

**Drilling for Disclosure:
Reducing the Over-Capitalization Risk in
Canada's Oil and Gas Sector**

by

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Abstract

Climate change has left Canadian investors exposed to significant risk from the market over-capitalization of the oil and gas sector. One of the identified sources of this over-capitalization is the information asymmetry that exists between firm managers and investors. Without access to business specific climate change information, investors cannot distinguish between “good” and “bad” investments; resulting in an incorrect valuation of firms. A content analysis approach is applied to the public disclosure documents issued by 30 Canadian oil and gas companies to identify limitations in Canada’s existing regulatory system. The conclusions are that climate change disclosures are of low information value and inadequate for investors to incorporate climate change considerations into their investment decision making processes. Furthermore, the materiality standard governing disclosure requirements is identified as the primary barrier to increased disclosure quality. A hybrid disclosure framework that links greenhouse gas emissions information to financial reporting obligations is presented as the best of four policy options.

Keywords: Disclosure Regulation; Climate Change; Oil and Gas; Investors; Canada; Content Analysis

*To my parents and my wife for
their years of encouragement and support*

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List of Acronyms

Term	Definition
AIF	Annual Information Form
ASC	Alberta Securities Commission
BCSC	British Columbia Securities Commission
CCPA	Canadian Centre for Policy Alternatives
CDP	Climate Disclosure Project
CERES	Coalition for Environmentally Responsible Economies
CICA	Canadian Institute of Chartered Accountants
CGA	Certified General Accountants Association of Canada
CSA	Canadian Securities Administrators
GHG	Greenhouse Gas
GRI	Global Reporting Initiative
IIGCC	Institutional Investor Group on Climate Change
IEA	International Energy Agency
INCR	Investor Network on Climate Risk
MD&A	Management Discussion and Analysis
MPT	Modern Portfolio Theory
NI	National Instrument
NRTEE	National Round Table on the Environment and Economy
SEC	United States Securities and Exchange Commission
SR	Sustainability Report
UNEP	United Nations Environment Program
UNEPFI	United Nations Environment Program Finance Initiative
UN PRI	United Nations Principles for Responsible Investment
WBCSD	World Business Council for Sustainable Development
WEF	World Economic Forum
WMO	World Meteorological Organization

Glossary

Term	Definition
Market Capitalization	is the total value of the issued shares of a publicly traded firm; equal to the share price multiplied by the number of shares outstanding (WB, 2012).
Materiality	an accounting convention relating to an issues' importance. It is a subjective concept based on professional judgement. The threshold for materiality is whether the information would influence a reasonable investor to buy, hold, or sell a security of the issuer (CSA, 2010).
Stranded Assets	refer to financial assets whose value under certain circumstances or policy scenarios, such as a reasonable price on carbon, have the potential to be reduced significantly (Generation Investment Management LLP, 2012).

Executive Summary

Climate change has left Canadian investors exposed to significant risk from the market-overcapitalization of the oil and gas sector. The most recent climate science tells us that the vast amount of fossil fuel reserves are going to have to remain undeveloped if dramatic global climate change is to be avoided. This has important implications for investors because a considerable proportion of the market value of fossil fuel extraction and production (E&P) companies is directly attributable to reserves.

One of the identified sources of this overcapitalization is the information asymmetry that exists between firm managers and investors. Without access to business specific climate change information, investors cannot distinguish between “good” and “bad” investments; resulting in an incorrect valuation of firms. Anecdotal evidence suggests Canada’s disclosure regulations are currently insufficient to address this information problem.

A content analysis approach is applied to the public disclosure documents issued by the 30 largest Canadian oil and gas companies to identify limitations in Canada’s existing regulatory system. The research shows that climate change disclosures are of low information value and inadequate for investors to incorporate climate change considerations into their investment decision making processes. Furthermore, the materiality standard governing disclosure requirements is identified as the primary barrier to increased disclosure quality. Inadequate enforcement is also identified as a contributing problem.

A hybrid disclosure framework that links greenhouse gas emissions information to financial reporting obligations is presented as the best of four policy options. It has the capability to affect change in the quality of disclosures, while indirectly increasing awareness in the financial industry regarding the problem posed by the overcapitalization. The hybrid model will create a common standard for reporting across the oil and gas industry. By complying with the standard, firms will be able to demonstrate to investors that they have used the appropriate process to assess risks increasing the information value of the disclosures.

The hybrid model is the option most likely to create a medium-term action cycle favouring the disclosure of climate change information; exemplary disclosure, the use of that information by investors, and the controlled market devaluation of Canada's oil and gas sector.

1. Introduction

The most recent climate science tells us that the vast amount of fossil fuel reserves including coal, oil and gas are going to have to stay in the ground if we are to avoid dramatic global climate change. This has important implications for the investments held by Canadians. A large proportion of the market value of fossil fuel extraction and production (E&P) companies is directly attributable to fossil fuel reserves. Consequently, if policy action is taken to limit the amount of greenhouse gas (GHG) emissions, the reserves held by E&P companies will no longer have the value underlying the companies' current market valuations. In effect, there is a carbon bubble imbedded in Canada's financial market that must be deflated before it bursts to avoid significant negative economic consequences.

History provides numerous examples of prolonged rises and then abrupt falls of asset prices, i.e., financial bubbles. From Dutch tulip mania in 1634 to the great depression and the dotcom bubble of 2000, the common element linking these events is that asset prices increase at a rate greater than what is supported by the market fundamentals (i.e. the overall state of the economy, interest rates, production, earnings) (White, 2011). Despite well-documented cases, there remains little consensus regarding the causes, characteristics and behaviour of financial bubbles and this variability makes them very difficult to identify in advance (Hunter, 2003). In particular, as the great depression and the dotcom bubble indicate, it is very difficult for an investor to know whether the rise in the price of an asset is the result of a fundamental shift and the creation of new economy or merely the result of over exuberance and speculation. The 1920s were a great period of technological innovation with the development of automobiles, radios and the spread of telephones. Likewise, the 1990s witnessed the expansion of the internet and as long as investors expected the new technologies to generate larger future returns, stock prices rose (Hunter, 2003). The fundamental question is whether the current price of a particular asset group has a solid foundation.

In the case of oil and gas, climate change has eroded this foundation and created the carbon bubble. The problem is that oil and gas firm market value is predicated on a perpetuation of the status quo in the structure and activities of the economy. Unlike the examples provided above, where a potential structural change provided rational justification for continued investment, in this case climate change, which demands structural changes be made to the economy, threatens the operational business model of the oil and gas sector. Action on climate change will prevent oil and gas firms from converting their reserve assets, into marketable products and these assets will become stranded. Stranded assets refer to financial assets whose value under certain circumstances or policy scenarios, such as a reasonable price on carbon, have the potential to be reduced significantly (Generation Investment Management LLP, 2012). Because investments in oil and gas have been very profitable in recent years, they have and continue to be an attractive asset class for institutional investors (i.e. banks and pension funds) (Shapiro and Pham, 2011). High allocation rates by Canadian institutional investors, such as the Canada Pension Plan, expose most Canadians to stranded fossil fuel assets and the carbon bubble (Lee and Ellis, 2013).

The sources of the carbon bubble are multiple and diverse. They range from systemic problems, like the short-term orientation of financial markets, to more focussed issues, like the limitations of traditional valuation models employed by the financial industry. One of the contributing problems raised by institutional investors, and one that offers a legitimate intervention point for government policy, is the lack of climate change disclosures by businesses. Without adequate access to climate change risk and performance information from public companies, investors are unable to accurately value companies and make fully informed investment decisions. Information asymmetry, therefore, contributes to market overcapitalization in the GHG emissions intensive oil and gas sector and creates the carbon bubble. Addressing this problem is a two-step process: first, determining what companies are disclosing and if this meets investors' requirements for making investment decisions; second, developing policies to remedy deficiencies.

Despite rising international interest in this subject, to my knowledge, no researcher has undertaken the systematic analysis of climate change disclosures for Canada's oil and gas E&P sector within its regulatory framework. Consequently, the aim

of this project is to empirically assess the quantity and quality of the climate change disclosures being made by this sector. The result is then used to determine if current disclosure practices are meeting investor needs. Using this methodology, this research demonstrates the extent to which the oil and gas sector is contributing to the existence of the carbon bubble within current regulations.

This research shows that the current climate change disclosures made by Canadian oil and gas firms are insufficient for investors to adequately evaluate climate change risks facing those companies. There are three major deficiencies: lack of standardization, insufficient quantitative data, and widespread omission of certain climate change information categories. Two main limitations of the current regulatory framework are discussed: the incompatibility of the current materiality standard with climate change and the failure to adequately enforce standards. Policy options are developed with the specific intention of addressing the limitations of the materiality standard. My recommendation is for the Canadian Securities Administrators to immediately integrate mandatory greenhouse gas reporting in annual financial reports through the development of a hybrid disclosure framework.

This research paper is organized as follows: chapter 2 outlines the current state of the climate and worldwide emissions levels and describes what this means for Canada's fossil fuel industry and financial markets. Chapter 3 examines the role that investors have played in the creation and financing of the carbon bubble and outlines corrective steps that have been taken. Chapter 4 examines the role of corporate climate change risk disclosures in solving the carbon bubble problem. Chapter 5 outlines Canada's institutional framework and the regulations governing disclosure. Chapter 6 presents the policy problem and identifies the main stakeholders. Chapter 7 presents the methodology employed in this research, and chapter 8 assesses the climate change risk disclosures being made by firms. Based on the results of the analysis, chapter 9 presents criteria and measures for evaluating the policy options, which are introduced in chapter 10. Evaluation of the policy options and recommendation takes place in chapter 11 and chapter 12 concludes.

2. Climate, emissions, economic costs of climate change

This chapter examines three issues. First, it provides a brief overview of the state of the climate and the current greenhouse gas (GHG) emissions trajectory. Second, it discusses the physical and regulatory risks of climate change and the potential costs to both the world and Canadian economies. Third, it discusses how these realities impact Canada's fossil fuel industry and investors.

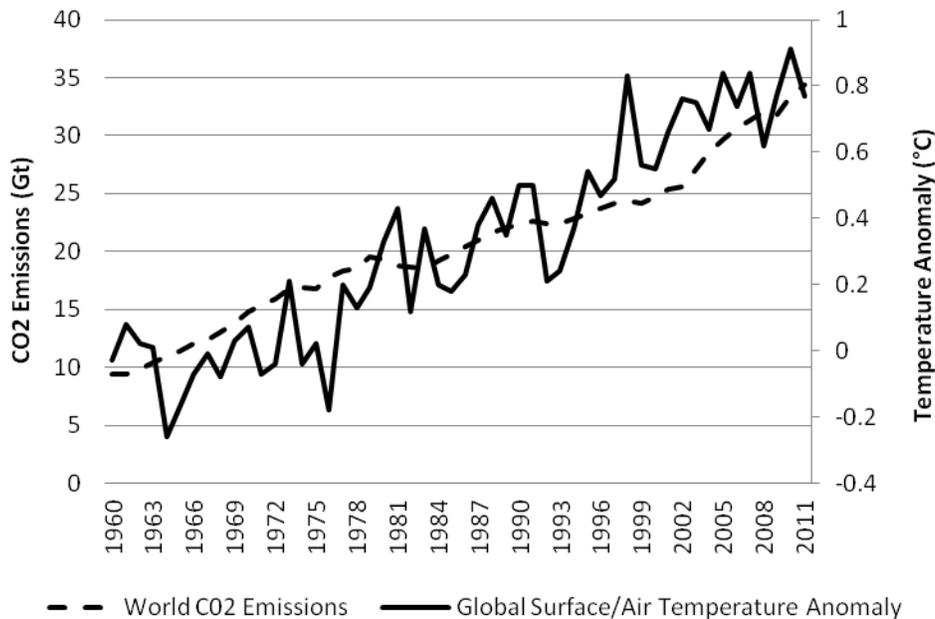
2.1. Climate conditions and emissions trends

Much of the recent climate science tells us that the world is experiencing anthropogenic climate warming. Figure 1 illustrates the recent trend in the world's temperature anomaly and in CO₂ emissions from 1960-2011. Temperature anomaly is the difference between the observed combined surface and air temperature and the average temperature calculated for the period 1951-1980. There is a positive trend in both emissions and temperature. In addition, the World Meteorological Organization (WMO) has indicated that 2011 was the eleventh warmest year on record since 1880 and that the ten year period ending in 2011 was tied with 2001-2010 as the warmest ten year period ever recorded (WMO, 2012). It concludes that these statistics are consistent with a long-term warming trend (WMO, 2012).¹ This fact was highlighted in 2009 by the leading scientific academies of the G8+5², which issued a joint statement indicating climate change is happening faster than previously estimated and that there is an indisputable need for urgent action to address its source, rising GHG levels (G8+5 Academies, 2009).

¹ Some argue that there is not a single credible scientific institution that now disputes the science of anthropogenic climate change (The Climate Institute, n.d., p. 3).

² Members of the G8+5 are Brazil, Canada, China, France, Germany, India, Italy, Japan, Mexico, Russia, South Africa, the United Kingdom, and the United States of America.

Figure 1: World CO₂ emissions and temperature trends 1960-2011

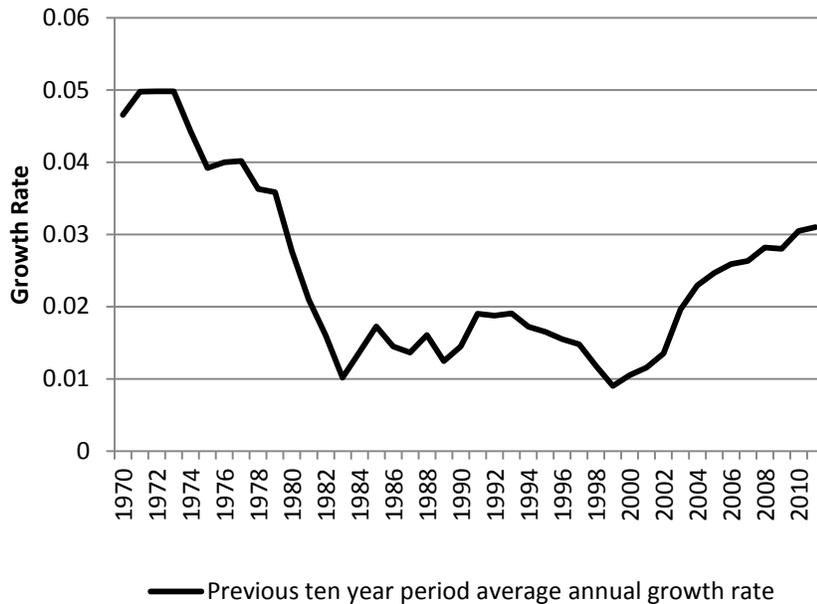


Sources: The CO₂ emissions data: World Bank (2012) for 1960-2008, Olivier et al. (2012) for 2009-2011. Temperature: Goddard Institute for Space Studies (2012).

The need for climate change action is linked to the rising level of the world’s GHG emissions. Not only did aggregate worldwide CO₂e emissions³ reach a record level of 34 billion tonnes in 2011, but growth rates have also recently been on the rise. Figure 2 illustrates the trend. It tracks the average annual growth rate in CO₂ emissions calculated for each year based on the previous ten year period. Average growth rates declined steadily from highs of approximately 5 percent in the early 1970s to a low of 1 percent in 1983. Since the period’s minimum was reached in 1999, average 10 year rates have risen steadily to over 3 percent in 2011. The evolutions pictured in Figures 1 and 2, which are consistent with the findings of Oliver et al. (2012) and Ceres (2012), are problematic for achieving climatic stability.

³ In addition to CO₂ emissions, there are two main GHG gases that are periodically included in emissions analyses. These are nitrous oxide (N₂O), methane (CH₄). When these emissions are included in a single measure, the acronym CO₂e is used. In 2011, CO₂e reached a record of approximately 34 billion tons (Oliver, et al., 2012; Ceres, 2012).

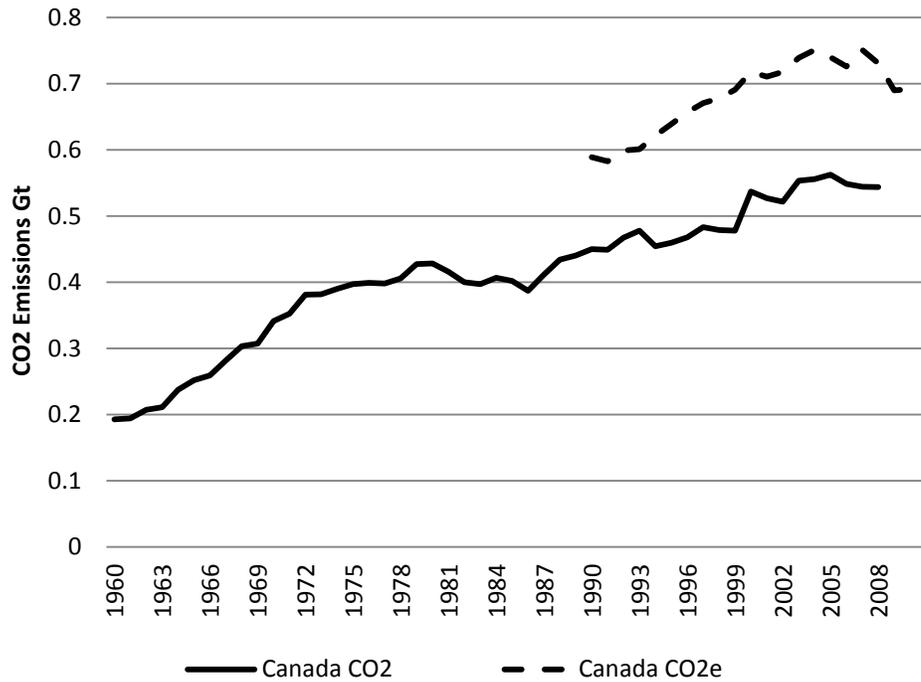
Figure 2: World CO₂ emission growth rates 1970-2011



Sources: World Bank (2012); Olivier et al. (2012)

The International Energy Agency (IEA) has modelled the effect of the world emission trends on global temperature rise. The results of their analysis indicate that the world is far from reaching the current international goal of limiting global warming to 2°C. For example, the study indicates that current international greenhouse gas reduction commitments will likely result in a global temperature rise of 3.5°C. If humanity is unable to meet these commitments and emissions continue to rise at the current escalating rate, the IEA has estimated that the resulting global temperature increase will be 6°C or more (IEA, 2011). The result of such an increase would likely be complete climate chaos (Schneider et al., 2007). Although Canada's emissions, illustrated in Figure 3, have declined marginally from their peak in the early 2000s, Canada will not escape the challenges and difficulties posed by warming global temperatures.

