hypothesising – that the current market for climate change-related services is influencing the ability of companies to effectively address climate change – it is an approach that lacks nuance and complements the hypothesis only to its extreme. If the structuralist account is correct, companies not only see their actions determined

by the structural landscape, but the teleological implications of structuralism would lead companies to make no initiative of their own. While one would like to see many more, there are enough examples of companies taking innovative, self-determined action to lead us to believe that the structuralist account does not quite apply.

4.2.2 Intentionalism

At the opposite end of the spectrum is the intentionalist view, which presents an agency-focussed approach to the structure and agency relationship. It thereby focuses on social practices, human agency and social interaction. As with structuralism, it has a monocausal view on the relationship between structure and agency, but rather conceives structure as being the product of intentional action:

The concepts of constraint and context are largely absent from such accounts, which tend to take issues of social and political interaction largely at face value, constructing explanations out of the direct actions, motivations and self-understandings of the actors involved and using explanatory concepts which lay actors might themselves use to account for their actions. (Hay 1995)

In other words, companies are not really forced to act on climate change, but choose to do so of their own free will. In our context, this completely undermines the ability of regulation to affect positive change. The intentionalist approach also implies that the apparent competition between Hertz and Avis to establish the greenest car rental fleet (Stoller 2007) had nothing to do with the others' actions. Indeed, the main criticism generally levelled at intentionalism is that they engage in *voluntarism*, i.e. they believe that in order to understand outcomes such as increasingly greener fleets within the world's two largest car rental companies, we need only to consider motivation and intentions of the actors – as if there exists a one-to-one correlation between intent and the effect of the action (Hay 1995). One might rather wish to posit that Hertz and Avis both had the intention to increase competitiveness and market share. Structural impositions – customer demand for greener, more fuel-efficient vehicles and the risk of falling behind a competitor – resulted in a race to establish green fleets.

Unlike structuralism, intentionalism is still a popular approach to explaining events today. Forms of intentionalism can be seen in rational choice theory, public choice theory and in the work of pluralists and particularly journalists. The approach is defined by a focus on the actor as selfish and utility-maximising or as rational strategic calculators and intentional actors (Hay 1995). The structuralist view is certainly a popular approach to viewing multinational corporations – powerful and without restraint. However, due to its disregard of "illogical" behaviour, unintended consequences, partial or incomplete information, and any form of structure bearing some influence on the agential capacity of companies, we disregard structuralism as a theoretical framework for our purposes.

4.2.3 Structuration theory

The third approach that we shall briefly introduce is that of structuration theory, developed by Anthony Giddens (cited in Hay 1995). The key aspect of structuration theory is that it seeks to transcend the rigid separation of structure and agency that we see in structuralism and intentionalism. Rather, structuration theory sees structure and agency as two sides of one coin. Giddens thus introduces a *dialectical* understanding of the relationship between structure and agency (Hay 1995). Structuration theory recognises the duality of structure, by which Giddens means that "social structures are both constituted by human agency, and yet at the same time are the very medium of this constitution." (cited in Hay 1995) There exist some highly intricate problems with structuration theory that we do not need to delve deeper into. Giddens work was however the first attempt at overcoming a rigid separation of structure and agency, paving the way for further refinements, including critical realism which we turn to next.

4.2.4 Critical realism / strategic-relational approach

Critical realism is the final approach to the structure and agency relationship that we shall introduce. As with structuration theory, critical realism attempts to overcome the dualism that pervades in structuralism and intentionalism. There are many similarities between critical realism and structuration theory, but crucially, critical realism approaches the relationship from a more structuralist starting point. (Hay 1995) In other words, it posits the existence of underlying structures that condition agency.

Hay (1995) explains that while Giddens' sees structure and agency as being two sides of one coin, which can only be seen one at a time, "critical realists prefer to see structure and agency as the two metals in the alloy from which the coin is moulded." Thus, while structure and agency are theoretically separable, they are in practice completely interwoven. Hay summarises the premises of the critical realist ontology in eight points:

1. All human agency occurs and acquires meaning only in relation to already preconstituted, and deeply structured, settings.

2. Such settings simultaneously constrain and enable the actors (whether individual or collective) that inhabit them by determining the *range* of potential appropriations and the direct consequences of such actions.

3. What constitutes a structure is entirely dependent upon our vantage point. For instance, the action of others (a crowd for example) represents a structure from the perspective (vantage point) of an individual who is not part of that collectivity. This is an inherently *relational* conception of structure.

4. Structures, do not determine outcomes *directly*, but merely define the potential range of options and strategies. Since actors only have a partial knowledge of such structures they only have partial access to this hypothetical range of strategies.

5. Action settings can be conceived of in terms of a nested hierarchy of levels of structure that interact in complex ways to condition and set the context within which agency is displayed.

6. The nature of the constraints (and range of opportunities) imposed on action by structured settings are twofold: (i) *Physical:* referring to the spatial and temporal properties of the (potential) action setting; and (ii) *Social:* (here the notion 'social' is employed in its

widest possible sense) – referring to the products of the intended and unintended consequences of previous human action or inaction on a structured context.

7. These constraints may also be seen as resources. Constraint also implies opportunity.

8. Strategic action is the dialectical interplay of intentional and knowledgeable, yet structurally-embedded actors and the preconstituted (structured) contexts they inhabit. Actions occur within structured settings, yet actors have the potential (at least partially) to transform those structures through their actions. This impact of agents upon structures may be either deliberate or unintended.

Now that we have an ontological framework in place, let us see how this applies to companies that wish to address climate change. Let us briefly remind ourselves that structure and agency logically entail one another - indeed that we cannot conceive of the concept of structure without recognizing its effect on agency. This is what point (1) refers to above and we can immediately recognize that the actions of companies are meaningless if we do not have a context within which to understand them. What would the countless examples of climate change-related actions mean in the absence of climate change? The context within which companies operate must be understood to have some effect in terms of constraining and enabling them (2). The structural setting determines a certain range of potential actions - climate change as a financial risk can lead investors to diversify across sources of risk, or across traditional asset classes. Thus the threat of climate change could be perceived as significant enough by two investors to act - but the two hold the agential capacity to diversify their risk in a multitude of manners. At the same time, the inherently relational conception of structure (3) must be recognized - if we think of a highly competitive market such as the clothing industry, we can imagine the different structural constraints placed on two companies in the same industry. The early-mover may feel compelled to launch a sustainable or organic clothing line under the belief that a significant market advantage is to be had. The second, not wishing to be left behind or perceived as slow in acting on environmental issues, is met by a quite different set of structural constraints. These structural

constraints do not determine outcomes directly (4), but rather define the range of strategies available to companies. Ameren Missouri, which has decided to cut its energy efficiency program (Tomich 2011) faces many of the same structural constraints as other utility companies. We should however not neglect to remember that no two companies experience the same structural constraints - nor is their agency equally affected. Climate change and the drivers we have discussed above are only some of many factors that affect the agential capacity of companies – in this case. Ameren has decided that its financial situation is such that it cannot bear the upfront costs of investing in energy efficiency. Of course, incomplete knowledge of its structural constraints means that the most efficient solution is not always selected. It must also be noted that as in our example of the clothing industry, the actions of some will contribute to form the structural scenery of others (5). When large numbers of actors are involved, we can conceive of different levels of structure creating the context within which the actor operates. In terms of the nature of constraints that structure places on agency, we can consider them to be two-fold (6): (i) physical and (ii) social. For example, a bank could have significant concerns about lending money to a construction project on the coastline, in terms of the risk posed by rising sea levels. However, the social context of for example the Netherlands, which has a long history of coping with high sea levels, may instill confidence in a lender. Opportunities (7) may even be seized through innovative design and architecture (Palca 2008). Finally, as point (8) crucially states, the action of agents can be seen as a dialectical interplay between their intentions and the preconstituted contexts that they inhabit. Thus all action occurs within this setting, but as has been indicated in several of the points above, agency also has an impact shaping structure, whether the impacts of agents is intentional or not.

4.3 Narrow approaches...

We now have the ontological framework of structure and agency in place, with a critical realist understanding of how structure and agency works in the context of companies acting on climate change. Now we shall attempt to apply the framework to how the service provision of climate change-related services, as a constraining factor and a part of the structural framework, influences the climate change actions of companies.

A research report by the MIT Sloan Management Review (Haanaes *et al.* 2011) has made a distinction between what it terms the "embracers" and the "cautious adopters" among companies acting on climate change. The former, it finds, have expanded their commitments to sustainability far more aggressively than the latter. "Cautious adopters" tend to see the sustainability business case in terms of risk management and efficiency gains, while "embracers" – who represent a small, pioneering group – "see the payoff of sustainability-driven management largely in intangible advantages, process improvements, the ability to innovate and, critically, in the opportunity to grow." (Haanaes *et al.* 2011) The report finds that companies are overtly more or less equally committed to sustainability, but that investment levels vary – thus opening up for the distinction between embracers and cautious adopters. What the report doesn't delve into more deeply, are the reasons behind the different levels of investment. Thus we ask ourselves, does the composition of the market for climate change-related services in some manner influence investment levels? Given the fragmented nature of the market, meaning that companies wishing to address a multitude of climate change-related issues must engage a number of service providers, are some companies less inclined to act on several issues?

Lending support to this hypothesis, Stephen Boston and Nora Simpson of Corporate Sustainability Inc. note that many early adopters of sustainable practices have tended to do so by focusing their attention on only one or two "significant though far from comprehensive areas" (Boston & Simpson 2011):

> For Wal-Mart, it was supply chain and convenient access to energy efficient light bulbs (at a volume-discounted price level). For GE, it was the branding and messaging. For BP, it was new product development (i.e. renewable fuel sources) combined with great marketing but clearly not operational efficiency or risk management.