Figure 3: Canada's emissions 1960-2010



Sources: World Bank (2012); Environment Canada (2012)

2.2. Business risks and climate change

Businesses face two types of risks in relation to climate change: physical and regulatory risks. For the fossil fuel extraction and production industry, the physical risks include water scarcity and drought, precipitation extremes and flooding, increased intensity and duration of extreme weather events, rising sea levels and temperatures, thawing permafrost and land ice, and increased exposure to disease (Desjardins and Willis, 2009). Any single one or combination of these effects could result in material impacts on business operations. The impacts can be divided into those that are expected to have an influence on production and those that may have broader business effects. The production effects include constrained exploration, decreased processing and refining capacity, and disruptions to transportation routes (David Gardner and Associates, LLC, 2012). Business effects from climate change are greater exposure to litigation, especially regarding issues such as GHG emissions and water usage, and

limited access to, or increased costs of, insurance. Climate change may also impact intangibles, such as brand value and consumer confidence (David Gardner and Associates, LLC, 2012; CSA, 2010; Desjardins and Willis, 2009).

The economic impact of the physical effects of climate change could be severe for both the world and Canada. The Stern report indicates that climate change will likely cost the global economy between 5 and 20 percent of yearly GDP, in perpetuity, depending on the range of risks and impacts that are incorporated into the model (Great Britian Treasury, 2006). Furthermore at the international level, several research institutes have estimated that the costs of climate change will reach \$21 trillion per year in 2050 (UN PRI et al., 2011). Canada is also expected to face significant costs. Canada's National Round Table on the Environment and the Economy (NRTEE) find that climate change will likely cost the Canadian economy \$5 billion per year by 2020. This number could rise to \$91 billion per year in 2050, depending on worldwide emissions, population and economic growth trajectories (NRTEE, 2011). These results prompted the conclusion that mitigation must take place through the adoption of strong and deliberate policy measures (Great Britian Treasury, 2006; NRTEE, 2009).

Since the first Earth Summit, held in Rio in June 1992, there has been an international political process in place to stabilize GHG emissions to prevent dangerous climate change. Despite the progress that has been made through this initiative, which includes the signing of the Kyoto Protocol in 1997, a binding international agreement has not been realized and the world's emissions have continued to rise. Nevertheless, some governments at various levels are taking actions (Galarraga et al., 2011). In Canada, the provinces of Alberta, British Columbia, Manitoba, Ontario and Quebec have implemented policies intended to reduce GHG emissions. For example, Manitoba and Ontario have implemented subsidies, grants and loans for the adoption of management practices that reduce emissions. British Columbia has introduced a carbon tax. Quebec has adopted GHG emission standards for transportation, and Alberta has implemented a carbon tax on large industrial emitters (Desjardins and Willis, 2009; Galarraga et al.,

2011). Furthermore, these provinces, with the exception of Alberta, have joined the Western Climate Initiative (WCI) a regional cap and trade system (WCI, 2012a).⁴

The adoption of these measures suggests that businesses should be acting proactively to understand how climate change and climate change policy action will impact them. Certain sectors and industries have taken proactive approaches to managing climate risks. For example, the insurance industry, because of its growing exposure to the physical effects of climate change has been active developing protocols and risk assessment tools for adapting their business model to climate change (see for example, Leurig and Dlugolecki, 2013). Similar to the insurance industry, the operational business model of the oil and gas sector is highly exposed to climate risks. In their case, however, their exposure is less tangible and primarily in the form of regulatory risks, which, in an uncertain regulatory environment such as Canada's, makes the evaluation of climate risks more challenging and its implications more rational to ignore (for further information on Canada's regulatory environment see Holmes et al., 2012).

2.3. Implications for the fossil fuel industry and investors

Evidence suggests that the majority of the world's fossil fuel reserves will have to stay in the ground if dramatic climate changes are to be avoided. In 2009, the Potsdam Institute quantified a greenhouse gas emissions budget for the period 2000 to 2050 that will limit global warming to less than 2°C. It concludes that no more than 1000 Gigatons (Gt) total of CO₂ can be released into the atmosphere, from the baseline year of 2000 up to 2050, to have a 75 percent chance of not exceeding the 2°C limit. To have a 50 percent chance of not exceeding the target, emissions cannot exceed 1440 Gt CO₂ (Meinshausen et al., 2009). Between 2000 and 2011, the world emitted approximately 355 Gt CO₂. Based on the safer model, this leaves an average of 16.5 Gt per year; less than half of the 2011 emissions.⁵ This poses a significant challenge to the oil and gas industry.

⁴ Quebec is the only Canadian jurisdiction to have formally adopted regulations respecting the WCI cap-and-trade system for GHG allowances (WCI 2012b).

⁵ These calculations were made using the data provided by World Bank (2012).

In 2011, the Carbon Tracker Initiative (CTI) demonstrated that for the world to stay within the Potsdam Institute's carbon budget, no more than 20 percent of the proven reserves⁶ held by the leading 200 fossil fuel production firms can be brought to market (Leaton, 2011). A similar conclusion has also been reached by the IEA with an analysis based on a 50 percent probability scenario, hence a larger carbon budget (Leaton, 2012). This requirement to limit the conversion of reserves into marketable products is problematic because companies are partially valued on stock exchanges based on their reserve resources. Empirical studies have shown that proven reserves are significant to the market capitalization⁷ of fossil fuel E&P companies (see for example, Boyer and Filion, 2007; Kaiser and Yu, 2012; Quirin et al., 2000).⁸ Consequently, if policy action is taken to limit emissions to sustainable levels, the reserve resources controlled by oil and gas companies will become stranded assets and they will no longer sustain the market price of the companies that control them. In short, on the world's financial markets there is an overvaluation of fossil fuel companies given the reality of climate change.

This market overvaluation is a particular risk to Canadian investors for two reasons: the nature of Canada's fossil fuel reserves; and, the weight of the oil and gas E&P sector on Canada's financial exchange market. The dominant fossil fuel reserve product held by Canadian companies (i.e. bitumen from the oil sands) is far more carbon intensive than other fossil fuel products (Lee and Ellis, 2013; NEB, 2012). In fact, on average, Canada's oil sands industry is three times more carbon intensive than the conventional oil industry (Mercer, 2010) and, even on a lifecycle basis, the carbon associated with bitumen is 14 to 25 percent higher than conventional oil (Mui et al., 2010). This situation persists despite the efforts made by federal and provincial

⁶ Proved reserves are in ground fossil fuel resources, held through ownership agreements, which have a high probability of being developed at current prices and using current technologies. (Society of Petroleum Evaluation Engineers, n.d.).

⁷ A firm's market capitalization is the current price per share, multiplied by the number of shares. It is also commonly known as the market valuation.

⁸ The calculation of a precise value for reserves is made complex by the psychological nature of market activities. Nevertheless it is widely understood that reserves contribute a significant proportion of value to oil and gas firms. One estimate produced by Goldman Sachs indicates proven reserves contribute approximately 50 percent of the oil and gas industry value chain (IIGCC, n.d.c).

governments and the fossil fuel industry to reduce the emissions intensity of oil sands operations (Reuter et al, 2012).

The consequence of this emissions intensity is significant. Estimates produced by the Canadian Centre for Policy Alternatives suggest that just the proven reserves of the top 114 fossil fuel producers in Canada have associated emissions of more than 24Gt CO₂e (Lee and Ellis, 2013). In a carbon constrained world Canada's industry will face significant pressures as a result of this GHG emission potential. At the domestic level, these emissions exceed Canada's current reduction commitments⁹ and what would be allocated to Canada in an international distribution of carbon credits (Lee and Ellis, 2013).

The carbon intensity of Canada's reserves may also challenge the industry's ability to export. This is important because the GHG emissions of exports do not currently enter national accounts (WBCSD; WRI, 2004). Consequently, under this regulatory arrangement, Canada's industry could continue its planned production of reserves without being restricted by national emissions targets. In a carbon constrained world, however, countries will increasingly be cognizant of the carbon content of their energy imports, which will likely place Canada's industry at significant competitive disadvantage. For example, low carbon fuel standards, which have been implemented in California, and carbon pricing and cap and trade systems, which have both been implemented in Europe, discriminate against Canada's primary fossil fuel export product (Reuter et al., 2012).¹⁰ This evidence supports the conclusion that in the long-run the financial base of the fossil fuel business model, reserves, is not exploitable to the degree required to sustain the current market prices of the companies in the sector. This poses a direct risk, in the form of stranded assets, to the investments held by Canadian investors.

The risk posed by stranded fossil fuel assets to Canadian investors is influenced by the market weight that fossil fuels have on Canada's principle stock exchange. The

⁹ Canada's current GHG reduction targets are the Copenhagen commitment of 17 percent below 2005 levels by 2020 and the commitment of 60-70 percent below 2005 levels by 2050 set out in the Government of Canada's 2007 "Turning the Corner" climate change document. See (Office of the Auditor General of Canada, 2012)

¹⁰ For further discussion of Canada's fossil fuel exports see NEB (2012).

Toronto Stock Exchange (TSX) lists more than 50 percent of the world's publicly traded oil and gas companies (Blakes Canadian Lawyers, 2010) and nearly 24 percent of the value on the TSX is directly related to fossil fuel extraction and production (Lee and Ellis, 2013). The overall market weight associated with specific sectors or industries plays an important role in influencing what kinds of investment allocation choices are possible (Elton et al., 2010).¹¹ This influence is based on the portfolio theory of investing that suggests that holding multiple securities reduces the risks facing an investor as long as those securities do not move in unison (Elton et al., 2010). Consequently, it is extremely difficult for investors to maintain diversified portfolios without holding fossil fuel assets (Lee and Ellis, 2013).

To date, investments in fossil fuels have also been very profitable, which increases their attractiveness. For example, the NYSE Arca Oil index, a leading U.S. oil and gas firm index, has outpaced the Dow Jones Index, the market index, since 2005 (Shapiro and Pham, 2011). This type of performance has made oil and gas firms attractive options for institutional investors. Determining Canadian institutional investor exposure to oil and gas stocks at a system-wide level is difficult.¹² According to Shapiro and Pham (2011), the ownership breakdown of U.S. oil and gas firms is pension funds (31.2%), individual investors (21.1%), asset management companies including mutual funds (20.6%), IRAs (U.S. version of RRSPs; 17.7%), other institutional investors (6.6%), and corporate management of oil companies (2.8%). These statistics suggest the public, largely through institutional investor activities is highly exposed to potentially stranded fossil fuel assets.

This may be particularly the case for Canadian institutional investors because there are fewer alternative industries in which to invest in Canada relative to the United States (Lee and Ellis, 2013). One such example is the Canada Pension Plan (CPP). The CPP invests 32.3 percent of its holdings in public equities. If invested in a diversified portfolio similar to the market, the CPP would have approximately Can\$12.5 billion, 8

¹¹ Portfolio theory, and its consequence, is dealt with in more detail in the next chapter.

¹² To my knowledge, these statistics are not aggregated for Canada's oil and gas sector. Furthermore, institutional investors such as the Canada Pension Plan Management Board and the British Columbia Investment Management Board do not aggregate their investments by sector or industry.

percent of its total value, in oil and gas assets (CPP Investment Board, 2013). This is likely not an unreasonable estimate since the CPP has \$1.15 billion invested in just four oil and gas firms (Suncor, \$366 million; Progress Energy, \$371 million; Cenovus, \$182 million; and Canadian Natural Resources Ltd \$228Million; CPP Investment Board, 2012). Collectively, what these statistics suggest is that Canadian institutional investors are highly exposed to oil and gas stocks and the Canadian public should be concerned about the potential impact of large volumes of stranded fossil fuel reserve assets.

The preceding analysis suggests that the fossil fuel bubble exists, as Canadian investors are exposed to fossil fuel assets that cannot be extracted, and that action needs to be taken to deflate it before it pops. Deciding what action should be taken involves first understanding the sources of the bubble, which are discussed in the next chapter.

3. Financing the carbon bubble

The sources of Canada's carbon bubble fall into one of two categories: first, the sources that contribute to the disregard of systemic risk factors; second, technical and methodological issues that might limit the incorporation of climate change risks into the market valuation of companies. This section explains how each factor contributes to the undervaluing of climate change investment risks and the market overcapitalization of the fossil fuel sector.

3.1. Disregard for systemic risk factors

Most investment decisions are made using modern portfolio theory (MPT). MPT is a set of techniques used to assess and monetize the risk and reward of securities (a market tradable asset). The risk attached to a security, measured by the volatility of its price, can be of two types: the idiosyncratic risk (specific) and the systematic risk (aggregate). Idiosyncratic risk can be substantively reduced through portfolio diversification. Each security has a specific level of risk and when investors hold multiple securities, the total risk is not the average of the risk associated with each individual asset. Total risk depends on whether the asset prices move together or not. Consequently, there is a reduction in total risk if price volatility is not highly correlated (Elton et al., 2010).

Theoretically, the larger the number of different types of assets included in a portfolio the lower the idiosyncratic risk of a particular security. This, however, does not mean that highly diversified portfolios face zero risk. Systematic risk, by definition, is non-diversifiable and this leads to fluctuations in the overall portfolio value. The systematic risk allows a portfolio to have a larger expected return per each unit of risk held – the risk-return ratio. The maximization of this ratio yields an optimum (or efficient) portfolio (Elton et al., 2010). Hence, under optimal portfolio theory an investor must

equal or outperform the market return rate by making strategic asset allocation decisions with a fully diversified portfolio (Elton et al., 2010).

One of the major consequences of the practical application of MPT is the disregard of climate change as a source of risk. This is a direct result of the fact that MPT implies that only risk captured in market activities is valued. Sources of risk, such as climate change, that do not directly get captured in market information are excluded from analysis (Lydenberg, 2009). For example, in the case of investing in an oil and gas company, MPT measures the expected financial return relative to the risks when the price of oil rises or falls, but does not evaluate the impact of allocating resources to a sector that contributes to climate change (Lydenberg, 2009). In short, such risks are treated by MPT as exogenous to the regular functioning of the market and are therefore excluded from the analysis (Hawley et al., 2011). Consequently, the investment sector does not internalize climate change.

The disregard of climate change is also supported by the industry's corporate culture. There are two interrelated drivers of this; the nature of performance evaluation and fiduciary responsibility. An investment manager's performance is evaluated by the return value of his clients' portfolios. To be comparable, the return value is calculated from the assumption that any change in value occurs in a timeframe where no cash flows into or out of the portfolio.¹³ The longer the timeframe sought for the analysis, the harder it is to meet this assumption, since cash will be more likely to move in and out of the portfolio. The industry has standardized the evaluation process by calculating return value over short sub-periods, typically monthly or quarterly, and then averaging those return values for the desired time period (Fabozzi & Markowitz, 2011). This calculation process has focussed attention on short-term value creation, with investment managers commonly picking their stocks based on short-term earnings and financial indicators (NRTEE, 2007). The compensation of managers is often linked to these same sub-periods, providing considerable incentive toward short-term value creation (Sorensen and Pfeifer, 2011; Gore and Blood, 2011). The practical result of these incentives is that

¹³ The three specific components of this assumption are: 1) cash flows into the portfolio during the evaluation but does not flow out; 2) if there are distributions from the portfolio, they occur at the end of the period or are held in cash until the end of the period; 3) there is no cash contributed to the portfolio of the client. See for example, Fabozzi and Markowitz (2011).

investment managers, even those whose clients may have longer term interests, are prevented from using longer-term investment strategies that would be more in line with the consideration of climate change – an investment issue requiring long-term focus (Hawley et al., 2011; WEF, 2011).

Fiduciary responsibility also promotes the disregard of climate change. Fiduciaries are persons that are legally entrusted to control the financial assets of others, such as pension fund managers. The large size of their asset base allows them to have a significant impact on market activities that can influence economic growth and development patterns (Harichandra and Thangavelu, 2004).¹⁴ Fiduciary responsibility refers to a set of behavioural norms and standards that ensure investment managers are working in the best financial interests of the asset owners (Hawley et al., 2011; Yaron, 2001). This duty of care standard, because it focuses on process rather than outcomes, encourages fiduciaries to adhere to common practices because the perceived liability increases for individuals if they are out of step with industry norms (Hawley et al., 2011). This is problematic because the norms discount climate change. The fiduciary mandate to treat the interests of clients as strictly financial undermines the consideration of climate change. For example, likely a reflection of the industry-wide orientation toward short-term value creation, there is reluctance among fiduciaries to apply any type of non-financial screen, such as an environmental performance measure, that would allow them to factor climate change considerations into investment decisions. Doing so prevents optimal diversification and the generation of maximum return value (Yaron, 2001). In this way, fiduciary responsibility norms perpetuate the disregard of climate change in markets activities.

Numerous reports highlight the impact of the status quo on the reluctance of many financial professionals to embrace climate change as an important factor influencing investment decisions. For example, Soloman (2009) has reported on the lack of trustee engagement on climate change and indicated that little progress has been made on this issue since the United Nations Environment Programme (UNEP) first identified obstacles that needed to be overcome in 2003. In addition, the UNEP Finance

¹⁴ For example, pension funds alone control approximately US\$30 trillion in assets (Ambachtsheer K., 2011).

Initiative and the World Business Council for Sustainable Development have found that many investors only think about long-term economic drivers, such as environmental, social, and corporate governance (ESG) factors, in very narrow terms. Being primarily concerned with how these issues affect corporate reputation and brand issues or perhaps corporate governance (CICA, 2010). Finally, more specifically to the topic of this report, in a survey of asset managers conducted by Ceres, 71 percent responded that they did not conduct a comprehensive assessment of climate risks as part of their due diligence process (Kapoor et al., 2011). In addition to the barriers discussed throughout section 3.1, significant methodological challenges also contribute to the disregard of climate change as an investment issue.

3.2. Technical and methodological uncertainties

The incorporation of climate change considerations into risk-return valuations is a complex and difficult task. According to the Chartered Financial Analyst (CFA) Institute, determining if there is value in making an investment is dependent on the ability of the financial analyst to determine the factors that influence the market valuation of a firm and then judge the accuracy of that valuation (UNEP FI, 2009). When it comes to understanding the impact of environmental issues, this involves specific expertise. For example, to adequately utilize environmental, social and corporate governance (ESG) information in the determination of risk, investment managers must be able to identify climate-related risks, understand how this might affect certain portfolios or industry sectors, be able to evaluate the risks facing particular geographical or political locations, and identify new promising or competing technologies (CICA, 2010). Despite efforts by some institutional investors to develop models that integrate such information, the development of these tools and competencies remains largely in its infancy (see for example, NRTEE, 2007; WEF, 2011; Sorenson and Pfeifer, 2011; CICA, 2010). This is important because investment advisors have indicated that failure to develop standardized, comparable and sector specific valuation metrics for ESG information is a significant barrier to their consideration of sustainability issues in investment decision-making (CICA, 2010).