Boston and Simpson further argue that other companies with sustainability programs have tended to follow suit, tending rather to focus on a narrow subset of issues "such as energy conservation or materials reduction" (Boston & Simpson 2011). Certainly, exceptions to the norm exist. For example, in 2010 electronics giant Philips invested over \notin 450m in "green innovation", thereby meeting its target to invest a cumulative \notin 1bn two years ahead of schedule. Furthermore, the company has announced that it plans to invest a further \notin 2bn by 2015. But what is remarkable is not just the size of investment, but its widespread nature. In its healthcare business area, the company has been seeking to reduce total lifecycle impact, weight and radiation doses; in its consumer lifestyle products, it has focused on developing environmentally-friendly products, enhancing energy efficiency and closing material loops. This area of the business has been able to phase out polyvinyl chloride (PVC) and brominated flame retardants (BFR) while seeing its green product sales rise to 38 percent of overall sales. The company has targeted this figure to exceed 50 percent by 2015 (Philips 2010). Philips has also been active in auditing its suppliers and has succeeded in reducing its operational carbon footprint from 1,937 to 1,808 kilotons of CO₂-equivalent between 2009 and 2010. (Philips 2010) While the company declined to provide specific information, it can be assumed that such a broad approach to climate change throughout a number of business areas has required the use of external service providers.

In the Carbon Disclosure Project particularly, but also in the wider literature, a lot of emphasis is placed on the level within the company at which climate change responsibility lies. The CDP (2010) found that in 85 percent of companies, this responsibility lies at board or other executive level. However, there appears to be a significant disconnect between the vision of board and executives and that which is implemented throughout the company (Deloitte 2010). This disconnect arguably begins with how the company incentivizes emissions reductions within their organizations. The CDP found that only 29 percent of companies have any formal mechanisms by which employees report to the board or other executive level on climate change. Engaging employees can pose a significant challenge: a 2010 report by Brighter Planet (2010) surveyed employees on how engaged they were by their employers on sustainability. The results showed that close to 86 percent of respondents said they were not engaged – despite the same number
responding that their company promotes sustainability. The report concluded that small organizations are taking the lead on engaging their employees in sustainability, finding that companies with under 100 employees are twice as likely to promote sustainability "very frequently". Furthermore, these efforts were found to be twice as likely to be effective in changing employee behaviour. The key message to take out of this is that there appears to be a gap between the aspiration of high-level executives and on-the-ground action. (Deloitte 2010) A research report by Deloitte (201) considers this partly to be a matter of the level of maturity with which a company addresses sustainability, believing that the perceived and actual impact of sustainability will spread to a greater number of roles, with time:

The typical progression we have observed is that sustainability first surfaces as a concern for functions such as legal and compliance; then, awareness of its impact spreads to operational functions, such as supply chain; and finally, companies begin to understand how it can affect demand-side functions such as sales and marketing.

This ex-post explanation is certainly valid, but as service provision today is fragmented into specialised areas – such as precisely legal and compliance, operational functions and supply chain – there is certainly reason to believe that this availability of services has played a role in affecting the agential capacity of these companies.

4.4 ... as a result of narrow services?

As illustrated in Figure 6 below, our structured observation of the market for climate changerelated services has uncovered a tendency for companies with a core competency in a field such as IT, engineering, consulting, tax and accounting, equipment manufacturing or quality assurance to branch out into the emerging market. For example, an IT company such as Hewlett-Packard, which produces computer hardware and software and also provides IT services and consulting, have used their expertise to branch out into the climate change-related service market by offering carbon and energy management software solutions (Environmental Leader 2011aa). The same can be said of most companies that have entered the market. This is of course not negative in itself: Hewlett-Packard provides a solution closely tied to its core competency and as such, is well positioned to provide a good service. It is not surprising the market for emissions services has developed in this manner: climate change presents a fresh market, which established players address as a risk or an opportunity. However, consolidation activity suggests that there may be a significant demand for companies providing a more comprehensive range of services.



Figure 6: Typical approach of service providers entering market for climate change-related services

As we have established in preceding sections, the drivers behind acting on climate change are diverse; as are the service requirements of companies wishing to address climate change. Indeed, climate change poses such complex and inter-linked challenges that it seems cogent to question the utility of addressing these challenges in such a fragmented manner. As we have seen, there are a number of notable companies – such as Philips – who have taken a broad approach to addressing climate change. However, the nature of the market for climate change-related services leads to companies wishing to do so finding themselves inefficiently managing a number of

service providers. Indeed, as we have seen, the drivers behind climate change rarely lead to one particular service requirement, but opportunities can often be seized in a variety of manners and risks can be mitigated with an equally diverse set of actions. As we have seen, sectors will vary in terms of the drivers pushing them towards action on climate change, and all require a fairly broad range of services if the drivers are to be addressed effectively. Figure 7 below gives an illustration of a hypothetical service provider with a core competency in climate change, able to address multiple service needs and eliminating the impracticality of dealing with numerous service providers.



Figure 7: Hypothetical service provider with core competency in climate change

A review of sustainability reports uncovers that companies rarely disclose the service providers that are used in order to fulfil objectives and targets. It is therefore difficult to uncover from such reports whether the company has relied on external service providers or in-house knowledge and expertise. However, in some instances service providers have been explicitly mentioned. For example, Adidas (2010) makes mention of their use of Historic Futures Limited, a company with expertise within supply-chain traceability. Likewise, BAE Systems, the British multinational defence, security and aerospace company, has employed The Co-efficient Company to provide data collection and carbon footprinting services (BAE 2009). A closer look at these service providers shows that they confirm the model outlined in Figure 6, addressing a small fraction of the climate change-related service requirements of their customers.

In order to test these findings, informal interviews were conducted with a number of companies, the findings from which are presented in the following two case-studies. While the companies were helpful in providing valuable insight, they requested to remain anonymous.

4.5 Case study: global specialty retailer

Key facts:

- Industry: Speciality retail
- Global operations
- 2010 revenue: over \$30bn.
- Employees: over 100,000.

This specialty retailer has 313 stores operating in 38 countries throughout the world. The company has taken a wide range of actions throughout its value chain to address climate change. For example, the company has committed itself to reducing energy consumption throughout its supply chain and has, to this end, run pilot projects at some of its key suppliers, seeking to identify the key barriers preventing it from establishing a low-carbon supply chain. The company has also piloted projects in the United Kingdom, China and the United States, exploring sustainable ways to transport customers to and from their stores, thus recognizing the importance of addressing their impact on climate outside of their four walls. As a retailer, the

company has also been proactive in identifying products and services that it can offer to help customers address their climate impact. Finally, the company has also invested significant resources into developing on-site renewable energy for its stores and warehouses.

Although the company declined to reveal its service providers, it did confirm that it often utilizes a large number of external service providers. It was confirmed that these service providers were experts in narrow areas and the company could disclose that it had in the recent past used different service providers for a range of needs including carbon footprinting, Life-Cycle Assessments, Input-Output analyses and energy savings in its buildings. However, while the company was ready to admit that in general terms the management of a large number of service providers can be time-consuming and considered inefficient, it did not regard the structure of the market as an obstacle to addressing climate change *per se*. Indeed, the company could not see how interacting with a single service provider covering all of their climate change-related service needs would be of any significant benefit. The interviewee explained that the decentralized structure of the company meant that its different sections act independently on climate change, bringing in external service providers if necessary.

4.6 Case study: global pharmaceutical company

Key facts:

- Industry: Pharmaceutical
- Global operations
- 2010 revenue: over \$45bn.
- Employees: 100,000.

This global pharmaceutical company has made a commitment to becoming carbon neutral by 2050. In 2010, the company carried out life-cycle assessments of several key products and also calculated its carbon footprint throughout its entire value chain. Other ways in which the company is addressing climate change include improving the energy efficiency of buildings and equipment; installing on-site renewable technologies; purchasing electricity from renewable

sources; reducing the company's impact from transportation by switching from air to sea freight and from road to rail; and making use of information technology to reduce the need for business travel.

Interviews with the company reaffirmed several of the points made by the specialty retailer. The company recognized that it too made use of numerous specialist service providers. In addition, the company stressed the importance of internal expertise which they considered as the preferred option over relying on third-party service providers. The reasoning behind this did not relate to challenges associated with managing multiple third-parties, but instead, the company argued that their experience suggested that better overall results were obtained by managing programmes with internal technical expertise. The company was also keen to emphasise the decentralized nature of its operations, stating that service requirements – as well as internal expertise – vary considerably among its different businesses and operations. The company cited cooperation with ESCOs as one example where areas of the business that employed such services lagged behind other parts of the business endowed with greater internal technical expertise.

The interviews delivered a very blunt answer to the fundamental question behind this thesis: the companies interviewed do not see the management of external service providers as a particularly significant obstacle to the effective management of climate change. Rather, the decentralised nature of such large corporations means that climate change is managed in a piecemeal manner. Therefore the wide range of service providers utilised by one company is rarely managed in a centralised fashion. If we return to the concept of structure and agency, we can see that the conceptual framework within which we have been working has had significant bearing on the formulation of our hypothesis: The hypothesis stated that the agential capacity of companies was influenced by certain structural constraints, among them the fragmented nature of the market for climate change-related services. However, while it is possible to cite the various drivers discussed

in Section 2 as structural constraints on a company, we have found that the market for climate change-related services does not influence companies on the same macroscopic level. This can be different in smaller companies where climate change is treated in a more centralised fashion, but in larger companies such as the ones investigated for this research, the market for services can only be seen to bear effect on individual business functions and operations, i.e. the microscopic level.

However, we must be careful to acknowledge that the responses of companies must be understood in the appropriate context. From the vantage point of companies it may be that the market for climate change-related services bears little effect on the way they are able to approach climate change, but we should recall that what constitutes structure is entirely dependent on vantage point. Thus the possibility opens for acknowledging the market for climate changerelated services as a constraining factor, despite companies' unwillingness to acknowledge them as such. While the decentralised nature of companies may mean that the management of multiple external service providers is not much of an obstacle, a fragmented marketplace can lead to other forms of structural constraint: it is cogent to surmise that the prevalent approach to service provision is marked by a lack of ability to tailor services to a changing policy and market environment. Tapping such a rapidly evolving market requires capital and management skills, on top of a global presence and new client orientation. It can therefore be argued that existing service providers are unprepared to respond to this need for a number of possible reasons:

- CEU eTD Collection
- As divisions of larger companies with a core business separate to that of climate change, they are influenced by the existing business models and skill bases. Climate changerelated services are therefore only approached in so far as they compliment the existing businesses.

• Entrepreneurial companies, addressing climate change as a core function of their business, are often undercapitalised and are therefore unable to enter new markets or contracts despite identifying new opportunities. In addition, they may be focused on technical or operational skills and lack the strategic management and marketing capacity necessary for growth.