3.3. Demand-side progress

There are numerous research groups working to remedy both the attitudinal and methodological deficiencies evident in the investor community. They are seeking to increase awareness, strengthen competencies, and modify the incentive structures of investment managers so that they reflect long-term sustainability goals.¹⁵ The UNEPFI and the United Kingdom Social Investment Forum specifically advocate for the adoption of a best practices approach to sustainable investing that includes advice on screening, the use of transparent standards, the application of leading ESG evaluation methods, the targeting of specific funds, and supporting research in these areas (UNEPFI, 2009). Evidence suggests that progress is being made to overcome these challenges. Increasing numbers of leading financial professionals are advocating for the incorporation of climate change factors in investment decision-making (Ceres, 2012), and the number of investors investing in sustainable funds, as well as the total market value of these investments is rising (PRI Association, 2012c; UNEP FI, 2009).

In summary, traditional portfolio theory, which is the basis for professional investing, excludes from its analysis factors, such as climate change risks, that are not valued by market transactions. Moving beyond the status quo in financial analysis - by taking climate change into account - is difficult for two reasons. First, financial market participants have significant incentives, including compensation schemes and fiduciary norms, for perpetuating the current system. Second, it is methodologically difficult because it calls for the development of expertise in new subject areas that are particularly challenging to evaluate financially. There is, however, emerging evidence that some financial market participants are becoming engaged with climate change as an investment issue. Investors' demand is only one side of the issue. Investors require access to relevant corporate climate change information to value firms accurately and make appropriate investing decisions. This is specifically the case for the oil and gas

¹⁵ See for example, the work undertaken by the Canadian Institute of Chartered Accountants, the Principles for Responsible Investment (PRI) association, the World Economic Forum, Ceres, the UNEPFI and the United Kingdom Social Investment Forum (UKSIF) information regarding (CICA , 2010; PRI Association , 2012b/2012c; and, The World Economic Forum, 2011).

sector because of its susceptibility to climate change risks. The next chapter discusses the economic theory and rationale for corporate disclosure.

4. The economic theory and rationale for disclosure

In modern capital markets, information and incentive problems drive the allocation of resources. The optimal allocation of savings to investment is complicated for two reasons. First, business managers typically have better information about the value of business investment opportunities and therefore have the incentive to overstate the opportunity. This creates a “lemons” problem.¹⁶ When investors are unable to distinguish between two investment options, one being “good” and the other “bad”, they will value those opportunities equally. Consequently, if the information problem is not resolved, capital markets will undervalue some good investments and over value some bad investments (Healy and Palepu, 2001). This applies to the carbon bubble problem.

Second, once investments have been made, business managers have an incentive to expropriate investors’ savings, creating an agency problem. The principal agent theory argues that because business managers and investors have competing interests, the outcome may not be that of a perfect market. Information asymmetry provides firm managers with an opportunity to invest in high risk projects that disproportionately benefit themselves while exposing investors to greater risks (Healy and Palepu, 2001). For example, regarding the environmental performance of public companies, if investors are unable to accurately value a company’s efforts at reducing GHG emissions, business managers have an incentive to neglect making such investments in order to realize short-term gains (Repetto, 2005). Unless financial market valuations reflect the financial risks incurred by companies through their environmental performance, investors will be endangered. The liability posed by GHG emissions to oil and gas firm value is just such an example. There are three well-known solutions to information asymmetry problems: the creation of optimal contracts, the use of information intermediaries, and the implementation of disclosure regulations. The

¹⁶ The “lemons” problem was originally discussed by Akerlof (1970).

optimal contract is needed to provide an incentive toward full disclosure by sharing the risk between business managers and investors. Its success is highly dependent on the ability of the parties to write, monitor, and enforce the contents of the contract. Information intermediaries engage in private information production to make known internal business information. This can be a resource intensive activity and, therefore, its success at eliminating information asymmetry is determined by the costs incurred. Finally, regulation can promote full disclosure if it can be written with few limitations and if conflict of interest concerns can be overcome (Healy and Palepu, 2001).

In Canada, many investments are made through financial intermediaries, such as fiduciaries and investment managers.¹⁷ Consequently, optimal contracts are inappropriate for the carbon bubble challenge because there is no direct relationship between the business manager and the asset owners (shareholders). Information intermediaries are important, however, they face huge challenges evaluating climate change business information from an external position. Hence, disclosure regulation is seen as an essential tool for reducing climate change information asymmetries (see for example, Repetto, 2005; McFarland, 2009). Canada's disclosure regulations are the subject of Chapter 5.

¹⁷ For example, nearly half of Canadians have a financial advisor and the top investment product sold in Canada, mutual funds, is primarily purchased through an advisor (Innovative Research Group, 2012; The Investment Fund Institute of Canada, 2011).

5. Canada's climate change disclosure framework

In Canada there are two methods through which investors can gain access to company specific climate change information: mandatory disclosures and voluntary initiatives. Both are briefly overviewed in this chapter.

5.1. Canada's mandatory oil and gas reporting guidelines

The description of Canada's mandatory reporting system can be divided into three categories; institutions, procedures, and principles.

5.1.1. *Institutions*

Canada's regulatory system for corporate disclosure is under 10 provincial and 3 territorial jurisdictions. To alleviate the regulatory burden on companies and ensure consistency throughout the country, the governance of disclosure is coordinated through a voluntary umbrella organization, the Canadian Securities Administrators (CSA). The CSA develops and amends the policy framework that all publicly listed Canadian and foreign owned companies featured on Canada's stock exchanges must comply with. The system allows a company to report to one provincial regulator and be subjected to its ruling throughout the country (CSA, 2009).

In addition, companies must comply with the regulations established by the TMX group. The TMX group owns, operates, and regulates activities on the Toronto Stock Exchange and the TSX Venture Exchange (TMX Group, 2012b). Since January 1, 2011, public companies must also act in accordance with the International Financial Reporting Standards (IFRS). The TMX policy framework primarily deals with the timing of disclosures while the IFRS ensure that disclosures are comparable internationally. The adoption of the IFRS standards has added disclosure requirements. The major change

concerns the recognition threshold. Under the IFRS, firms are required to report if a provision is “probable” or “likely to occur”, which is a lower threshold (requiring more disclosure) than what was required previously (OSC, 2009). The TMX and IFRS regulations are of particular importance because they ensure a level playing field for all investors and contribute to the integrity of the entire financial market system (Woodside, 2009).

5.1.2. Procedures

In addition to filing financial statements that must include all assets and liabilities, there are two mandatory documents through which publicly traded oil and gas companies must disclose company performance regarding environmental and climate change issues. These are the Management Discussion and Analysis (MD&A) and Annual Information Form (AIF).¹⁸

The MD&A is a document prepared by a company to complement its financial statements. It provides an overview of the factors that contribute to a period’s financial performance as well as a forward looking prospectus. The Certified General Accountants Association of Canada (CGA) provides interpretation of what should be included in the MD&A. It indicates that “companies are expected to discuss commitments, events, risks, or uncertainties that could materially affect a company’s future performance” (CGA, 2005, p. 30). In addition, MD&As must include discussion of known environmental and political issues which have affected current operations. This requirement applies to all properties held by a company including those that have not been developed (Woodside, 2009; CGA, 2005).

The AIF is used to provide information about a company to investors at a particular point in time given its historical context and possible future developments. It requires companies to describe “the financial and operational effects of environmental protection requirements on capital expenditures, earnings and competitive position...that would have a potential impact on an investor’s decision to purchase securities in the

¹⁸ Both the MD&A and AIF are required by National Instrument (NI) 51-102 *Continuous Disclosure Obligations*. National Instruments are policies created by the CSA that are applied throughout the country by all provincial and territorial securities regulators (Woodside, 2009).

company” (CGA, 2005, p. 31). The essential point of this requirement is that all relevant risks, be they environmental, social or economic be thoroughly discussed in the AIF. In short, it is through the MD&A and AIF that investors expect to gain information about risks and opportunities associated with a company’s environmental performance (Woodside, 2009).

5.1.3. Principles

In Canada, disclosures from publicly listed oil and gas companies are based on the concept of materiality. Materiality is an accounting convention relating to an issues’ importance. It is a subjective assessment based on professional judgement. CSA (2010) states “information is *material* in respect of a *reporting issuer* if it would be likely to influence a decision by a reasonable investor to buy, hold or sell a security of the *reporting issuer*” (p. 6). Hence, a company must disclose any information that could result in a change in the market price of its stock.

The Timely Disclosure Policy of the TSX provides examples of material issues that could affect the valuation of companies in the extractive industries. These include for example, acquisitions, discoveries, changes to significant contracts, labour disputes, or any other developments that would reasonably be expected to significantly affect the issuers’ market price or would be likely to influence a reasonable investor’s decision process (TSX, 2012). The problem with these explanations is that “reasonably” and “significantly” are highly subjective concepts. Defining what is reasonable and what is significant is a challenge and may bring ambiguity into the reporting process (Woodside, 2009).

The flexibility of materiality, however, is important. From the regulator’s perspective, it ensures that regulations are able to keep pace with technological change and the advancement of scientific knowledge without having to be periodically rewritten. For companies, flexibility is also important. Because management is in the best position to understand the issues affecting their business, it allows for disclosure to investors information that may not be identified by regulators. In this way, materiality serves the role of promoting creativity in the reporting process and, thus serves the interests of

investors (Burton, 2010).¹⁹ Materiality also serves the interests of investors by ensuring that financial reports are not cluttered by unnecessary and potentially confusing information. Overall, this description reveals clear trade-offs between providing more specific definitions of materiality, such as through a bright-line test or definition, the quantity and quality of the information provided by firms, and its accessibility and usefulness to investors (Smith et al., 2008).

5.2. Voluntary disclosure programs

Outside of the mandatory reporting system, some companies are disclosing climate change information voluntarily. This can be done by participating in an initiative such as the Climate Disclosure Project (CDP) or by self-publishing a sustainability or corporate responsibility report.

The CDP was launched in 2000 and collects information (through corporate surveys) for institutional investors (CDP, 2012). Questions cover climate change risks, GHG emission totals, reduction targets, management strategies, and opportunities for improvement (Andrew and Cortese, 2012). In 2011, the number of information requests issued by the CDP had risen to over 8000 worldwide and the number of institutional investors requesting CDP reports had reached 655. The asset base of these investors exceeds US \$78 trillion (CDP, 2012; Accenture, 2012).

Companies can also self-publish sustainability reports. These are often completed using an established methodology such as the one developed by the Global Reporting Initiative (GRI). This framework includes reporting guidelines, sector specific guidelines and other resources, which assist companies in their disclosure of ESG performance. There are 30 environmental performance indicators with detailed information about how to measure them (GRI, 2012). The measures related to climate change include total direct and indirect GHG emissions by weight, other relevant indirect emissions, initiatives to reduce GHG emissions and reductions achieved, and the monetary costs associated with compliance (GRI, 2011). In addition to the GRI, there

¹⁹ Firms typically report the assumptions that underlie the determination of materiality for forward looking information in their financial reports.

are more than 100 independent frameworks for sustainability reporting globally and more than 30 “major” schemes for GHG emissions reporting (Guthrie, 2012; IPIECA, 2012).

5.3. The current state of climate change disclosures

Investors have indicated the effectiveness of disclosure is limited by two factors: the comparability of voluntary initiatives and materiality in the mandatory regime.

The comparability of voluntary programs is limited by two factors: their inability to secure widespread use and methodological consistency. For example, in 2009, only 64 percent of the companies in the S&P 500 Index responded to the CDP’s questionnaire and of those, only 49 percent permitted the public disclosure of their information on the CDP’s website. Although these statistics are consistent with a positive trend in favour of disclosure, the pace at which growth is occurring is extremely slow (McFarland, 2009). The most recent data from Canada also follows this trend. For the 2012 survey, only 54 percent of companies in the Canada 200 index chose to report to the CDP (Accenture, 2012). Without comprehensive information across or, at the very least, within sectors, the usefulness of the information by investors is severely compromised.

The consistency problem is a particular challenge for GHG emissions. For years, companies reported GHG emissions numbers to the CDP without disclosing how those emissions were calculated. This has reduced the value of the information to investors, NGOs and policymakers. Although the CDP has taken steps to remedy this issue, such as by requesting the disclosure of the methodology, standardization remains a challenge (Andrew and Cortese, 2012). This is a problem with all voluntary programs. Companies can choose to follow the prescribed guidelines or, they can choose to use a different methodology that better suits the desired output (Andrew and Cortese, 2011; Burton, 2010). Because of this deficiency, mandatory disclosure requirements are an extremely important source of investor information.

Numerous regulators and stakeholders have, however, indicated that there are inadequacies in mandatory reports. In 2007, institutional investors petitioned the US Securities and Exchange Commission (SEC) asking it to improve its regulatory framework regarding environmental disclosures. The SEC responded to this request with

new interpretive guidance detailing the specific instances when climate change is of material importance to investors (McFarland, 2009). Similar events also occurred in Canada after the issue was raised by the Ontario Government. For example, the CICA, the CSA, and the CGA each published guidance documents to clarify materiality requirements and increase the disclosure of climate change information (see for example, CICA, 2008a/b; CSA, 2010; Girdharry et al., 2011). The CICA further indicates that regulatory disclosures “do not necessarily” meet investors’ needs for ESG information and that regulatory change may be required (CICA, 2008b).

Problems arise particularly when investor and corporate interests conflict. Goldman Sachs has pointed out that some companies do not view ESG impacts as sufficiently material to company performance to warrant quantification and public disclosure (CICA, 2010). This criticism has also been repeated by several NGOs all of whom found major discrepancies between the ESG information that investors deemed material and that which was provided by companies.²⁰ In fact, a report issued jointly by Ceres and the Environmental Defense Fund concluded that there was “an alarming pattern” of non-disclosure by corporations specifically regarding climate risks (CICA, 2010, p. 21). Similar results have been found by a number of international academic studies.²¹ Unfortunately, it remains unclear what specific part or parts of Canada’s regulatory framework are inadequate.

In Canada, the disclosure system has a compulsory and voluntary component. Unfortunately both suffer from shortcomings, which lead to inadequate evaluation of climate change risk by investors. The rest of this study evaluates the oil and gas sector’s disclosures, links the deficiencies to Canada’s regulations, and recommends policy solutions. The next chapter defines the policy problem and stakeholders.

²⁰ The NGOs include: the UNEP FI, the World Business Council for Sustainable Development, Ceres, and the Environmental Defense Fund (CICA, 2010).

²¹ See for example, Dong and Burritt (2010); Doran and Quinn (2009); McFarland (2009).

6. Policy problem and stakeholders

The policy problem addressed in this research is: the disclosures of Canada's oil and gas exploration and production sector are inadequate for investors to properly evaluate the risk posed by climate change to the value of those companies. This lack of information leads to market overcapitalization of the sector that leaves investors open to significant losses should the carbon bubble burst. Although demand-side problems from the investor community are a challenge, this research focuses on the supply-side (i.e. the business-side). The provision of climate change information from the oil and gas sector is a necessary first step to consider all investment risks and not just financial ones. Unless financial market valuations of risk and return accurately reflect the risks that companies face as a result of their business practices, investors and the economy will be endangered. Rational investing, therefore, serves as a means to mitigate the social harms that could result from the undervaluing of climate change risks.

The major stakeholders involved in this policy problem are firms in Canada's oil and gas sector and institutional investors. Any alteration to Canada's disclosure system will impact investors' decision-making processes and the profitability of making investments in oil and gas firms. In addition, because investment managers are information providers and intermediaries between firms and asset owners, their engagement with climate change is an essential first step in reducing exposure to the carbon bubble. Many are also an important source promoting change in Canada's climate change corporate disclosure regulations.

Minor stakeholders include the Canadian Securities Administrators (CSA), the Canadian Institute of Chartered Accountants (CICA), the Certified General Accountants of Canada (CGA), and the Canadian Association of Petroleum Producers (CAPP). The CSA is the authority that governs and enforces corporate disclosure practices in Canada. It, therefore, has the principle role in the successful implementation of disclosure policy. The CICA and the CGA, as associations of Canada's professional accountants, have an important role in providing guidance and setting industry

standards. Finally, the CAPP, which represents the interests of Canada's oil and gas producers, communicates standards, develops guidelines, and offers training programs to its members (CAPP, 2012). It therefore has a role in influencing industry-wide disclosure standards. Despite potentially benefitting from a more efficient capital market system, the public is not considered a significant stakeholder group in this research.

7. Methodology and sample description

In this chapter I describe the analytical methodology used to evaluate the corporate climate change disclosures from Canada's oil and gas E&P sector, describe the sample and provide reasons why it was chosen.

7.1. The methodology

The goal of this research is to evaluate the quantity and quality of climate change disclosures being made by Canada's oil and gas extraction and production sector and link the results to regulations. The methodology used is predominantly a content analysis. Content analysis is a research technique for the objective, systematic, and quantitative description of the subject matter of communicated material (Krippendorff, 2004). It has been used extensively to assess corporate, social, and environmental reporting (see for example, Dong and Burritt, 2010; Doran and Quinn, 2009; Milne and Adler, 1999). Content analysis is used because corporate climate change information tends to be disclosed qualitatively and it is the most appropriate tool for empirically assessing such information.

Content analysis is not devoid of limitations as the English language is imprecise and nuanced. This means that the interpretation and coding of written material is an inherently subjective exercise. This research uses three methods to increase the reliability and validity of the results. First, content categories are selected from relevant literature and are clearly defined. Second, a reliable coding instrument (rubric) with decision rules is established (the decision rules are available in Appendix A). Third, the sentence is chosen as the unit of analysis to increase the validity of the results (see for example, Krippendorff, 2004; Hackston & Milne, 1996).

In addition, clear description of the assessment and data-making processes are an essential component of the content analysis process (Krippendorff, 2004). In this research, the analysis takes place in three stages.

The first stage is analyzing and tracking the nature of the climate change information being disclosed, as well as the volume and location of that information. This requires the creation of units and categories of analysis. This is important because categorization of the qualitative information being assessed ensures that the results of the analysis are replicable (Krippendorff, 2004). The categories used in this report are developed from best practice e guidelines and previous content analyses studies examining oil and gas disclosures.²² The categories are: GHG Emissions Data Reporting; GHG Emissions Reduction Strategy/Pledges; Risk Identification; Risk Management & Mitigation; and, Opportunity. Following Dong and Burritt (2010), the information corresponding to each category is assessed based on the type of evidence (monetary, non-monetary, declarative), the type of news (positive, negative, neutral), and volume (number of sentences). This information is used to evaluate the overall trends in the reporting efforts of the sample companies.