Thus while it may be difficult to argue that the ability of companies to manage climate change is hampered due to the impracticalities of managing multiple service providers, it is conceivable that their agential capacity is compromised due to the sub-optimal quality of services rendered. While this research has concluded that companies do not see the management of multiple service providers as an obstacle to their management of climate change, the case for a service provider with a core competency in climate change can be made in terms of superior quality of service.

5. CONCLUSION

A recent study by Rödl & Partner (2010) found that consolidation activity has been increasing rapidly in the renewables sector. The study found that despite difficult global economic conditions, deal-making within the renewable energy industry has remained remarkably robust: in 2009 a total of 228 deals were announced worth a collective \notin 49.7bn (\$72.4bn), a volume that mirrors the level of activity witnessed at the height of the mergers and acquisitions boom in 2007. Our structured observation of the market in the period January – April 2011 has indicated that the same trend is beginning to be seen in the market for climate change-related services.

A number of service providers are beginning to expand their service provision, mostly through expanding within their own field of expertise, but also to a lesser extent through crossfertilization into other climate change-related services. Recent examples include Deloitte who have expanded their offering by acquiring the assets of ClearCarbon Consulting, Inc. and DOMANI Sustainability Consulting LLC (Environmental Leader 2010d). Deloitte, a professional services organization delivering audit, tax, consulting, enterprise risk and financial advisory services, has thereby enhanced its ability to meet the needs of companies addressing climate change risk and opportunities. DOMANI is an executive level sustainability strategy consulting firm providing strategic and technical solutions to their clients' energy, carbon and water challenges. ClearCarbon helps clients measure their environmental impacts and develop strategies for reducing their carbon footprint (Environmental Leader 2010d). Similarly, General Electric has expanded it's involvement in the electrical efficiency market by acquiring a 90 percent stake in French electrification and automation company Converteam (Environmental Leader 2011z). Converteam help its customers in a wide range of industries to replace mechanical processes with high-efficiency electric alternatives, which deliver improved reliability, reduced maintenance requirements and fewer emissions. GE has stated that the acquisition will boost its smart grid portfolio and also help it to provide services to the metals and mining industries. A final, more typical example, is that of Hewlett-Packard which has recently expanded its portfolio of energy management products with the unveiling of EcoSMART (Environmental Leader 2011aa). Hewlett-Packard, as an IT company, has not wandered far from its core business area by introducing EcoSMART, which allows customers to track real-time performance to save energy and paper.

Perhaps consolidation activity within the market cannot be attributed to the notion that a fragmented market presents an obstacle to the efforts of companies wishing to address climate change. As we have seen, this argumentation did not resonate particularly well with the case study companies. We must recall that within a structure and agency framework, structure should not be perceived only as a collection of *constraining* factors. As well as constraining agential capacity, structure also enables actors by determining the range of potential options and strategies (Hay 1995). The actions of others contribute to building the structural landscape, and it is from this perspective that we have sought to determine whether or not the approach of prevalent service providers has borne significant effect on companies. In the same manner, we must consider the potential of service providers as enablers of good practice in addressing climate change. Thus, while we have concluded that companies do not perceive the current market for climate change-related services as a constraining factor, we cannot rule out the opportunity that exists for new types of service providers to strengthen the agential capacity of companies. As we have seen, there is a proven disconnect between the vision of board and executives and the reality implemented on the ground (Deloitte 2010). We have seen that companies have a tendency to focus one or two areas, before spreading to other functions. While this status quo may not be attributable to the structure of the market for climate change-related services, the potential is certainly there for a new approach to providing these services – perhaps one that better connects board and executive-level vision with on-the-ground action; provides the climate change expertise to complement internal know-how; establishes a strong relationship between

client and service provider; and most importantly, enables the most effective possible approach to addressing the many risks and opportunities that climate change presents.

5.1 Summary of key findings

- Companies' spending on sustainability has largely survived the global economic downturn, with nearly 60 percent of companies stating in a survey by the MIT Sloan Management Review (2011) that their sustainability investments increased in 2010. According to De Lima and Sumon (2010), climate revenue has also held up relatively well despite the economic conditions. This is corroborated by an Ernst & Young survey which found that a large majority of companies intend to increase their spending on climate change initiatives (E&Y 2010a).
- The unstructured observation of the market found a number of key drivers behind corporate action on climate change. These can be grouped as *Increased regulation*, *Risk* and *Opportunity*. The Carbon Disclosure Project (2010) finds that companies and suppliers (2011) are increasingly embracing the *opportunities* presented by climate change and moving away from risk-management strategies.
- The structured observation of the market revealed that the drivers behind corporate action on climate change have lead to a number of key service needs. The structured observation grouped these needs under the categories of *Energy efficiency; Supply chain management; Life-Cycle Assessment; Data collection; Information; and Environmental Reporting.*
- Findings of the structured observation also included the fragmented nature of the market. Various niches along the value chain are being approached by companies from a wide range of different competencies and are as such delivering specialised services. Therefore, a company that wishes to address climate change in a variety of manners is required to engage a significant number of service providers. This appears to be in tune with Boston and Simpson's (2011) observation that companies have a tendency to focus their attention on a narrow subset of issues when addressing sustainability.

- A survey by Ernst & Young (2010a) found that the issue of climate change governance generally rests with C-suite executives or board members. However, research by Deloitte (2010) has highlighted a disconnect between the vision of board and executives and what is implemented on the ground throughout the company. In other words, there is a gap between aspiration and action that needs to be closed.
- Interviews with a global specialty retailer and a global pharmaceutical company found that companies do not perceive the fragmented nature of the market to influence their ability to address climate change. However, there are strong reasons to believe that the structure of the market does not lend itself towards the delivery of an optimal quality of service. It seems cogent to conclude that there exists significant potential to provide the required services in a manner that is better able to help companies close the gap between aspiration and concrete action.

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7. APPENDICES

7.1 Annex 1

Date	Title	Source
21/01/2010	Sustainability Perception of General Mills, Kellogg, Kraft Far Exceeds Actual Records	http://www.environmentalleader.com/2010/01/21/s ustainability-perception-of-general-mills-kellogg- kraft-far-exceeds-actual-records/
12/02/2010	86% of Employees Not Engaged By Companies' Sustainability Programs	http://www.environmentalleader.com/2010/02/12/8 6-of-firms-fail-to-engage-employees-on- sustainability/
12/05/2010	P&G Launches Supplier Sustainability Scorecard	http://www.environmentalleader.com/2010/05/12/p g-launches-supplier-sustainability-scorecard/
01/07/2010	Green Building Market To Hit \$173.5 Billion by 2015	http://www.environmentalleader.com/2010/07/01/g reen-building-market-to-hit-173-5-billion-by-2015/
10/08/2010	Sustainability Efforts Derailed by Lack of Credible Data	http://www.environmentalleader.com/2010/08/10/u -s-businesses-lack-data-to-meet-sustainability- goals/
13/12/2010	Deloitte Expands Sustainability Offerings, Acquires ClearCarbon, DOMANI	http://www.environmentalleader.com/2010/12/13/d eloitte-expands-sustainability-offerings-acquires- clearcarbon-domani/
03/01/2011	Most Read Environmental Management & Sustainable Business Stories of 2010	http://www.environmentalleader.com/2011/01/03/ most-read-environmental-management-sustainable- business-stories-of-2010/
04/01/2011	Climate Change and Business: The Importance of Stakeholder Engagement and Communication	http://www.environmentalleader.com/2011/01/04/c limate-change-and-business-the-importance-of- stakeholder-engagement-and-communication/
13/01/2011	Report: Climate Change Information Is Insufficient	http://www.environmentalleader.com/2011/01/13/r eport-climate-change-information-is-insufficient/
18/01/2011	How Climate Change Impacts Utility Customer Service	http://www.environmentalleader.com/2011/01/18/h ow-climate-change-impacts-utility-customer- service/
19/01/2011	10 Trends Driving Action on Climate Change in 2011	http://www.environmentalleader.com/2011/01/19/1 0-trends-driving-action-on-climate-change-in-2011/
21/01/2011	Survey: Reporting Indicates Company Sustainability	http://www.environmentalleader.com/2011/01/21/s urvey-reporting-indicates-company-sustainability/
27/01/2011	Environmental Reporting Pressures Greater than Ever	http://www.environmentalleader.com/2011/01/27/e nvironmental-reporting-pressures-greater-than- ever/
27/01/2011	The Case of GM's CSR Initiative: Why Good Intentions Are Not Enough	http://www.environmentalleader.com/2011/01/27/t he-case-of-gms-csr-initiative-why-good-intentions- are-not-enough/
31/01/2011	Global Firms Find Sustainable Supply Chain Savings	http://www.environmentalleader.com/2011/01/31/g lobal-firms-find-sustainable-supply-chain-savings/
31/01/2011	Utilities Expect to Spend More on Efficiency	http://www.environmentalleader.com/2011/01/31/u tilities-expect-to-spend-more-on-efficiency/
01/02/2011	Energy Companies Fail to Track Carbon	http://www.environmentalleader.com/2011/02/01/e nviance-survey/
08/02/2011	Energy and Carbon Software Market Poised for 300% Growth; Sector Leaders Named	http://www.environmentalleader.com/2011/02/08/e nergy-and-carbon-software-market-poised-for-300- growth-sector-leaders-named/
10/02/2011	Energy Efficiency a Moral Imperative – to Save Money	http://www.environmentalleader.com/2011/02/10/e nergy-efficiency-a-moral-imperative-to-save-