The second stage is the evaluation of the quality of the disclosures. This is done using a dichotomous benchmarking approach. Following Doran and Quinn (2009), for each of the content categories developed for the first stage, a set of optimal criteria (the benchmark) is created based on the best practice guidelines suggested by the relevant literature. In total there are 28 criteria distributed over the five content categories (see Appendix B). The goal of this scoring framework is to objectively and systematically assess the aggregate value of the climate change information provided by the fossil fuel sector. It does this by tracking whether companies disclose or do not disclose the selected best practice features. Because this process is limited [it is unable to document the internal quality of the 28 criteria], qualitative evaluation and discussion accompanies the quantitative results.

²² The content categories are specifically developed from the Global Reporting Initiative (2012), the Global Framework for Climate Risk Disclosure (2006), CICA (2008), Gardner et al. (2007) and McFarland (2009).

The third stage is a literature-based qualitative evaluation of Canada's disclosure regulatory system. Supporting evidence for identifying shortcomings is drawn from international jurisdictions that share Canada's principles-based approach to disclosure. The value of the three stage approach is that each provides a different lens through which to identify deficiencies, which overcomes the limitations associated with any individual framework. In the final subsection, the identified shortcomings from each stage are brought together to identify what specific issues need to be addressed with policy reform.

The data used in the content analysis were obtained from the main sources of corporate climate change information accessible by investors, MD&As, AIFs and sustainability reports. The MD&As and AIFs, were downloaded from Canada's System for Electronic Document Analysis and Retrieval (SEDAR). All of the mandatory reports utilized in this report are 2011 year end disclosures. The sustainability reports were downloaded from the corresponding companies' web sites. Due to the low number available for 2011, reports from 2009 and 2010 were included. The total number of documents included in the sample is 67: 30 MD&As, 29 AIFs, and 8 sustainability reports.

7.2. Sample description

This analysis is based on the climate change disclosures of the 30 largest oil and gas exploration and production firms that are publicly listed in Canada. In order to choose the sample companies, all firms operating in the fossil fuel E&P sector were rank-ordered on July 5th 2012, based on their market capitalization, and the top 30 were recorded.²³

The 30 firms featured in this sample on July 5th 2012 had a total market capitalization of approximately Can\$276.4 billion. At the end of 2011, there were 405 Oil and Gas companies listed on the TSX with a total market value of approximately Can\$379 billion (TMX Group, 2012a). This means that the 30 companies featured in this

²³ This process was completed using tools available on the FP Infomart web site (FP Infomart, 2012).

sample account for approximately 73 percent of the total oil and gas value on the TSX. The largest company in the sample is Suncor Energy Inc. with a market capitalization of Can\$47.4 billion. The smallest company is Bonterra Energy Inc., which has a market capitalization of Can\$0.9 billion. The total proven reserves controlled by sample companies exceeds 19.7 billion barrels of oil equivalent. The carbon content associated with this level of reserves is approximately 9.3 Gt CO₂e. This level of emissions would have a corresponding social cost of carbon (SCC) of approximately Can\$373.4 billion.²⁴ This liability, an order of magnitude equal to the sector's capitalization rate, indicates that regulation could lead to stranded assets and significant loss of shareholder value. A full list of the companies, including their market capitalization, proven emissions potential and associated SCC is available in Appendix C.

The decision to conduct the analysis on the 30 largest firms (market value) rather than using a representative sample is based on the nature of the carbon bubble. Since firm market capitalization is positively correlated with reserve holdings (Boyer and Filion, 2007) and aggregate reserves dictate the climate risk facing investors through the market, it is more important to analyze the disclosures of the large firms. This decision was also made despite the potential for the future development and use of abatement technologies, particularly by large firms.²⁵ Regarding the quality of the expected disclosures, empirical research has indicated that smaller firms tend to make relatively fewer and poorer quality ESG disclosures compared to their large counterparts (CGA, 2005). This suggests that it is unlikely that this analysis will underestimate the disclosures being made by Canada's oil and gas sector. Nevertheless, from the perspective of investors, whose exposure to the carbon bubble is associated with the total market value of the firms, the results of the analysis and its implications for the development of sound public policy are more appropriately measured by limiting the study to larger firms.

²⁴ The social cost of carbon is the estimated economic loss created by a ton of carbon released into the atmosphere. These calculations are based on the companies' reported reserves. The methodology used in the calculations is developed by Ellis and Lee (2012) and \$40 per ton is derived in Jaccard et al. (2009).

²⁵ For further discussion of carbon abatement technologies and their current limited ability to moderate the emissions from oil sands operations see Reuter et al. (2012).

8. Analysis

The results of the content analysis are divided into three sub-sections: The first presents the analysis of the quantity of climate change disclosures; the second, the evaluation of the quality of the disclosures; and the third, the deficiencies in Canada's reporting regulations.

8.1. Quantity analysis

The quantity analysis makes specific reference to the type of news and evidence reported. The type of news captures if the information is positive, negative, or neutral. The type of evidence refers to whether the information is monetary or non-monetary data, or a declarative statement. The analysis takes place in sub-sections devoted to the overall results and individually for each of the disclosure documents (ie MD&A, AIF and SR). The results are compared to the existing literature to validate my findings.

8.1.1. Overall results

The results are presented in Tables 1 and 2. Overall, the sample companies disclosed 921 sentences with company specific climate change data across the three report types; an average of approximately 31 sentences per company. There is, however, considerable range in the number of sentences disclosed by individual companies. The highest number of sentences is 123, disclosed by Cenovus Energy Inc. In contrast, Bonterra Energy Corp. did not mention climate change in its public disclosures (Appendix D shows the results for each firm). The overall results also indicate that disclosures are skewed towards the positive end of the distribution, as a relatively small number of companies are responsible for the majority of the disclosed sentences. This is evidenced by both the low median level, 15.5, compared to the mean (31) and the fact that 20 percent of the sampled companies accounted for 58 percent of the total.

The categories of disclosure provide further insight. Declarative and neutral information were the dominant forms of information (92 and 57 percent of the total disclosures, respectively). The finding with regard to the high proportion of declarative statements is consistent with previous literature. Dong and Burritt (2010) find that 84 percent of the disclosures from their sample are declarative. The high proportion of neutral sentences is a divergence from the existing literature. Previous studies, which examined more broadly social and environmental disclosures, find higher rates of positive disclosures.²⁶ Such studies argue that companies in environmentally sensitive industries generally use positive language in attempts to manage their reputation and favourably differentiate their company from competitors (Hackston and Milne, 1996). The overall results indicate this is not occurring throughout the sample. This discrepancy is likely a result of the climate change specific nature of this research. For example, when the results featured in Dong and Burritt (2010) are examined with a focus on climate the result is consistent with my findings.²⁷

The cumulative results also indicate that very few companies monetize or include other relevant quantitative data in their disclosures. However, at least one piece of monetized climate change-related data is disclosed by 9 companies, while 8 provide at least one example of non-monetized data. Interestingly, although negative sentences account for the lowest proportion of disclosures (28 percent), 90 percent of the companies made at least one negative statement regarding the impact of climate change on their business' operations. This exceeds the number of companies making overtly positive statements.

²⁶ See for example, Dong and Burritt (2012) and Hackston and Milne (1996).

²⁷ The two categories most closely linked to climate change, product and energy disclosures, had considerably fewer "positive" statements than the other categories (Don and Burritt (2010). This result suggests that the broader analysis may have overshadowed an important observation about oil and gas firms' presentation of climate change information to the public.

Table 1: Evidence of climate change disclosures

Evidence	Number of Companies Disclosing	Percentage of total sampled companies	Number of sentences disclosed	Percentage of total disclosures
Declarative	29	97%	850	92%
Monetary	9	30%	16	2%
Non-monetary	8	27%	55	6%
Total			921	100%

Table 2: News type of climate change disclosures

News Type	Number of Companies Disclosing	Percentage of total sampled companies	Number of sentences disclosed	Percentage of total disclosures
Positive	15	50%	260	28%
Negative	27	90%	138	15%
Neutral	29	97%	523	57%
Total			921	100%

8.1.2. Management Discussion and Analysis (MD&A)

Climate change disclosures in MD&As accounted for approximately 12 percent of the total. Table 3 provides a summary of the quantity and type of evidence in the reports. The total number of climate change-related sentences is 110 (3.7 per company). Similar to the overall results, there is significant range in the number of sentences disclosed by individual companies. The maximum value, 20, is disclosed by Canadian Natural Resources Limited, while 14 companies did not include a single reference to climate change in their MD&A.

Categorization of the sentences indicates that the highest volume of disclosures involved the identification of climate change risks (69 percent). Noticeably absent from the MD&A is any meaningful discussion or data related to greenhouse gas emissions. Only one sentence is disclosed throughout the 30 documents. In addition, very little information was provided with regard to the actions that have been taken by management to reduce GHG emissions (22 sentences), or manage or mitigate the potential impacts of climate change on business operations (8 sentences). Following the overall trend, the majority of the sentences are both declarative and neutral, with very few sentences containing quantitative or monetized information.

8.1.3. Annual Information Form (AIF)

The climate change disclosures within the annual information forms accounted for 42 percent of the total, or more than 13 sentences per company. A very high proportion of the disclosures (98 percent) were declarative. Regarding the type of news being reported, 65 percent were neutral, 25 percent negative and 9 percent positive.

The analysis of the disclosure categories in Table 4 indicates that the AIF is the primary document where companies are identifying climate change risks. Climate change risk identification account for 311 out of the total 387 sentences disclosed in the AIF. The companies also disclose 53 sentences describing the actions that had been undertaken to address GHG emissions. Much less information is provided with regard to the actions that had been taken to manage the wider subject of climate change risks, the GHGs generated from operations, and potential opportunities occurring as a result of climate change. These categories accounted for 4, 1 and 0.5 percent, respectively, of the total.

Table 4: Annual Information Form quantity summary (29 companies)

AIF Category	Declarative	Monetary	Non-monetary	Total	Positive	Negative	Neutral	Total
GHG Emissions Data Reporting	4	0	1	5	0	0	5	5
GHG Emissions Reduction Strategy/Pledges	47	5	1	53	21	3	29	53
Risk Identification	310	0	1	311	5	95	211	311
Risk Management & Mitigation	16	0	0	16	7	1	8	16
Opportunity Identification	2	0	0	2	2	0	0	2
Total	379	5	3	387	35	99	253	387

Note: totals in table may not sum to 100 percent due to rounding

Climate change disclosures are more consistently found in the AIF than in the MD&A. The vast majority (28 out of the 29) of the sample AIFs contained at least one climate change-related sentence. Despite the fact that most companies made a climate change disclosure in their AIF, the range is still significant. Trilogy Energy includes 4 climate change-related sentences, while Suncor and Nexen Inc. each disclose 32 sentences. Similarly to the MD&As, the information provided in the AIFs is far more qualitative than quantitative, as a total of 8 sentences included monetized or quantified data. The majority of this data is related to GHG emissions management activities.

8.1.4. Sustainability Report (SR)

Although only 8 companies in the sample produced a sustainability report, it is the largest single source of climate change information. A total of 424 sentences are disclosed in these documents (Table 5). This represents 46 percent of the total and an average of 53 sentences per company, a number that far exceeds the level achieved in the mandatory documents. The total number of sentences disclosed ranged from 15, by Canadian Natural Resources Inc, to 103, by Imperial Oil.

Table 5: Sustainability Report quantity summary (8 companies)

Sustainability Reports		Declarative	Monetary	Non-monetary	Total	Positive	Negative	Neutral	Total
Category									
GHG Emissions Data Reporting	23	6%	0	30	53	26	4	23	53
GHG Emissions Reduction Strategy/Pledges	293	79%	6	17	316	169	3	144	316
Risk Identification	7	2%	0	0	7	1	2	4	7
Risk Management & Mitigation	44	12%	0	2	46	14	11	21	46
Opportunity Identification	2	1%	0	0	2	2	0	0	2
Total	369	87%	6	49	424	212	20	192	424

Note: totals in table may not sum to 100 percent due to rounding

GHG emissions management is the largest disclosure category accounting for approximately 75 percent of the total. The majority of the information disclosed in this category is declarative; however, the type of news is fairly evenly split between positive and neutral. Only 3 sentences are negative. This suggests that sustainability reports, because they are voluntary, are the location where companies are engaging in the reputation management and brand-value enhancement activities suggested in the environmental disclosure literature (see section 8.1.1). The results further indicate that such statements are most likely to occur in terms of GHG emissions management.

One of the most significant results is that the sustainability report is the location where companies are publicly disclosing GHG emissions data. A total of 53 sentences described firms' emissions. The majority of this information (61 percent) is non-monetary quantitative data. Within the GHG emissions reduction strategy category, 6 sentences contained monetary information. This level of quantitative data exceeds what is presented in the other document types.

8.1.5. *Conclusions from the quantity analysis*

Companies in the sample are more likely to report information in areas that are qualitative in nature. For example, discussion of climate risks, strategic management and corporate governance of climate change are much more likely to be discussed in the mandatory disclosure documents than areas that require more quantitative information and analysis, such as emissions data and monetization of current and future regulatory scenarios. Similar conclusions are reached by Gardner et al., (2007) in their assessment of the disclosures made by a sample of S&P 500 companies. The results also indicate that there is little integration of GHG emissions information with financial information. Furthermore, companies are not providing data that allows tracking or measurable analysis of their performance from year to year. Finally, within each type of document, the results reveal wide ranges in the quantity of information provided. Such extreme variance and limited use of quantitative information makes it difficult for investors to compare the operations of competing companies (Coburn et al., 2012).

Having a sense of what types of information are disclosed and in what location is only the first step in evaluating corporate climate change disclosures. The second step is evaluating the quality.

8.2. Quality analysis

In general, what investors want to see in corporate climate change disclosures is an analysis of the challenges and opportunities faced by the company, including how climate change affects the company's ability to compete in the marketplace (McFarland, 2009). This sub-section examines the quality of the reports by comparing the disclosures to a best-practice benchmark. The presentation follows each of the assessment categories introduced in Chapter 7: GHG emissions data reporting; GHG emissions reduction strategy/pledges; Risk identification; Risk management and mitigation; and Opportunity identification. Table 6 summarizes the results at the end of the sub-section.

8.2.1. *GHG emissions data reporting*

To be of use to investors, GHG emissions data must be presented in a clear and concise manner, include all relevant sources and be interpreted and described by the company (Coburn et al., 2012). To assess the quality of the greenhouse gas information reported by the sample companies, the reports are examined for the inclusion of the following information: quantification of GHG emissions, differentiated between direct and indirect emissions, non-differentiated or other emissions data, such as industry emissions data²⁸; monetization of the liability; integration with financial disclosures; third party verification; disclosure of the calculation methodology; and, the use of plain language, which was specifically included to capture whether the GHG data is interpreted and presented to investors clearly.

The results in Table 6 indicate that the only consistent location where GHG emissions data appears is sustainability reports. This raises concerns regarding the quality and reliability of the information. For example, the type of reported emissions varied between the reports. Direct and indirect emissions are reported by 3 companies,

²⁸ The GHG Protocol defines direct emissions as emissions from sources that are owned or controlled by the reporting entity, while indirect emissions are emissions that are a consequence of the activities of the reporting firm, but occur at sources owned or controlled by another entity (The Greenhouse Gas Protocol, 2012). For example, Arc Resources Inc. reports that it calculates direct emissions as those associated with combustion, flaring, and venting, while indirect emissions are those resulting from the company's electricity consumption (Arc Resources Inc., 2010).

an additional company reported direct emissions, and 4 companies did not specify what types of emissions are presented.

Failure to disclose the value of the emissions factors used in the analysis also compromises the comparability of the data. For example, Husky Energy Inc. presents aggregate emissions in its sustainability report broken down among its facilities, but does not make any reference to how the data was calculated. Canadian Natural Resources Inc. provides slightly more information. It indicates that “generic emissions factors” were used in the calculation of the emissions totals, but does not provide details as to the specific values. Given the large volumes of energy used by the oil and gas industry, slight differences in the emissions factors could result in significantly different results. This compromises the usefulness of the information for investors because they cannot easily compare the historical performance of a firm nor how it compares to peers.

An additional failure of the sampled firms is the verification of their emissions data by an independent third party. Third party verification of financial information, including reserves estimates, is an essential component of the mandatory disclosure process for oil and gas companies because it provides certainty to investors and regulators (Ioannou and Serafeim, 2012; KPMG, 2010). It appears that this system has not yet been adopted for emissions data. For example, Canadian Natural Resources Ltd. is the only company to make reference to the verification of emissions data. However, it also indicates that only a portion of its sustainability report is externally vetted, but does not indicate which portion (Canadian Natural Resources Ltd., 2011). Finally, none of the companies produce monetized emissions information outside of costs incurred to comply with existing regulatory regimes. In aggregate, the GHG data problems apparent in the sustainability reports highlight the issue of format and information.

8.2.2. GHG emissions reduction strategy/pledges

Investors require information that will allow them to evaluate how well a company is engaged with climate change as a business issue. In particular, there are four pieces of information within this category that are sought by investors: 1) a climate change policy statement that demonstrates the firm’s level of engagement; 2) discussion of the actions that are being taken by the firm to manage its emissions; 3) an explanation

of the corporate governance of climate change; and, 4) disclosure of any costs associated with such activities.

Very few companies make explicit climate change policy statements. Instead, the majority make broad statements referencing sustainability. The following excerpt from Canadian Natural Resources Ltd is illustrative: “At Canadian Natural, we are committed to environmental responsibility and stewardship. Our operations have an impact on the environment and our goal is to develop resources in a sustainable and responsible way.” (Canadian Natural Resources Ltd., 2011, p. 9) While this statement demonstrates a level of engagement, it fails to make an explicit connection between climate change and the operational business model of the oil and gas sector. What would be more helpful to investors is what is included in Imperial Oil’s 2011 Corporate Sustainability Report; a statement that reflects the company’s current position on climate change, its responsibility to address the issue, and its engagement with governments and advocacy organizations to affect climate change policy (Imperial Oil, 2012).²⁹

Regarding the other assessment categories, emissions management actions are discussed by 14 different companies across the three documents, corporate governance of climate change is discussed by 8 companies and compliance costs are discussed by 4 companies. Inadequate descriptions of environmental management and corporate governance activities are found in other studies (see for example, Coburn et al., 2012; Berthelot and Robert, 2011). Similar to the climate change policy statement, these categories contained varying levels of specificity. For example, regarding the corporate governance of climate change, Suncor discusses some details about corporate governance related to emissions management and climate risks, but does not describe the effectiveness of that oversight or how it is measured (Suncor Energy, 2012). Although Suncor offers significantly more information than the majority of companies in the sample, their description is not comprehensive.

²⁹ For further discussion on the importance of the climate change policy statement see McFarland, (2009).

8.2.3. Risk identification

Broadly speaking, what investors want to see in corporate risk disclosures are known trends (for example, GHG emissions trajectories), commitments and uncertainties, associated with climate change, that have the potential to affect the financial or operational condition of the company. Regarding climate change risks, there are four primary types of information sought by investors: physical risks, regulatory risks, litigation risks, and business model risks (Gardner et al., 2007).