		money/
11/02/2011	MIT Sloan: Two Thirds of Companies Will Up Environmental Efforts This Year	http://www.environmentalleader.com/2011/02/11/ mit-sloan-two-thirds-of-companies-will-up- environmental-efforts-this-year/
17/02/2011	We Are All Green Consumers, Now and for the Future	http://www.environmentalleader.com/2011/02/17/ we-are-all-green-consumers-now-and-for-the- future/
18/02/2011	Shareholder Environmental Resolutions Hit Record	http://www.environmentalleader.com/2011/02/18/s hareholder-environmental-resolutions-hit-record/
18/02/2011	Start Lifecycle Assessments Now, Expert Urges	http://www.environmentalleader.com/2011/02/18/st art-lifecycle-assessments-now-expert-urges/
23/02/2011	Market for Carbon and Energy Management Software to Quadruple, Report Says	http://www.environmentalleader.com/2011/02/23/ market-for-carbon-and-energy-management- software-to-quadruple-report-says/
08/03/2011	Behind the Mission of Sustainability	http://www.environmentalleader.com/2011/03/08/b ehind-the-mission-of-sustainability/
11/03/2011	Life-cycle Budgeting Will Help Maximize Infrastructure Investment	http://www.environmentalleader.com/2011/03/11/li fe-cycle-budgeting-will-help-maximize- infrastructure-investment/
15/03/2011	Smart Grid Budgets Rising, Survey Says	http://www.environmentalleader.com/2011/03/15/s mart-grid-budgets-rising-survey-says/
15/03/2011	When Bad Data Happens to Good Companies	http://www.environmentalleader.com/2011/03/15/ when-bad-data-happens-to-good-companies/
21/03/2011	Utilities Want Cap and Trade – The Sooner, the Better	http://www.environmentalleader.com/2011/03/21/u tilities-want-cap-and-trade-the-sooner-the-better/
21/03/2011	Stepping toward Corporate Sustainability Footprinting	http://www.environmentalleader.com/2011/03/21/st epping-toward-corporate-sustainability- footprinting/
23/03/2011	GRI Unveils Updated Sustainability Guidance – 'Most Comprehensive Available'	http://www.environmentalleader.com/2011/03/23/g ri-unveils-updated-sustainability-guidance-most- comprehensive-available/
24/03/2011	We Need to Grow to Become Sustainable	http://www.environmentalleader.com/2011/03/24/ we-need-to-grow-to-become-sustainable/
24/03/2011	Americans Give Green Marketing Claims Too Much Credit, Study Finds	http://www.environmentalleader.com/2011/03/24/a mericans-give-green-marketing-claims-too-much- credit-study-finds/
24/03/2011	Greenwashing Fears Common, Carbon Trust Finds – Only 7% of Public Believe Companies	http://www.environmentalleader.com/2011/03/24/g reenwashing-fears-common-carbon-trust-finds- only-7-of-public-believe-companies/
25/03/2011	Forget 'Dark Green' Shoppers – 'New Consumers' Will Drive Sustainability, Report Says	http://www.environmentalleader.com/2011/03/25/f orget-dark-green-shoppers-new-consumers-will- drive-sustainability-report-says/
28/03/2011	Lifecycle Assessment Market 'to Pick Up in 2012'	http://www.environmentalleader.com/2011/03/28/li fecycle-assessment-market-to-pick-up-in-2012/
29/03/2011	EU May Bring Shipping Companies into Carbon Market; WWL Cuts CO2 21%	http://www.environmentalleader.com/2011/03/29/e u-may-bring-shipping-companies-into-carbon- market-wwl-cuts-co2-21/
30/03/2011	California Assembly Approves 33% Renewable Mandate	http://www.environmentalleader.com/2011/03/30/c alifornia-assembly-approves-33-renewable- mandate/
31/03/2011	Most Firms Focused on Improving Supply Chain PR and Risk, not Environmental Impact, Report Says	http://www.environmentalleader.com/2011/03/31/ most-firms-focused-on-improving-supply-chain-pr- and-risk-not-environmental-impact-report-says/
01/04/2011	ISO 14001 News from Inmetco, Canadian Solar, Hobas and More	http://www.environmentalleader.com/2011/04/01/is o-14001-news-from-inmetco-canadian-solar-hobas- and-more/