An extremely high proportion of the sampled companies, 28 out of 30, mentioned the regulatory risks of climate change. Although this result is higher than for other assessment categories, it overestimates the quality of the reporting. This is a result of the use of “boilerplate” legal language, which undermines the usefulness of the data for investors. For example, most of sample AIFs include discussion of the greenhouse gas and climate change regulatory framework in which they operate. However, little information is provided regarding the specific impact that existing and potential future regulations could have on firms’ operations. The following statement from Athabasca Oil Sands Corp. is indicative:

There has been much debate with respect to Canada’s ability to meet GHG emissions targets and the Government’s strategy or alternative strategies with respect to climate change and the control of GHGs. Implementation of strategies for reducing GHGs... could have a material impact on the nature of oil and natural gas operations. Given the evolving nature of the debate related to climate change and the control of GHGs and resulting requirements, it is not possible to predict the impact on the Company and its operations and financial condition. (Athabasca Oil Sands Corp., 2012, p. 69)

While such statements recognize that climate change legislation poses a potential financial risk, it does not state the effect of regulation on the company. Consequently, it is difficult for investors to evaluate the adequacy of the company’s response. Furthermore, despite guidance from the CSA indicating that it is inadequate for companies to use similar language and/or copy the disclosures of other firms, numerous

firms within the sample disclosed nearly identical legislative risk statements (CSA, 2011).³⁰

In addition, none of the companies in the sample discuss any potential financial impacts from the physical effects of climate change; nor did they disclose risks to the operational business model. Similarly, Coburn et al. (2012), find non-disclosure to be predominant in their assessment of the disclosures from 11 major international oil and gas producers. Finally, although numerous companies note the potential for environment related litigation, for example from oil spills and other acute incidents, only one company, Enerplus Corporation, specifically mentions the potential for climate change-related litigation. Although this company recognizes the potential for litigation from environmental pollution occurring over time, no assessment or discussion is made regarding the likelihood of such a lawsuit, nor the potential financial implications for the company (Enerplus Corporation, 2012).

8.2.4. Risk management and mitigation

To evaluate how susceptible a company is to climate change risks, investors require information about specific actions undertaken by companies to mitigate those risks. Investors need information in four areas: physical security measures, anticipation of regulatory requirements, business model shifts, or any other activities being undertaken to reduce the likelihood of climate change affecting the future financial and operational success of the company.

Discussion of risk management actions took place in all three disclosure documents. The frequency of disclosure is limited. Anticipating regulatory requirements is referenced in 9 documents, 1 company mentions a business model shift, and 9 firms make other risk management and mitigation statements. These statements most often involve description of engagement with regulators or industry groups for the purpose of influencing government policy. No company mentions activities undertaken to reduce the physical impacts of climate change.

³⁰ See for example the discussion of regulatory risks in the 2011 Annual Information Forms of Penn West Petroleum Ltd., PetroBank Energy and Resources Ltd., Peyto Exploration and Development Corp., and Tourmaline Oil Corp.

Discussion of actions being taken in preparation for increased regulations mostly takes place in the AIF, where 5 companies reported this information. Mention of this issue was also made by 3 companies in their MD&A. The most comprehensive discussion was undertaken by Cenovus Energy Inc. Within its AIF, it indicates the company understands that carbon has a cost and that part of their management and board decision making process involves evaluating a variety of carbon constraining policy scenarios. They indicate they use a range of carbon prices from US\$15 to US\$65 per tonne when making capital allocation decisions (Cenovus Energy Inc, 2012). Similar processes take place within Suncor (Suncor Energy, 2012). The quality of these disclosures exceeded those of other firms. For example, Crescent Point recognizes that emissions regulations are likely to increase but does not attempt to quantify the potential impact on the company nor indicate how such risks are managed by the company. It was, however, one of the few companies to monetarily discuss its efforts to reduce GHG emissions (Crescent Point Energy Corp., 2012). Unfortunately, this discussion did not include targets or evaluation of the effectiveness of the program, which are highly desirable for evaluating the likely impact of risks on firms' financial futures (King, 2012).

8.2.5. *Opportunity identification*

Very few opportunities are presented in the sample documents. One company mentions an opportunity in an MD&A, one in an AIF and two in sustainability reports. This systematic omission is likely a reflection of the emphasis on risk identification in the mandatory disclosure documents. It may also be a reflection of the precise definition of opportunity used in the analysis. Opportunities were only recognized if there is specific mention of a new market or product made possible by climate change or climate change regulation.

8.2.6. *Conclusions from the quality analysis*

The true test of climate change disclosure is its quality. Overall the analysis indicates that some oil and gas disclosures contain discussions of climate risks and opportunities. The quality of these disclosures – assessed in terms of the informational value to investors – is low. There are major gaps compared to the content requested by investors and the sample companies rarely provide quantitative and monetized

information that would enable readers to assess outcomes and achievements. Where information is provided, it is not presented in a way that permits comparison. The information is often presented using boilerplate language, or, in the case of GHG data, is not presented in a transparent and standardized manner.

Table 6: Disclosure quality summary

Disclosure Categories Companies Disclosing	Document Type							
	MD&A		AIF		SR		Total	
	No.	% (n=30)	No.	% (n=29)	No.	% (n=8)	No.	% (n=30)
GHG Emissions Data Reporting								
Company Direct Emissions	0	0%	0	0%	4	50%	4	13%
Company Indirect Emissions	0	0%	0	0%	3	38%	3	10%
Non-differentiated Emissions	0	0%	0	0%	4	50%	4	13%
Industry / Sector Emissions Information	0	0%	0	0%	1	13%	1	3%
Other GHG Emissions Data	1	3%	1	3%	7	88%	8	27%
Monetization	0	0%	0	0%	0	0%	0	0%
Integrated with Financial Reporting	0	0%	0	0%	0	0%	0	0%
Third Party Verification of GHG Emissions	0	0%	0	0%	0	0%	0	0%
Disclosure of Calculation Methodology	0	0%	0	0%	0	0%	0	0%
Use of Plain Language	0	0%	2	7%	6	75%	8	27%
Total Number of Sentences	1		5		53		59	
GHG Emissions Reduction Strategy/Pledges								
Climate Change Statement	1	3%	2	7%	2	25%	4	13%
Emissions Management Actions	6	20%	7	24%	8	100%	14	47%
Corporate Governance of Climate Change	1	3%	2	7%	6	75%	8	27%
Compliance Costs	2	7%	2	7%	0	0%	4	13%
Use of Plain Language	2	7%	9	31%	7	88%	14	47%
Total Number of Sentences	22		53		316		391	
Risk Identification								
Physical Risks	0	0%	0	0%	0	0%	0	0%
Regulatory Risks	12	40%	28	97%	3	38%	28	93%
Business Model Risks	0	0%	0	0%	0	0%	0	0%
Litigation Risks	0	0%	1	3%	0	0%	1	3%
Other RI	0	0%	0	0%	1	13%	1	3%
Monetization of Expected Costs	0	0%	0	0%	0	0%	0	0%
Use of Plain Language	12	40%	28	97%	3	38%	28	93%
Total Number of Sentences	76		311		7		394	

Disclosure Categories Companies Disclosing	Document Type							
	MD&A		AIF		SR		Total	
	No.	% (n=30)	No.	% (n=29)	No.	% (n=8)	No.	% (n=30)
Risk Management & Mitigation								
Physical Security Measures	0	0%	0	0%	0	0%	0	0%
Anticipating Regulatory Requirements	3	10%	5	17%	1	13%	9	30%
Business Model Shifts	0	0%	0	0%	1	13%	1	3%
Other RM&M Mentions	0	0%	2	7%	7	88%	9	30%
Use of Plain Language	2	7%	1	3%	5	63%	7	23%
Total Number of Sentences	8		16		46		70	
Opportunity Identification								
Use of Plain Language	1	3%	1	3%	2	25%	3	10%
Monetization	0	0%	0	0%	0	0%	0	0%
Total Number of Sentences	3		3		2		7	

8.3. Qualitative analysis of the regulations

Canada's disclosure regulations are examined in this section. The analysis focuses on two factors: materiality and enforcement.

8.3.1. Disclosure regulations and materiality

To reiterate from chapter 5, materiality refers to information that if omitted or misstated is likely to influence the decision of a reasonable investor to buy, sell, or hold a security of the issuer (Woodside, 2009). Important for climate change disclosures, the materiality standard applies specifically to forward-looking information of which climate change is likely to be of significance for oil and gas firms (Venalainen and Sagan, 2010). There are two issues related to materiality that make it an ineffective mechanism for promoting the provision of climate change information. These are its subjectivity and its incompatibility with the cumulative nature of greenhouse gas emissions and climate change. Each of these issues is examined below.

The first component of the materiality subjectivity problem is that its definition is left to the discretion of each company. This is a problem because firms interpret the concept very differently. For example, an online survey conducted by the Brattle Group, asked companies what tests they use in the determination of materiality. The responses

are highly variable and include the filing of a legal claim, a specified dollar amount, and the expectation of a liability in the next five years. Other respondents indicate that they do not apply a specific test (The Brattle Group, 2006). Such inconsistencies lead to high levels of variance in the quantity of disclosures because there is no regularly applied standard. Instead, issuers may measure materiality by gauging public consensus on climate change and by using their own discretion (Dimitt, 2009).

For years both the CSA and Canada's accounting standards setting bodies have provided clarification on the disclosure responsibilities of reporting issuers with regard to environmental matters. This guidance, however, fails to resolve the critical definitional problem associated with materiality. For example, in its guidance document "Building a Better MD&A", the CICA limits its commentary to the reasonable investor paradigm (refer to section 5.1.3 for description of this concept) and, consequently, fails to offer concrete suggestions as to what should be considered by firms in their definition (CICA, 2008a).

In 2010, the CSA issued a staff notice which provided more comprehensive guidance to issuers. It directs firms to assess the materiality of environmental issues using principles and identifies key items that should be evaluated in the materiality assessment process.³¹ The guidance further indicates that the key items should be considered outside of their current financial effect and that they should be discussed, particularly in MD&As, even if their full effect cannot be precisely determined or quantified (CSA, 2010). Taken as a whole, this suggests that issuers should be taking a broader approach to the assessment of materiality and providing increased quality descriptions of climate change impacts.³² Evidence suggests this has not occurred. For example, NRTEE (2012) finds that narrowly focussed materiality standards have persisted in Canada, a result similar to that experienced in the US after the SEC

³¹ The principles demand an assessment of the context of environmental facts, the timeline of environmental effects, and the importance of known environmental trends to disclosure. The items that should be evaluated are environmental risks, trends and uncertainties, environmental liabilities, asset retirement obligations, and financial and operational effects (CSA, 2010).

³² For further analysis of the meaning of Staff Notice 51-333 see Black et al. (2011) and Jones et al. (2010).

guidance (Shorter, 2012). These results demonstrate the incompatibility of climate change issues with existing regulatory definitions.

Greenhouse gas emissions are used to illustrate this point. Because the materiality standard is tied to financial risk, emissions are likely only to become material if governing regulations are tightened and the external costs of CO₂ are internalized. That is, if the financial liability associated with GHG emissions increases, more firms would be required to disclose that information. Until this occurs, the current disclosure regulations are incapable of requiring the reporting of the known liability associated with carbon. The failure to have a meaningful and consistent GHG management framework also reduces firms' ability project and report future liabilities. This is because climate change regulation is a major driver of firm reporting efforts (CDP, 2012; Trexler, 2012). The divergent provincial approaches to emissions management in Canada are an example of just such a regulatory framework.³³ Firms respond to this uncertainty, and the broader uncertainty linked to materiality, by increasing their use of boilerplate language (Trexler, 2012).

There is a second issue involving emissions that poses a challenge to the current materiality-based framework; its inherent relationship to the size and operations of the firm. For example, because materiality is determined based on the financial impact that a risk is likely to pose to a company, large firms may not face the same disclosure requirements as smaller firms; for example, if the liability associated with the emissions does not exceed the materiality threshold. Put another way, a small company with low levels of aggregate emissions could be required under current regulations to disclose its emissions before a large polluter if the large polluter has other, less carbon intensive, income streams that lower the significance of the GHG liability below its materiality threshold. This inconsistency and incompatibility with the cumulative nature of climate

³³ The inconsistent regulatory approach to greenhouse gas emissions management in Canada includes the following: Ontario, Quebec, Manitoba and British Columbia have joined the Western Climate Initiative, a cap-and-trade carbon trading system; Alberta has imposed a carbon tax on large industrial emitters; British Columbia has implemented a carbon tax and legislated carbon reduction commitments; and the federal government requires the reporting of emissions from large industrial emitters (Bramley et al., 2009).

change poses a significant challenge to investors seeking reliable and useful emissions data.³⁴

8.3.2. *Limited enforcement of the current regulations*

The final issue is enforcement of existing rules and regulations. For any disclosure regulation to be credible, it must be backed by the legitimate threat of monitoring, evaluation and sanction in the event of non-compliance (Morgan and Yeung, 2007). Prosecutions exclusively for environmental disclosure violations are extremely rare throughout Europe and North America despite low compliance rates (see for example, Repetto, 2005; Smith et al., 2008). Between 2009 and 2011, the CSA concluded a total of 35 cases (CSA, 2012). In particular, The Alberta Securities Commission (ASC), which has jurisdictional authority over the majority of Canadian oil and gas firms, does not review environmental disclosures as a targeted category of its annual Oil and Gas review (ASC, 2012). The CICA and the Ontario Securities Commission have expressed concerns regarding limited enforcement and have recommended the creation of new mechanisms and procedures to address this problem (OSC, 2008; Desjardins and Willis, 2009).

There are two factors that likely contribute to Canada's limited enforcement; limited resources allocation and the subjectivity of the materiality standard. Provincial regulators typically spend between 13 and 19 percent of their budgets on enforcement activities (Gray and Kitching, 2005). Gray and Kitching (2005) indicate that this level of resource allocation, which is significantly less than the 39 percent allocated by SEC, is insufficient for the CSA to conduct enough reviews and prosecute enough cases to establish a credible deterrent. Just as the materiality standard increases discretion for firms, it also makes the evaluation of climate change reporting efforts difficult for regulators. In particular, the discretion provided to firms creates considerable risk for regulators seeking to prosecute firms for non-compliance of continuous disclosure obligations based on a subjective definition (Josephine, 2010). The combination of this evidence indicates the failure to establish a credible deterrent is undermining disclosure quality from Canada's oil and gas sector.

³⁴ For further discussion of this issue see Latham (2009) and Woodside (2009).

8.3.3. *Conclusions from the regulatory analysis*

Canada's disclosure system is driven by the materiality standard. The preceding analysis shows that this concept is incompatible with climate change disclosure. A high degree of discretion is provided to firms regarding the criteria for analysis and the appropriate threshold. In addition, because it is strictly a financial concept derived from monetary significance, it is inappropriate for accounting for the cumulative nature of GHG emissions. Evidence also suggests that limited enforcement, also linked to materiality, contributes to poor climate change reporting.

8.4. Conclusions from the analysis

Each step of the analysis has shown limitations in climate change disclosure practices. Table 7 is a summary of the shortcomings. The results of the quantitative analysis indicate that there are substantive categories of climate change information that are consistently omitted from the mandatory disclosures of large Canadian oil and gas companies. These include GHG emissions data, non-regulatory risks, and substantive discussions of risk management activities. The analysis also documents a high degree of variation in the amount of climate change disclosure as well as limited presentation of quantitative and monetized information. The quality analysis supported these conclusions while further demonstrating inconsistent informational value. Comparability, resulting from the use of boilerplate language and inconsistent GHG calculation methodologies, is also limited. The analysis of Canada's disclosure regulations adds further insight. It shows the shortcomings of the materiality standard, its subjectivity and its inappropriateness for the cumulative nature of climate change, which contributes to enforcement challenges that encourage widespread use of boilerplate language, gaps and wide ranges in reported information, and decreased standardization. Policy solutions are developed to address these shortcomings.

Table 7: Shortcomings

	Quantitative	Quantitative and qualitative	Qualitative regulatory assessment
Identified deficiencies			
Financial and GHG information integration	✓		✓
Quantitative data provision	✓	✓	
Monetization	✓	✓	
Categorical gaps in information provision		✓	✓
Wide range in transparency	✓	✓	✓
Boilerplate language		✓	✓
Standardization/comparability		✓	✓

9. Policy objectives, criteria and measures

This chapter identifies and discusses the policy objectives, criteria and measures used to evaluate the policy options.

9.1. Policy objectives

The policy objectives, summarized in Table 8, are divided in three time periods. In the long term, the objective is to fully internalize climate change into all financial market activities thereby eliminating the carbon bubble. Such an environment would see the overall market value attributable to fossil fuel extraction and production decline and the investment gap between fossil fuels and clean energy narrow.

In the medium term, 3-5 years, the objective is to create a positive disclosure action cycle between oil and gas firms and investors. The action cycle would be characterized by high levels of knowledge, climate change entering the standard operating procedures of fossil fuel firms and investors, and market processes reinforcing these activities. Market driven incentives and awareness will promote information provision and use, and lead to low monitoring and enforcement costs.

Achieving the positive action disclosure cycle requires increased disclosure of value-relevant information from businesses and increased awareness of the carbon bubble. These are the two short-term policy objectives. To increase the usefulness of climate change information for investors, firms must evaluate the full impact of climate change and present that information to interested investors in a way that facilitates its use. Indicators that the policy is achieving the short-term objectives are the development and standardization of metrics, models and methodologies to measure financial market implications of climate change, higher quality disclosures by firms, and rising participation levels in climate change investor networks.

Table 8: Policy objectives

Category	Indicators
Long term Full internalization of climate change in financial market activities	Investment gap between fossil fuels and clean energy has narrowed Proportion of total market value attributable to fossil fuel extraction and production has declined
Medium term Positive disclosure action cycle	Investment and fossil fuel firms' standard operating procedures incorporate climate change considerations Provision of information is high with low monitoring and enforcement costs Investor knowledge and use of climate change information is high
Short term Increased provision of value-relevant information Increased awareness of the carbon bubble	Development and standardization of metrics, models and methodologies to measure financial market implications of climate change Firms are evaluating the full impact of climate change and publishing the results Increasing numbers of investors are joining and participating in climate change investor networks (IIGCC, INCR etc)

9.2. Criteria and measures

The policy alternatives developed to address the deficiencies identified in the analysis are compared using the following criteria: cost; effectiveness; administrative feasibility; and, stakeholder acceptability. Each criterion is defined and given a specific measure. Each measure is defined using a specific benchmark that corresponds to a value (score) of high (3), moderate (2), or low (1). The total scores for each alternative are summed and the policy achieving the highest total is considered the most preferable option. Table 9 describes the criteria, how they are measured, and the benchmark used for their scoring. Following the table is a short discussion of each criterion. Each criterion was selected because of its importance for addressing the policy problem. In order to achieve equal weighting among the criteria, which permits clear identification of trade-offs, the average score for the criteria with multiple components was calculated.

Table 9: Criteria and measures

Criteria	Definiton	Measurement	Benchmark	Value
Cost Feasibility				
Government/regulator costs	Financial cost to staff and administer each policy	Aggregate personnel and administrative costs for policy (5 years)	Cost is < 0.5 million Cost is 0.5 million to 1.0 million Cost is > 1.0 million	High (3) Moderate (2) Low (1)
Effectiveness				
Information value	How well does the policy facilitate the disclosure of climate change information?	Number of desired outcomes supported by the policy	5>= desired outcomes are supported 3-4 desired outcomes are supported 2<= desired outcomes are supported	High (3) Moderate (2) Low (1)
Scope	Does the policy increase awareness of the carbon bubble?	The reach of the policy	The policy targets firms and investors directly The policy targets one group directly and one indirectly The policy targets one group directly	High (3) Moderate (2) Low (1)
Administrative Feasibility				
Legislative requirements	Can the policy be implemented within current securities regulations?	Extent to which the policy fits within the current legislative framework	Within current legislation Requires regulatory amendment Requires new legislation	High (3) Moderate (2) Low (1)
Stakeholder Acceptability				
Acceptability to oil and gas firms	The level of participation companies are required to have in each policy	What level of choice do the companies have in their participation under the policy?	Voluntary participation Companies must comply with certain aspects of the policy Mandatory legal participation with all aspects of the policy	High (3) Moderate (2) Low (1)
Acceptability to institutional investor groups	Financial cost to producers to comply with the policy	Monetary cost imposed on firms by the policy	Cost is equal to the status quo Cost is higher than the status quo but not material	High (3) Moderate (2) Low (1)
	How well does the policy reduce investor risk?	Number of risk reducing desired outcomes supported by the policy	Cost is higher than the status quo and financially material 4-5 desired outcomes are supported 3 desired outcomes are supported 1-2 desired outcomes are supported	High (3) Moderate (2) Low (1)

Cost: The regulator cost is measured as the estimated additional personnel and administrative costs of the policy. The benchmarks of Can\$0.5 million and Can\$1.0 million were chosen from examining the recent variability in education program spending by the Alberta Securities Commission and the British Columbia Securities Commission.³⁵ To maintain comparability between options, which have varying fixed and variable costs, the cost is assessed based on the aggregate cost incurred at year 5.³⁶

Effectiveness: The effectiveness of the policy alternatives will be assessed in two ways: 1) its ability to promote the disclosure of useful climate change business information to the investor community – information value; and 2) its ability to raise awareness about the carbon bubble – scope. The information value criterion is measured by the number of short-term desired outcomes supported by the policy. The six desired outcomes are presented in Table 9. The scoring benchmarks are located at three and five supported outcomes. The scope criterion is measured by the reach of the policy; whether it raises awareness among target audiences and whether this occurs directly or indirectly.

Table 10: Mechanisms to evaluate policy effectiveness

Category	Mechanism	Desired outcomes
Information value	Data collection	1) Increases capacity 2) Provides tools
	Systems	3) Facilitates standardized, comparable and disaggregated information 4) Integrates climate change information with financial disclosures
	Verification	5) Achieves high levels of compliance 6) Facilitates/promotes ease of evaluation
Awareness	Knowledge	Firms, investors and the public are aware of the carbon bubble

Administrative Feasibility: This criterion examines how easily the policy can be implemented within the existing legislative framework. A policy that requires a regulatory change is considered less feasible than a policy requiring no change and a policy

³⁵ The institutional capacity for the CSA to fund additional education programs rests between \$0.5 million and \$1.0 million. For example in 2012, the BCSC increased its spending on education by 128%, from approximately Can\$0.6 million to Can\$1.5 million. This is also consistent with the BCSC's 2008 to 2011 educational expenditures, which had a range of Can\$0.4 million and a maximum of Can\$0.9 million (BCSC, 2013). Similarly, the ASC reduced its spending on education by approximately Can\$0.5 million from 2011 to 2012. The 2011 expenditure was more than Can\$0.6 million (ASC, 2013).

³⁶ Year 5 is chosen because it is a reasonable timeframe for evaluating the effectiveness of the policy in its ability to reach the objectives.

requiring new legislation is less feasible than a policy that can be independently altered by the governing regulator. This criterion is important both for its resource and organizational requirements, as well as the timeframe associated with implementation.

Stakeholder Acceptability: In this framework stakeholder acceptability is measured from the perspective of oil and gas firms and institutional investors. Firms' acceptability is evaluated using two distinct measures. First is the type of participation firms are permitted to have in the policy. A policy that provides the greatest level of firm flexibility – voluntary participation - is considered to be the most acceptable to firms. Some flexibility within the policy is considered more acceptable than a mandatory policy with no flexibility. Second is firm compliance cost. This is measured as the average monetary cost to comply with the policy using the status quo as the baseline. Costs beyond the status quo are assessed based on whether or not they are likely to be material to the sample firms. In addition, potential costs resulting from litigation are mentioned in the analysis when relevant but are not quantified. Finally, since the medium and long-term objectives are to reduce the market overvaluation of oil and gas firms, there is an expectation that each policy option may result in loss of firm value, competitive position and/or brand value. These costs are not quantified. The scores for each cost measure are averaged to achieve a final firm acceptability score.

Institutional investors are concerned about the financial risk posed by climate change to their investments and are actively encouraging firms to take two steps; improve their governance of climate change (internal action) and disclose risks and opportunities to investors (external action) (IIGCC, n.d.b). Institutional investors will therefore be in support of policy measures that encourage these two activities. Table 11 presents the key climate change-related practices that investors expect companies to undertake to reduce investors' exposure to climate change risks. This framework is used as the benchmark to evaluate the policy options. The thresholds are set at 3 (moderate) and 4 (high) promoted outcomes.

Note that because the analysis of the policy options is limited to the large firms based on the sample for analysis, equity is not considered in the policy analysis.

Table 11: Index to evaluate institutional investor acceptability

Category	Desired outcomes
Governance and strategy	Policy will assist firms integrate the management of climate change risks and opportunities into the company's business strategy.
Implementation	Policy will assist management review climate change impacts to identify goals and opportunities to increase energy efficiency, reduce emissions and adapt to climate change impacts.
Emissions inventories	Policy will support the preparation and reporting of GHG emissions that include past trends and future projections.
Disclosure	Policy will promote the integration of climate change risks and opportunities, including GHG emissions, into financial reports.
Public policy	Policy will promote interaction between firms and policy makers.

Source: adapted from IIGCC (n.d.b).

10. Policy options

This chapter outlines the policy options developed to solve the deficiencies in the climate change reporting by Canada's oil and gas sector.³⁷

10.1. Policy option one: mandatory disclosure framework

Across the investment community, there is general consensus that climate change disclosure requires two distinct elements: 1) disclosure of climate change business risks and governance/management activities; 2) greenhouse gas/energy measurement information (Guthrie, 2012). My analysis indicates that both areas are deficient and, more specifically, that the materiality standard is limiting the availability of this information in corporate financial reports.

The creation of a mandatory disclosure framework can remedy these shortcomings by requiring certain climate change information to be disclosed by firms regardless of the assessed materiality of this information. The core attributes of this option include: a standardized reporting framework for oil and gas firms based on a set of key performance indicators; detailed calculation methodologies; alignment with international standards; and, assurance. The framework would include questions regarding the management and governance structure of climate change business issues, climate risk assessments, as well as key performance indicators such as GHG emissions data, mitigation and research efforts, each of which would be calculated on using a performance-linked comparability measure. Implementing a program based on these attributes disconnects the materiality standard from disclosure obligations and standardizes information. This would increase the comparability of information across firms and through time. It would also provide clarity to firms regarding their reporting

³⁷ Further description of the core elements of the policy options, including discussion of jurisdictions' experience with them and key challenges, is provided in Appendix E.

obligations and assure investors that firms have assessed climate risks and opportunities using appropriate metrics.

The mandatory disclosure framework would be designed and implemented by a new CSA climate change policy subcommittee, coordinated through the CSA Secretariat.³⁸ This would likely be created under the CSA Enforcement Standing Committee or the CSA Investor Education Standing Committee.³⁹ Consultation would occur with Canada's accounting standard setting bodies, Industry Canada, and the CAPP. Its implementation would require the creation of a new disclosure regulation and publication and distribution of the regulatory requirements to firms. A short term funding commitment by the CSA would be required.

10.2. Policy option two: disclosure guide

Policy option two is the creation of a comprehensive climate change disclosure guide. It would increase the publication of value-relevant climate change information by decreasing the business costs associated with disclosure. The disclosure guide has two goals: 1) build the internal capacity in the oil and gas industry to evaluate the implications of climate change; and, 2) increase the standardization of climate change reporting. It is a standalone policy that does not have to accompany mandatory disclosure.

The guide would be funded and developed by the CSA and Canada's professional accounting associations, the CICA and the CGA. Consultation with Industry Canada, international investor groups, and the CAPP would ensure the information content matches investors' needs and current government GHG protocols and increases its use by the industry. The development process would be best undertaken by a new

³⁸ The creation of a policy sub-committee under the CSA Secretariat to lead the development of the policy would limit any conflicts of interest that may exist for individual securities regulators. In addition, because the ASC has jurisdictional authority over the largest proportion of listed Canadian oil and gas companies and it has a Petroleum Advisory Committee in place to consult with industry proponents, the CSA Secretariat may draw on its expertise in the development process (ASC, 2012).

³⁹ For a description of the mandate of each of these committees see CSA Secretariat (n.d.).

climate change policy sub-committee.⁴⁰ Development of the guide would be within the CSA's existing mandate. Distribution would be most effectively and efficiently coordinated through Canada's accounting professional associations. Involving this key financial intermediary in the implementation process is essential for demonstrating the importance of the issue, ensuring the technical skills are available to the public for interpreting climate change business data and coordinating the activities of firms. The guidance document would clarify the existing regulatory requirements for disclosure and prescribe a government supported format for companies choosing to report climate change information voluntarily. Hence, this option would provide an incentive, by decreasing information production costs, for oil and gas companies to undertake climate change reporting voluntarily. It would also improve the quality of climate change information required in financial reports by specifying the CSA's expectations.

The format would follow international best practices and include the description of a set of key performance indicators and detailed instructions covering the appropriate scope and methodology for analysis. The CSA would also provide clarification of the materiality standard. To this end, the CSA should follow the lead of the SEC by defining materiality within the context of climate change and tailor its guidance to the oil and gas sector. The SEC guidance document specifically discusses: when national and international regulations are relevant for disclosure; the scope required for analysis, which includes both direct and indirect business impacts; and, why the energy sector is particularly sensitive to climate change issues and how this influences firms' disclosure obligations (SEC, 2010).

10.3. Policy option three: hybrid disclosure framework

The hybrid disclosure regime seeks to balance the need for greater data accuracy and availability in financial reports with firm discretion regarding how it interprets climate change as a strategic business issue. It would do this by mandating the inclusion of GHG data in financial disclosures, but retains the flexibility of the current

⁴⁰ Refer to footnote 34.

materiality standard for discussion of other climate change related risks, opportunities and management activities.

There are two main reasons to make GHG reporting mandatory. The first is knowledge that greenhouse gas emissions have an economic cost (see for example, Ackerman and Stanton, 2011; Jaccard et al., 2009) and it is this unaccounted for cost that is the source of the carbon bubble. This cost implies that GHG emissions need to be defined, measured, and accounted for in the same way as other liabilities within the financial statements of oil and gas firms. The second reason is the increased certainty that would be provided to investors. By reporting according to a common GHG standard and using the appropriate process, which has been made difficult by the newly developed and divergent GHG provincial policy frameworks throughout the country, firms will demonstrate to investors that they have assessed the risks associated with their emissions at the appropriate scope (Holmes et al., 2012). This would enhance comparability across firms and over time.

The core attributes of the program include: detailed calculation methodologies; harmonization with existing national and international frameworks and standards; and, assurance. The British government's draft GHG reporting legislation is a useful model (DEFRA, 2013). Beyond illustrating the required characteristics, this proposal legislation ensures comprehensiveness by requiring all market listed companies to comply with the legislation regardless of their greenhouse gas output (DEFRA, 2013). It addresses many of the shortcomings I have identified through my analysis.

The hybrid disclosure framework will be developed, implemented and funded by the CSA. This process would be undertaken by a new CSA Secretariat climate policy sub-committee.⁴¹ Implementation requires legislative change to the governing national instrument (CSA, n.d.). Consultation will occur with Industry Canada for their input on Canada's existing GHG reporting frameworks, the CICA and the CGA for their expertise on accounting standards and with the CAPP and institutional investor groups as the primary stakeholders.

⁴¹ Refer to footnote 34.

10.4. Policy option four: public compliance campaign

The public compliance campaign, which will be developed and administered by the CSA, has three core elements. First it would provide the disclosure guide (option two) to the industry to reaffirm the CSA's expectations regarding disclosure. Second, it would undertake an annual evaluation of the climate change disclosures by Canada's oil and gas sector, according to current regulations and standards. Third, it would make a public presentation of the results to demonstrate which companies are leaders and laggards in disclosure. The public nature of this campaign would influence both the supply of and demand for climate change business information.

The mechanism through which publicity influences corporate behaviour operates in several overlapping ways. First, publication of the compliance rates may be seen as providing a non-financial incentive that encourages some firms to strive for excellence. Equally important, for those at the other end of the disclosure spectrum, the threat of having poor performance demonstrated - the threat of public shaming and corresponding potential loss of share value - may serve as a deterrent to letting compliance fall short of regulatory standards (see for example, Yeung, 2007; Cartwright, 2012).

The second component of the instrument is its educational and informational value. From the perspective of reporting firms, the CSA will make clear its standards for acceptable and unacceptable climate change disclosures and communicate this information to firms on a continuous basis. The program also has informational value for the public at large. By publishing the compliance rates, the CSA will be sending a signal to the public that they should be alert to climate change as an investment issue and that firms' mandatory reports are an important source of information for evaluating their exposure to this issue. Consequently, the development of an easily comprehensible presentation format that is capable of clearly and succinctly articulating the complex compliance information to the public is an important component for this policy achieving its objectives (Cartwright, 2012).

Implementation of this policy requires the creation of a climate policy sub-committee within the CSA secretariat.⁴² Once provided with the appropriate mandate, the sub-committee will be responsible for developing the assessment model, perhaps similar to the one used in this research, conducting the analysis, and making the results public. This policy option requires a long-term funding commitment.

⁴² Refer to footnote 34.

11. Policy analysis

This chapter evaluates the identified policy options based on the criteria and measures described in chapter 9. The results of the analysis (Table 12) are summarized after the evaluation of policy option four. The recommendation follows policy analysis.

11.1. Policy option one: mandatory disclosure framework

Cost: The regulator costs resulting from the mandatory program are primarily the short-term costs from program development and communicating the requirements to firms. Although additional resources may be required to provide guidance and additional monitoring in the short-term, the ASC has the institutional capacity to provide this oversight.⁴³ Thus, the policy does not impose any additional long-term funding obligations on CSA members. The policy is expected to require 2 to 3 new employees for the 3 years required for implementation (Gray and Kitching, 2005). The expected additional cost to the regulator is Can\$690,000 to Can\$1,035,000.⁴⁴ So, the score is moderate (2) for government and regulator costs.

Effectiveness: The mandatory regime will satisfy all of the basic information-value requirements. It will require the publication of GHG emissions and discussion of

⁴³ Because of the prominence of the oil and gas sector to the Alberta economy, the ASC maintains a team of specialized oil and gas staff to review disclosures. Since 2004, this team has released an annual Oil and Gas Review Report containing a summary of staff observations on the disclosure practices of sampled firms. Although the review has focussed on assessing technical aspects of issuer's reports, such as statements of reserves data, this mandate could be relatively easily expanded to identify climate change reporting deficiencies within the new framework. The ASC, in some cases, has also carried out detailed issue-oriented reviews of specific disclosure requirements and documents for all firms. This indicates that it has the capacity to conduct systematic analysis across the sector (ASC, 2012).

⁴⁴ The cost of an average employee to the ASC is approximately Can\$100,000 per annum (ASC, 2013). Typical administrative costs are approximately 15 percent that of personnel costs to Canada's securities regulators (ASC, 2013; BCSC, 2013).

management's engagement with climate change as a business issue. It will also standardize the information and integrate emissions data with financial information. Removing the materiality standard and well-defined reporting requirements will also promote easier regulator evaluation. Hence, the policy promotes the 5 desired outcomes so the score is high (3) for information value.

Regarding its scope, the option does not directly address the problem of raising awareness about the carbon bubble for investment managers or the public. Nevertheless, evidence from behavioural finance literature suggests that investors often focus their attention on highly visible, easy to process information (see for example, Palomino, et al., 2009; da Silva Rosa and Durand, 2008). Consequently, the public disclosure of climate change information in financial reporting could raise the attention of investors to climate change. So, the option scores moderate (2) for scope.

Administrative Feasibility: The development of the mandatory framework requires an amendment to the governing national instrument (CSA, 2010). Completing the amendment is a complex administrative task requiring the cooperation of the thirteen regulators. Implementation requires completion of three steps. First, the policy framework needs to be introduced by one of the provincial regulators. This could be done independently by a CSA member or as a result of the passing of a new provincial securities law. Second, once drafted, the policy will go to the CSA secretariat, which facilitates negotiations among the provincial regulators. Third, the negotiated national instrument is implemented. Several provinces require ministerial approval for changes to national instruments (Lortie, 2010), which means full implementation will likely take 1.5 to 3 years (Gray and Kitching, 2005). Hence, the administrative feasibility scores low (1).

Stakeholder Acceptability: Approximately one-quarter of the companies sampled in this research are already making detailed carbon disclosures. This indicates that some firms see value in the calculation and disclosure of climate change and emissions information. Nevertheless, the mandatory disclosure regime does not provide any flexibility with respect to firm participation levels and, it represents a significant change from current norms. For these reasons, the comprehensive mandatory framework will likely face resistance from firms which might be concerned about intrusions into their autonomy, the costs of reporting, and the pressure to take actions that potentially

compromise their market position (Kolk et al., 2008). For these reasons the policy scores low (1) for flexibility.