7.2 Annex 2

Date	Company / institution	Title	Source
21/04/2010	FedEx	FedEx Increases Vehicle Fuel Efficiency 14% since 2005	http://www.environmentalleader.com/20 10/04/21/fedex-increases-vehicle-fuel- efficiency-14-since-2005/
12/05/2010	P&G	P&G Launches Supplier Sustainability Scorecard	http://www.environmentalleader.com/20 10/05/12/pg-launches-supplier- sustainability-scorecard/
14/10/2010	WalMart	Wal-Mart Makes Major Commitment to Sustainable Agriculture	http://www.environmentalleader.com/20 10/10/14/wal-mart-makes-major- commitment-to-sustainable-agriculture/
09/12/2010	Target	Target Outlines 2016 Environmental Goals	http://www.environmentalleader.com/20 10/12/09/target-outlines-2016- environmental-goals/
15/12/2010	BAE Systems	BAE Plans \$2 Million "No- Money-Down" Retrofit	http://www.environmentalleader.com/20 10/12/15/bae-plans-2-million- %E2%80%9Cno-money- down%E2%80%9D-retrofit/
15/12/2010	HP	A Conversation with HP: Post COP16 and Prop23	http://www.environmentalleader.com/20 10/12/15/a-conversation-with-hp-post- cop16-and-prop23/
16/12/2010	Dell	Dell Touts Energy Efficiency of Products	http://www.environmentalleader.com/20 10/12/16/dell-touts-energy-efficiency-of- products/
17/12/2010	Boeing	Boeing's VP EHS Discusses Sustainability, Corporate Strategy	http://www.environmentalleader.com/20 10/12/17/boeings-vp-ehs-discusses- sustainability-corporate-strategy/
22/12/2010	Xerox	Poor Economy Helps Xerox Advance on Sustainability Targets	http://www.environmentalleader.com/20 10/12/22/poor-economy-helps-xerox- advance-on-sustainability-targets/
28/12/2010	Caterpillar	Caterpillar Achieves Zero-Waste at Two Facilities	http://www.environmentalleader.com/20 10/12/28/caterpillar-achieves-zero- waste-at-two-facilities/
29/12/2010	Ikea	IKEA Outfits Two East Coast Stores with Solar Panels	http://www.environmentalleader.com/20 10/12/29/ikea-outfits-two-east-coast- stores-with-solar-panels/
30/12/2010	Vodafone	Vodafone Sustainability – Keeping Our House In Order	http://www.environmentalleader.com/20 10/12/30/vodafone-sustainability- keeping-our-house-in-order/
03/01/2011	State of Massachusets	Massachusetts Sets 25% GHG Reduction Goal	http://www.environmentalleader.com/20 11/01/03/massachusetts-sets-25-ghg- reduction-goal/
06/01/2011	Panasonic	Panasonic Unveils Environmental Goals for North America	http://www.environmentalleader.com/20 11/01/06/panasonic-unveils- environmental-goals-for-north-america/
10/01/2011	GE	GE Challenge to Focus on Home Energy Use	http://www.environmentalleader.com/20 11/01/10/ge-challenge-to-focus-on- home-energy-use/
13/01/2011	Reckitt Benckiser	Lysol, Woolite Maker Halfway to Carbon Target	http://www.environmentalleader.com/20 11/01/13/lysol-woolite-maker-halfway- to-carbon-target/
18/01/2011	PepsiCo UK	PepsiCo UK Aims to Ditch Fossil	http://www.environmentalleader.com/20

		Fuels by 2023	11/01/18/pepsico-uk-aims-to-ditch- fossil-fuels-by-2023/
18/01/2011	National Steak and Poultry	Meat Producer Cuts Water, Electricity Use	http://www.environmentalleader.com/20 11/01/18/meat-producer-cuts-water- electricity-use/
19/01/2011	Honda	Honda Rolls Out Global Supply Chain Guidelines	http://www.environmentalleader.com/20 11/01/19/honda-rolls-out-global-supply- chain-guidelines/
21/01/2011	Tesco	Tesco Installs Energy Monitors to Motivate Employees	http://www.environmentalleader.com/20 11/01/21/tesco-installs-energy-monitors- to-motivate-employees/
27/01/2011	US Postal Service	USPS Makes \$27m From Sustainability Efforts	http://www.environmentalleader.com/20 11/01/27/usps-makes-27m-from- sustainability-efforts/
27/01/2011	GM	GM Rolling out GE Efficiency Program at 20 Plants	http://www.environmentalleader.com/20 11/01/27/gm-rolling-out-ge-efficiency- program-at-20-plants/
31/01/2011	Bacardi	Bacardi Improves Energy, Water Efficiency	http://www.environmentalleader.com/20 11/01/31/bacardi-improves-energy- water-efficiency/
01/02/2011	7-Eleven	7-Eleven Japan to Open 100 Eco- Stores This Month	http://www.environmentalleader.com/20 11/02/01/7-eleven-japan-to-open-100- eco-stores-this-month/
02/02/2011	Intel	Intel Makes Green Power Push, Keeps EPA Top Spot	http://www.environmentalleader.com/20 11/02/02/intel-tops-epas-green-power- purchasers/
03/02/2011	CSL	Biomedical Firm Cuts Per-Unit Water, Energy, Carbon	http://www.environmentalleader.com/20 11/02/03/biomedical-firm-cuts-per-unit- water-energy-carbon/
09/02/2011	Facebook	Facebook Seeks to Mitigate HQ Move	http://www.environmentalleader.com/20 11/02/09/facebook-seeks-to-mitigate-hq- move/
09/02/2011	Otis Elevators	Otis Elevators Makes 'End to End' Environmental Pledge	http://www.environmentalleader.com/20 11/02/09/otis-elevators-makes-end-to- end-environmental-pledge/
10/02/2011	Hertz	Hertz to Install 16 Solar Power Systems	http://www.environmentalleader.com/20 11/02/10/hertz-to-install-16-solar- power-systems/
11/02/2011	H&M	H&M Unveils Recycled and Organic Fashion	http://www.environmentalleader.com/20 11/02/11/hm-unveils-recycled-and- organic-fashion/
14/02/2011	Menasha Corporation	Sustainability Report: Packaging Firm Cuts CO2	http://www.environmentalleader.com/20 11/02/14/sustainability-report- packaging-firm-cuts-co2/
14/02/2011	Danske Bank Group	Sustainability Report: Carbon- Neutral Danske Targets Electricity Cuts	http://www.environmentalleader.com/20 11/02/14/sustainability-report-carbon- neutral-danske-targets-electricity-cuts/
17/02/2011	Boeing	Boeing, easyJet Reveal Fuel- Efficient Products	http://www.environmentalleader.com/20 11/02/17/boeing-easyjet-reveal-fuel- efficient-products/
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