The mandatory disclosure framework would impose costs on firms above the status quo. The EU Emissions Trading System (ETS) is a useful proxy for valuating those costs. It requires GHG measurement, reporting, and third-party assurance. For the UK's oil and gas sector, the average administrative cost burden imposed by the ETS is Can\$21,567 for facilities with CO₂e emissions of 25000 tons.⁴⁵ Assessed per ton of CO₂e, the cost of the EU system ranges from Can\$1.58 to Can\$0.06, with an average of Can\$0.11/tCO₂e (King et al., 2010). Because reporting costs are largely fixed, the cost burden rises at a marginal declining rate as emissions levels rise. Evidence indicates that these costs are rarely financially material for large firms (Townsend and Cofre, 2012).⁴⁶

In addition to compliance costs, the implementation of a new reporting framework may increase the probability of non-compliance thereby increasing firms' exposure to regulatory sanctions.⁴⁷ Despite these costs, many analysts predict overall cost savings for firms as reporting requirements are increased because measurement of emissions leads to better management of energy use and net cost savings (see for example, Townsend and Cofre, 2012; Eccles et al., 2012; Repetto, 2005). So, the mandatory

⁴⁵ Of note, this estimate includes only two costs; the estimated internal effort cost and third party assurance cost. These two components contribute approximately 65 percent of the total cost burden imposed by the EU ETS (King et al., 2010). This estimate is based on an exchange rate of £1 = Can\$1.58 (The Money Converter, 2013). These costs are similar to the estimated cost burden for the US EPA's GHG reporting system. The EPA has estimated that for the first year of reporting, an average facility emitting 25000 tons CO₂e would likely face costs of Can\$18,000 for the first year and Can\$8,000 in subsequent years. This system does not require third party assurance, which explains the slightly lower numbers (EPA, 2010). Calculation based on an exchange rate of US\$1 = to Can\$1.00 (The Money Converter, 2013).

⁴⁶ This note applies the potential EU costs to Suncor to demonstrate the non-financial materiality of climate change reporting. Chan et al. (2010) estimate 0.140t CO₂/boe of bitumen produced and upgraded. Using the Can\$0.11 per ton CO₂, the mandatory framework would add Can\$0.0154 per boe produced. Using the highest cost (CAN\$1.58 per ton CO₂) the additional cost is 0.221 per boe produced. For Suncor the low estimate would equal Can\$1.162 million per year or 0.003 percent of annual revenue. The high cost estimate represents 0.04 percent of revenue (Suncor's production and revenue figures required in this calculation were obtained from Suncor Energy, 2012).

⁴⁷ In 2011, the CSA concluded 10 cases regarding disclosure violations and imposed fines totalling Can\$2,360,200 (CSA, 2012).

disclosure regime is likely to impose non-financially material administrative costs and therefore, scores moderate (2) for firm costs. The average score for firm acceptability is moderate/low (1.5).

On the demand side, the mandatory regime will achieve 4 of the 5 desired outcomes. By requiring the tracking and analysis of GHG emissions, the mandatory framework will promote climate change as a governance issue and assist firms in their identification of internal risks and opportunities (see for example, Kauffman et al., 2012). The policy will also support the reporting of past emissions trends and projections and will integrate this information into firms' financial reports. The policy does not promote continuous engagement between firms and policy makers or regulators, the final institutional investor concern. Hence, the mandatory disclosure framework scores high (3) for its acceptability to institutional investors.

11.2. Policy option two: disclosure guide

Cost: The disclosure guide will impose costs on the CSA. To develop a disclosure guide capable of providing guidance on all of the relevant subjects requested by investors, the CSA would need to hire 2-3 new employees for a year one term. Including costs for educational materials, administration and communications, the program cost would be Can\$230,000 to Can\$345,000.⁴⁸ Therefore, it scores high (3) for regulator costs.

Effectiveness: There is a high degree of uncertainty regarding the effectiveness of this policy option. On the positive side, there is growing evidence, particularly from rising participation rates in the Carbon Disclosure Project, that businesses are increasingly seeing value in the voluntary disclosure of climate change information (Andrew and Cortese, 2012). This suggests that providing guidance may entice more companies to engage in voluntary reporting. Such disclosures, however, will continue to be limited by profit maximization calculations. A firms' decision to report climate change information beyond what is required by law, and in the suggested format, involves an analysis of the expected benefits versus the costs. The incentive provided by the guide,

⁴⁸ For the calculation methodology refer to footnote 40.

lowered information and transaction costs, is likely insufficient to tip the cost-benefit analysis in the direction of reporting for most firms (Deegan et al., 2002).

Firms that may benefit from adoption of the recommended disclosure protocols are those with international operations because they may see value in early alignment with an emerging international standard. Nevertheless, the overall effectiveness of the guide, because it achieves only two of the five desired short-term outcomes, increasing capacity and providing tools, is expected to be small. Regarding the scope of the policy, the guide only targets firms. It does not contain a mechanism for raising investor awareness. For these reasons, it scores low (1) for both effectiveness categories.

Administrative Feasibility. The disclosure guide is highly feasible. It can be developed and implemented without changes to the existing regulatory framework (CSA Secretariat, n.d.). It therefore scores high (3).

Stakeholder Acceptability. Because the disclosure guide provides complete flexibility to firms regarding what climate change information they integrate into their disclosures, it is expected to be well received by Canada's oil and gas sector. Thus, it scores high (3). The disclosure guide imposes zero mandatory compliance costs on regulated firms, scoring high (3). The average firm acceptability score is high (3) In contrast, the disclosure guide will not be highly acceptable to institutional investors. The evaluation tools will assist management in reporting GHG emissions and identify goals and efficiency opportunities, but, because it is a voluntary program, it is unlikely to affect firms' governance vis-a-vis climate change.⁴⁹ It will also not integrate climate change into financial reports, or promote the engagement of firms with policy makers. Consequently, it meets only 2 of the desired outcomes and scores low (1).

11.3. Policy option three: hybrid disclosure framework

Cost. The regulator costs imposed by the hybrid disclosure framework are primarily short-term costs resulting from the research and design process,

⁴⁹ For example, Kauffmann et al. (2012) indicate that there is a strong link between GHG emissions reporting and the development of corporate climate change strategy.

communications and implementation. Once completed, the framework is unlikely to require permanent additional funding outside of what is currently allocated by the provincial securities regulators for monitoring and enforcement. The hybrid framework will require the ASC, the lead regulator, to hire 2-3 new employees for a minimum 3 year period. The additional cost to the regulator is estimated to be Can\$690,000 to Can\$1,035,000.⁵⁰ Hence, the policy scores moderate (2)

Effectiveness: Information need not be fully interpreted by firms to have information value for investors. It only needs to be useful as an input into predictive investment processes (CDSB, 2012). For this reason, the provision of GHG emissions information fostered by the hybrid disclosure framework will be effective in its ability to affect the disclosure of value-relevant information. It provides tools and builds capacity, standardizes GHG emissions information, and integrates GHG data into financial reports. The framework also requires third party verification of emissions and will provide the CSA with a framework more conducive to the current system based on technical evaluation (ASC, 2012). So, the hybrid model scores high (3) for its information value.

The hybrid disclosure framework is not likely to directly affect the demand and use of climate change information by investors. It also has little capacity to directly inform the public about the financial dangers posed by the carbon bubble. In spite of these limitations, behavioural finance literature suggests the provision of GHG data will increase the salience of the carbon bubble to investors (Palomino, et al., 2009; da Silva Rosa and Durand, 2008). The option, therefore, indirectly contributes to increased awareness and scores moderate (2) for its scope.

Administrative Feasibility: It is not within the legislative authority of the CSA to substantively change the oil and gas disclosure regulations to include the publication of GHG emissions data in financial reports (Lortie, 2010). Consequently, the development of this policy option requires adherence to the CSA's full negotiated implementation process, which may take up to 3 years (Gray and Kitching, 2005). It scores low (1) for its administrative feasibility.

⁵⁰ The assumptions underlining this policy option are the same as the mandatory disclosure framework. Please refer to footnote 40.

Stakeholder Acceptability: Although this framework mandates the disclosure of GHG emissions, it provides flexibility to firms by retaining the existing materiality standard. Firm discretion will guide the analysis, interpretation, and disclosure of all other climate change-related information. So, it scores moderate (2). The largest sources of firm disclosure costs result from GHG measurement and assurance (King et al., 2010). Consequently, the average cost burden imposed by the hybrid disclosure framework is an estimated non-material Can\$0.11 per ton CO₂e (King et al., 2010).⁵¹ As a new disclosure framework, the hybrid model will expose firms to increased risk of non-compliance sanctions. Given the CSA's preference for education and redress for disclosure violations, the average cost facing firms will likely be limited to the direct disclosure costs.⁵² For these reasons, the hybrid framework scores moderate (2) for firm cost. The average firm acceptability score is (2).

For institutional investors, the hybrid disclosure framework will achieve many of the desired outcomes. It will support the preparation and reporting of GHG emissions, integrate this information into financial reports and assist firm managers identify opportunities to improve their climate change performance. In addition, because the measurement of GHG emissions is a mandatory component, it will promote the integration of climate change risks into governance processes. The program will not facilitate the interaction of firms with policy makers. It scores high (3) for its institutional investor acceptability.

11.4. Policy option four: public compliance campaign

Cost: The compliance campaign will impose both short and long-term costs on the CSA. In the short-run, the CSA will have to dedicate significant resources to the creation of the disclosure guide and assessment framework. Despite the current capacity of the CSA, in particular the ASC, to monitor and assess the disclosures of oil and gas firms, conducting an ongoing comprehensive review of the climate change disclosures of the sample firms will require additional personnel and administrative

⁵¹ See footnotes 41 and 42.

⁵² For example, see the discussion of oil and gas industry education in ASC (2013).

resources. The development process would require 2-3 new employees for two years. The ongoing evaluation process would also require 2-3 new employees for the duration of the program. Assessed at the five year mark, the estimated cost to staff and administer the policy is Can\$0.9 million to Can\$1.4 million.⁵³ The program scores low (1) for the regulator costs.

Effectiveness: The combination of the disclosure guide and public compliance campaign fails to address the significant limitation within the existing regulatory framework regarding the disclosure of GHG emissions data, its integration in financial reports, and the evaluation of climate change disclosures. It would, however, provide tools and improve the capacity of firms to assess climate risks.

Where the program would be particularly effective is encouraging compliance. Evidence indicates that environmental and compliance ratings are capable of influencing investors' perceptions, thereby creating a credible threat to firm market valuation and an incentive for firms to improve their disclosures. For example, listed firms in Canada and the United States have seen their market values drop in the wake of publication of adverse environmental or climate change performance information (see for example, Beatty and Shimshack, 2010; Lanoie et al., 1998; Konar and Cohen, 1996). In particular, Lanoie et al., (1998) present evidence that firms appearing on a non-compliance list published twice annually by the B.C. Ministry of Environment had their stock prices decline significantly after the publication. Furthermore, Konar and Cohen (1996) and Foulon et al. (2002) indicate that the market reaction to such disclosures, even if it only occurs in the short-run and prices subsequently rebound, is strong enough to influence firm behaviour. For these reasons, the policy scores moderate (2).

Publication of the results of the compliance assessment would demonstrate to the oil and gas sector directly, and institutional investors and the public indirectly, that climate change business information is important and should be evaluated in decision making processes. The policy scores moderate (2) for its scope.

Administrative Feasibility: The public compliance campaign will require the creation of a CSA sub-committee to coordinate the activities of provincial regulators and

⁵³ The calculation methodology is described in footnote 40.

an amendment to the CSA's continuous disclosure review policy (CSA, 2009). It scores moderate (2) for its administrative feasibility.

Stakeholder Acceptability: Firms do not have any flexibility regarding their participation in the compliance campaign and this scores low (1). The guide/compliance campaign will impose no additional regulatory costs on firms. However, the ongoing systematic analysis of disclosures will expose firms to increased risk of financial sanctions for non-compliance, but as indicated earlier, this is unlikely to affect costs. Thus it scores high (3) for firm cost effectiveness. The average firm acceptability score is (2).

Regarding its acceptability to institutional investors, the policy achieves three of the desired outcomes. The evaluation tools of the guide would assist management in reporting GHG emissions and identify efficiency opportunities, while the compliance campaign facilitates an ongoing dialogue between firms and the regulator. The policy would not directly promote the calculation, measurement or disclosure of emissions and, because it does not require any action to be taken by firm managers, it is unlikely to affect their corporate governance processes. Hence, it scores moderate (2) for its acceptability by institutional investors.

Table 12: Policy evaluation results matrix

Criteria	Mandatory Framework	Disclosure Guide	Hybrid Framework	Compliance Campaign
Cost Feasibility(average)	(2)	(2.0)	(2)	(1)
Government/regulator costs	2 Moderate	2 Moderate	2 Moderate	1 Low
Effectiveness	(2.5)	(1)	(2.5)	(2)
Information value	3 High	1 Low	3 High	2 Moderate
Scope	2 Moderate	1 Low	2 Moderate	2 Moderate
Administrative Feasibility	(1)	(3)	(1)	(2)
Legislative requirements	1 Low	3 High	1 Low	2 Moderate
Stakeholder Acceptability	(2.25)	(2)	(2.5)	(2.0)
Acceptability to Oil and Gas firms	1.5 Moderate/Low	3 High	2 Moderate	2 Moderate
Acceptability to Institutional Investor Groups	3 High	1 Low	3 High	2 Moderate
Total	7.75	8.0	8.0	7.0

11.5. Policy recommendations

The evaluation of the policy options indicates that none is dominant. More specifically, the results indicate the significant trade-off that exists between the effectiveness of the program – its ability to achieve the policy objectives of increasing the quality of disclosures and raising awareness of the carbon bubble – and the options’ administrative feasibility. The disclosure frameworks are more effective than the disclosure guide and compliance campaign. However, they require legislative change and significant jurisdictional coordination, which increases the administrative complexity and timeline associated with implementation.

The cost burden for the regulators is greatest for the compliance campaign. It is the only policy option that requires additional resources to be allocated to monitoring and enforcement over the medium and long term. Given its limited effectiveness compared to the hybrid framework, this high cost renders the option unacceptable. None of the policy

options are expected to impose burdensome administrative costs on firms. The two disclosure frameworks nevertheless will impose costs greater than the status quo.

Finally, in terms of stakeholder acceptability, there is a clear trade-off between providing value-relevant information to investors and the amount of flexibility assigned to firms by the policy. The hybrid model outperforms the other options in this criterion. It provides some flexibility to firms, but also provides investors with high quality information. In short, it is the most balanced policy alternative. The hybrid and mandatory frameworks also outperform the other options in their acceptability to institutional investors. Both promote internal (firm) and external (investor) climate change risk analysis.

The cumulative results of the analysis, Table 12, suggest the disclosure guide should be implemented immediately. It is the least costly policy option, will be well-received by the oil and gas sector and can be implemented with limited administrative change. The problem is its limited effectiveness. For this reason, the disclosure guide can be treated as a first step towards the introduction of the hybrid disclosure framework. It will help prepare the oil and gas sector for many of the assessment processes and procedures associated with the introduction of integrated mandatory GHG emissions reporting, the core component of the hybrid disclosure framework.

The hybrid disclosure framework has real potential to affect change in the quality of disclosures, while indirectly increasing awareness in the financial industry regarding the problem posed by the carbon bubble. By mandating the inclusion of GHG emissions data in financial disclosures, implementation of the hybrid model does involve making a trade-off regarding the materiality standard. The provision of GHG emissions data will provide the investor community, particularly large institutional investors, with a source of information that was previously inaccessible to them. This information, however, may be complex to interpret and evaluate and may not have immediate financial implications; outcomes that are in opposition to the intentions of the materiality standard. Despite this trade-off, investors have expressed a clear desire to have this information so that they can evaluate climate risk and make informed decisions. The hybrid model will create a common standard for reporting, which will encourage firms to assess risks at the appropriate scope and will provide assurance to investors that the analysis is credible. The hybrid model's detailed GHG framework will also assist the CSA's assessment and

management of disclosure compliance. For these reason, even though it could take up to three years to implement, the hybrid model is the option most likely to create the conditions favouring the disclosure of climate change information and the controlled market devaluation of Canada's oil and gas sector.

11.6. Additional policy considerations: carbon pricing

In addition to the policy options and recommendation presented previously, there is one policy option outside of the scope of this research that requires mention because of its capability to internalize the cost of carbon, force its inclusion in financial statements, and influence investor decision making; a national comprehensive long-run climate action policy suite. A full description of this policy option, including challenges, is presented in Appendix E.

12. Conclusion

Climate change requires a significant portion of the world's fossil fuel reserves to remain undeveloped. If policy action is taken by the world's governments to limit greenhouse gas emissions to sustainable levels, the reserves held by firms will no longer have the value underlying their current market valuations. This has important implications for Canadian investors, as a large share of the market value of fossil fuel extraction and production companies is directly attributable to these reserves. If this overvaluation is corrected over a short time period, this will likely have significant negative consequences for both individual Canadians, as investors and stakeholders in institutional investor activities, and the Canadian economy. In order to prevent this situation from occurring what is needed is a controlled devaluation and a soft landing, which can only take place if investors have the information required to evaluate the business risks of climate change.

This research demonstrates that the current climate change disclosures made by oil and gas firms are insufficient for investors to adequately evaluate the climate change risks in this sector. The content analysis indicates a significant lack of standardized and comparable information, little quantitative data, and the omission of certain investment-relevant climate change information; principally GHG emissions data. The research also identifies the primary source of these limitations, the materiality standard, its incompatibility with climate change and the influence the concept has had on creating inadequate, and difficult to enforce, regulatory standards.

Four policy options are conceived to address these issues. As a result of an analysis based on four relevant criteria, I recommend that the Canadian Securities Administrators immediately develop a disclosure guide to assist regulated firms in their assessment of climate change as a business issue. This is an easily implemented and cost effective first step toward the long legislative process to integrate mandatory greenhouse gas reporting with annual financial reporting. The hybrid disclosure framework requires the disclosure of GHG emissions data from oil and gas firms in a

prescribed format and scale, which is verified by third-party auditors. This policy option addresses the subjectivity of the materiality standard and its inherent incompatibility with GHG emissions and climate change. In a regulatory environment that often provides weak and divergent carbon prices, the materiality standard has undermined consistent firm evaluation of carbon and climate risks. The requirement for disclosure of carbon liabilities, even in the absence of strong carbon prices, will allow investors to be well-positioned to evaluate the significant business model risk facing oil and gas firms.

With better disclosure requirements in place, the next challenge will involve getting the information out to the investment community. Two key stakeholder groups, investment advisors and professional accountants, will be integral to this process. Both groups are important information intermediaries that have an interest in understanding climate change liability issues, and should be targeted by the regulator during the policy development and implementations processes. Directly involving them in these processes will help to demonstrate the significance of the carbon bubble, emphasize the importance of developing skills to interpret and understand climate business risks, and integrate climate change disclosure information into their operational practices. Without support from these experts, investors are unlikely to understand the vulnerability of their oil and gas assets to climate change risks.

History provides numerous examples of the destructive power of financial bubbles and the actions taken by government to reduce the risk of such events reoccurring. In response to the massive accounting fraud perpetuated by WorldCom, the U.S. government introduced the Sarbanes-Oxley Act, the stated purpose of which is to protect investors by improving the accuracy and reliability of corporate disclosures (Li et al., 2008). This too is the goal of the hybrid disclosure model. It addresses the information asymmetry that exists between firm managers and investors, and places both groups in the position to evaluate the climate change risks facing oil and gas firms. This policy recommendation, which targets the needs of large, risk averse institutional investors that control the savings of millions of Canadians, ensures the information required to accurately evaluate exposure is available. This will enable Canadian investors to decrease their vulnerability to the carbon bubble.

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Appendices

Appendix A: Content analysis decision rules

No.	Rule Description
1	The type of news determination is made from the perspective of the company disclosing the information. To qualify as either positive or negative, the sentence had to specifically state a positive or negative outcome; it could not be merely implied. Otherwise, it is considered neutral.
2	A sentence is only counted if it is self-reflected. For example, statements regarding the regulatory framework in which the company operates are only counted if the company indicates the regulation's impact/influence on the company.
3	Bullet points are counted as one sentence, unless they contain more than one sentence.
4	A line within a table is counted as one sentence.
5	A graph is considered one sentence

Appendix B: Assessment rubric

		No Climate Change Mention
Climate Change Mention Only	Negative Climate Change Mention (e.g. Climate Change is a	
	Climate Change Is Happening	
	Climate Change is Anthropogenic	
	Total Number of Sentences	
GHG Emissions Data Reporting	Dichotomous Disclosure (Quality)	Company Direct Emissions
		Company Indirect Emissions
		Industry / Sector Emissions Information
		Other GHG Emissions Data
		Monetization
		Integrated with Financial Reporting
		Third Party Verification of GHG Emissions
		Disclosure of Calculation Methodology
		Use of Plain Language
	Summary (Quantity)	Total Number of Sentences
		Monetary
		Non-monetary (data)
		Declarative
		Type of Evidence
		Positive
		Negative
		Neutral
		Type of News
GHG Emissions Reduction Strategy/Pledges	Dichotomous Disclosure (Quality)	Climate Change Statement (responsibility/engagement)
		Emissions Management: Explanation of actions being taken to reduce GHGs
		Corporate Governance of Climate Change
		compliance costs
		Use of Plain Language
		Total Number of Sentences
	Summary (Quantity)	Monetary
		Non-monetary (data)
		Declarative
		Type of Evidence
		Positive
		Negative
		Neutral
		Type of News

Risk Identification	Dichotomous Disclosure (Quality)	Physical Risks
		Regulatory Risks (Provincial / Regional / Federal)
		Business Model Risks
		Litigation Risks
		Other RI
		Monetization of expected costs
		Use of Plain Language
	Summary (Quantity)	Total Number of Sentences
		Monetary
		Non-monetary (data)
		Declarative
		Type of Evidence
		Positive
		Negative
		Neutral
		Type of News
Risk Management & Mitigation	Dichotomous Disclosure (Quality)	Physical Security Measures
		Anticipating Regulatory Requirements
		Business Model Shifts
		Other RM&M mentions
		Use of Plain Language
		Total Number of Sentences
	Summary (Quantity)	Monetary
		Non-monetary (data)
		Declarative
		Type of Evidence
		Positive
		Negative
		Neutral
		Type of News
Opportunity Identification (new jobs / markets / investments)	Dichotomous Disclosure (Quality)	Use of Plain Language
		Monetization
	Summary (Quantity)	Total Number of Sentences
		Monetary
		Non-monetary (data)
		Declarative
		Type of Evidence
		Positive
		Negative
		Neutral
		Type of News

Appendix C: Sample table

Company Name	Market Capitalization (\$000,000)	Proved Reserves (Mboe)	Proved CO2e emissions (t000,000)	Potential Liability \$40/tonne CO2e (\$000,000)
Suncor Energy Inc.	47,400.97	3693724.69	1744964.53	69,798.58
Imperial Oil Limited	36,311.14	3754827.1	2043734.78	81,749.39
Canadian Natural Resources Ltd.	30,286.51	3697861.8	1690422.07	67,616.88
Husky Energy Inc.	25,354.74	1158188.06	500677.52	20,027.10
Cenovus Energy Inc.	25,223.30	1959254.3	1042644.18	41,705.77
Crescent Point Energy Corp	12,505.08	277708.5681	117263.39	4,690.54
Talisman Energy Inc. (formerly BP)	12,030.05	320472.72	101540.83	4,061.63
Canadian Oil Sands Ltd	9,729.43	848000	386679.66	15,467.19
Nexen Inc	9,229.55	734899.6	324714.94	12,988.60
MEG Energy Corp.	7,230.50	708200	405284.27	16,211.37
Penn West Petroleum Ltd.	6,757.99	506452.3	205226.50	8,209.06
ARC Resources LTD	6,506.06	123402.7239	50029.91	2,001.20
Baytex Energy Trust	5,204.73	134846.117	63084.75	2,523.39
Athabasca Oil Corporation	4,750.03	98137.2	55535.98	2,221.44
Progress Energy Resources Corp.	4,712.13	200056.9207	66899.16	2,675.97
Vermilion Energy Inc	4,505.64	40062.7991	14857.72	594.31
Tourmaline Oil Corp.	4,355.02	157795.5917	53298.73	2,131.95
Bonavista Energy Trust	2,790.57	241347.1376	80597.79	3,223.91
Peyto Exploration and Development Corp.	2,776.64	237925.229	76862.29	3,074.49
Trilogy Energy	2,735.72	66639.7229	22820.68	912.83
Enerplus Corporation	2,636.81	175060.7684	67861.16	2,714.45
Pengrowth Energy Corporation	2,409.15	241921.7759	92083.09	3,683.32
Petrobakken Energy Ltd	2,172.27	120071.4518	49439.69	1,977.59
Paramount Resources Ltd.	2,139.23	34659.15	11661.50	466.46
Celtic Exploration Ltd.	1,448.93	82642.0022	27054.59	1,082.18
Petrobank Energy and Resources	1,205.26	10237.4835	4342.24	173.69
Freehold Royalties Ltd.	1,204.08	2644.7759	1045.23	41.81
NAL Energy Corporation	996.50	68388.8969	25120.32	1,004.81
BlackPearl Resources Inc.	912.87	15287.1576	7515.30	300.61
Bonterra Energy Corp.	908.18	28608.5982	11463.10	458.52
Totals	276,429.08	19739324.64	9344725.88	373,789.04

Appendix D: Disclosure summary (sentences)

Company	GHG Emissions Data Reporting	GHG Emissions Reduction Strategy/Pledges	Risk Identification	Risk Management & Mitigation	Opportunity Identification	Total number of sentences
Cenovus Energy Inc	9	76	25	12	1	123
Imperial Oil Limited	7	93	0	3	0	103
Suncor Energy Inc	14	56	12	18	1	101
Husky Energy Inc	6	41	22	5	0	74
ARC Resources Ltd	5	32	21	5	5	68
Canadian Natural Resources Ltd	4	29	23	5	0	61
Nexen Inc.	7	22	19	10	0	58
Talisman Energy Inc.	2	15	37	3	0	57
Penn West Petroleum Ltd	4	3	21	0	0	28
Enerplus Corporation	0	7	15	1	0	23
Petrobakken Energy Ltd	0	0	23	0	0	23
Petrobank Energy and Resources	0	0	20	1	0	21
Bonavista Energy Trust	0	3	16	0	0	19
Canadian Oil Sands Ltd	0	5	13	0	0	18
Pengrowth Energy Corporation	0	2	13	2	0	17
MEG Energy Corp.	0	0	14	0	0	14
Baytex Energy Trust	0	0	13	0	0	13
Celtic Exploration Ltd	0	0	8	3	0	11
Crescent Point Energy Corp.	0	4	7	0	0	11
Paramount Resources Ltd	1	2	8	0	0	11
BlackPearl Resources Inc.	0	0	9	2	0	11
Vermilion Energy Inc.	0	0	9	0	0	9
Freehold Royalties Ltd	0	0	9	0	0	9
Progress Energy Resources Corp.	0	0	7	0	0	7
Tourmaline Oil Corp.	0	0	7	0	0	7

Peyto Exploration and Development Corp.	0	1	6	0	0	7
NAL Energy Corporation	0	0	7	0	0	7
Athabasca Oil Corporation	0	0	6	0	0	6
Trilogy Energy	0	0	4	0	0	4
Bonterra Energy Corp.	0	0	0	0	0	0

Appendix E: Additional policy option information

Mandatory disclosure framework core components and challenges:

Outlined below are the core principles and components that should be included in the mandatory regime. The first is a standardized reporting framework based on a set of key performance indicators, which contains detailed instructions describing required calculation methodologies and the scope for analysis. There are two international frameworks that could provide this foundation. The first is the Climate Change Standards Board's Climate Change Reporting Framework, which is an attempt to unify the common features of existing reporting programs in a single document (CDSB, 2012). The second is the climate change components of the Global Reporting Initiative's G3 framework. The GRI is the most widely recognized standard for global sustainability reporting and has been incorporated into Sweden's mandatory reporting requirements for State-owned enterprises (KPMG, 2010).⁵⁴ Lydenberg et al. (2010) have developed a six step process for the identification of appropriate KPIs that could help inform this process.

There are two components of the scope for analysis that require specific definition. One is the range of emissions that require quantification and presentation. Disclosing to scope 3 of the GRI framework, which includes direct, indirect and supply chain/product emissions, will provide the greatest informational value to investors (GRI, 2012). Two is defining the thresholds and organizational boundaries for analysis. This is of particular concern for capturing the diversified emissions sources resulting from oil and gas exploration and production activities. The US Environmental Protection Agency requires analysis and quantification of emissions at the facility level, which for oil and gas companies is defined through common ownership and a defined geographic area (Trexler, 2012). Regarding specific thresholds for disclosure, California has taken an innovative approach to its threshold by requiring the reporting from companies based on the emissions potential of their fuel products (California Environmental Protection Agency Air Resources Board, 2012). The adoption of this approach in Canada's

⁵⁴ The government of Canada currently provides guidance on emissions factors and calculation methodologies through the GHG reporting system for large industrial emitters; however, it has not produced a sector specific framework for Canada's oil and gas sector (Environment Canada, 2012).

mandatory regime is important for documenting the carbon liability associated with future production.

This raises the third core component, which is alignment with international standards. Mandatory reporting may impose a significant cost burden on corporations (Burton, 2010). Canada's mandatory policy framework should therefore be aligned with international reporting standards, where possible, to decrease the burden faced specifically by international firms, which may be subject to multiple reporting requirements (KPMG, 2010). Canada has demonstrated a willingness to do this through its adoption of the IFRS and should follow the same pattern regarding climate change disclosures.

The final core principle is the requirement for assurance of climate change disclosures; specifically GHG emissions data. Assurance standards are an important provision for the successful implementation of a mandatory reporting system because they result in more credible sustainability reporting and thereby contribute to decreased monitoring and enforcement costs (Eccles et al., 2012; KPMG, 2010). Although no international standard has emerged, a number of OECD countries have developed country-specific sustainability assurance standards.⁵⁵ Once again, Sweden is a leading example. The Swedish Guidelines for external reporting by state-owned companies requires those companies to subject all mandatory reports, including sustainability, to third party scrutiny and assurance (KPMG, 2010).

In Canada, third party assurance currently takes place in financial disclosures for oil and gas reserve estimates and among certain mandatory GHG reporting frameworks (see for example, British Columbia Ministry of Environment, 2011; Ontario Ministry of the Environment, 2012; Woodside, 2009). These examples suggest that implementation of a Sweden-type model is not inconsistent with current approaches to emissions management and future-directed financial reporting in Canada. Finally, indicating its immediate feasibility, a profession of auditors already exist with the technical

⁵⁵ These countries include: Australia, France, Germany, Japan, the Netherlands, Spain and Sweden. For additional information on these countries sustainability standards see KPMG, (2010).

competence required to implement third party assurance for climate change reporting in Canada (Fagotto and Graham, 2007).

Despite the benefits of a mandatory system, there are three noteworthy limitations of a comprehensive mandatory regime:

- The danger that companies will focus on meeting the mandated requirements rather than reporting on other emerging issues that may become more material to the business (Sullivan and Gouldson, 2012).
- The removal of the signalling value of voluntary reports that allow investors to distinguish between firms (Eccles et al., 2012).
- Its ability to maintain room for innovation (KPMG, 2010).

These issues raise the importance of including in the policy a mechanism for continued evaluation of both the substance of the policy, specifically as international standards continue to emerge, and its effectiveness at encouraging more comprehensive disclosures. During the first few years of the policy it will likely require concerted effort to be made by the provincial regulators and the CSA to review firm progress and issue further guidance, or make adjustments to the framework, as required.

Disclosure guide core components and challenges:

The core components of the disclosure guide are those discussed in the mandatory disclosure framework (see above). The four core challenges and limitations of the disclosure guide are listed below:

- It is unlikely to increase the integration of emissions data with financial information.
- The materiality of climate change to oil and gas operations will be clarified; however, the concept's flexibility will be maintained.
- The potential increase in value-relevant information is dependent on the good will of the oil and gas sector and their seeing value from climate change information provision as well as from the utilization of the prescribed framework. This is uncertain.
- The disclosure guide does not contain a mechanism for raising investor consciousness regarding the investment implications of climate change.

Hybrid disclosure framework core components and challenges:

The details of a GHG centered reporting framework have a significant impact on its ability to promote the disclosure of value-relevant information. The British government's draft legislation, The Greenhouse Gas Emissions (Directors' reports) Regulations 2013, provides a useful framework for illustrating potential tradeoffs and how to maximize information provision while reducing the burden on reporting firms. It specifically defines the scope for analysis and requires publication of the calculation methodology, a comparable intensity ratio, and continued reference to the baseline year of reporting to ensure consistency and comparability across firms and through time. Of particular note, it reduces the regulatory burden imposed by allowing firms to report their emissions in a format consistent with other reporting obligations. Despite this flexibility, Britain's draft regulation ensures comprehensiveness by requiring all market listed companies to comply with the legislation regardless of the firm's greenhouse gas output (DEFRA, 2013).

The British example raises two fundamental tradeoffs that have to be considered in the development of the GHG reporting framework. First is the consistency of information required and the potential regulatory burden. As was evident in the analysis chapter, investors currently face significant challenges comparing reported emissions levels. The UK legislation has tried to reduce this burden by allowing firms to disclose the particular methodology used in the analysis if the calculation was made within the context of a national or sub-national GHG framework. The problem faced by investors is that to be comparable, the GHG data will have to be standardized through recalculation. The higher the number of approved GHG analysis frameworks, the more difficult it will be to achieve the policy goal of standardization. In Canada, there are currently three separate provincial GHG reporting systems and one at the national level.⁵⁶ Consequently, the greater the degree of harmonization achieved by the hybrid

⁵⁶ Ontario, Alberta, British Columbia and the federal government have introduced mandatory GHG reporting obligations for large industrial emitters. For further information on these programs see for example; British Columbia Ministry of Environment (2011); Government of Alberta (2013); Environment Canada (2012); Ontario Ministry of the Environment (2012).

disclosure framework, with regard to these systems, the easier the use of the information will be to investors.

The second trade-off is between the comprehensiveness of the regime - the proportion of firms required to report within it - and the regulatory burden imposed. As such, the draft British legislation sets the standard for comprehensiveness; however, there is recognition that this will impose a greater burden on smaller operators. An alternative standard could be set, such as the 10,000 metric tonnes of CO₂e per annum threshold used in GHG reporting frameworks of California and British Columbia. Finally, the reporting obligation could be tied to market capitalization and investor's exposure to the carbon bubble.

In addition to the issues discussed previously, there are a number of key limitations inherent to the hybrid policy option. These are:

- While increasing the integration of emissions data with financial information, this policy option does not address firms' assessment of the materiality of climate change.
- This policy option does not contain a direct mechanism for raising investor consciousness regarding the investment implications of climate change.
- Administratively, development and implementation could be a slow and difficult process.

Public Compliance Campaign and Guide core components and challenges:

The mechanism through which public compliance campaigns of this type work to influence corporate behaviour operates in several overlapping ways. First, publication of the compliance rates may be seen as providing a non-financial incentive that encourages some firms to strive for excellence. Equally important, for those at the other end of the disclosure spectrum, the threat of having poor performance demonstrated - the threat of public shaming - may serve as a deterrent to letting compliance fall short of regulatory standards (see for example, Yeung, 2007; Cartwright, 2012). The escalating rates of participation in voluntary sustainability reporting initiatives suggest that firms are concerned about their reputational image around climate change issues, which supports the conclusion that this instrument can help improve reporting practices.

The second component of the instrument is its educational and informational value. From the perspective of reporting firms, the CSA will be able to make clear its standards for acceptable and unacceptable climate change disclosures. The CSA's current approach to compliance focuses on both education and deterrence. As part of the continuous review process it conducts a limited number of investigations each year, based on the risk level of the issuer, and provides feedback and issues penalties for misconduct. The penalties typically involve monetary sanctions and prohibitions from market participation.⁵⁷ The main limitation of this approach is its scope. Because the evaluation takes place only for a sample, the majority of the companies receive no information regarding how they perform relative to the benchmark or their peers. The compliance campaign will resolve this deficiency.

Finally the program also has informational value for the public at large. By publishing the compliance rates, the CSA will be sending a signal to the public that they should be alert to climate change as an investment issue and that firms' mandatory reports are an important source of information for evaluating their financial exposure to this issue. The ability of the program to reach the entire public, which includes both asset owners and investment managers, is particularly important because there are certain investment options, such as actively managed funds and fund of funds, which disconnect asset owners from the investment decision-making process. Consequently, being able to target all groups operating in the financial sector has distinct advantages over an information campaign that only targets specific actors, such as institutional investors or fiduciaries.

The ultimate efficacy of this policy option is related to the extent to which the information value of the compliance ratings will influence public and investor perceptions and create a credible threat to firm value. Evidence indicates that this potential exists. For example, Beatty and Shimshack (2010) found that the release of new information, in the form of climate change ratings from a third party, had a statistically significant effect on firm market values in the United States. While the informational content of the compliance program policy option is one step removed from the direct assessment of

⁵⁷ From 2009 to 2011, the number of enforcement cases concluded by the CSA that investigated disclosure violations averaged less than 12 per year. For further information on the compliance and enforcement activities undertaken by the CSA see CSA (2012).

firm climate change performance, this result suggest investors will utilize new information when making investment decisions. Furthermore, Kwan and Lau (2011) indicate that markets will react to regulatory enforcement of corporate governance issues, of which disclosure violations would be an example.⁵⁸

Implementation of this policy option, like the changes to the disclosure regime, is administratively and resource intensive. Because evaluation and securities enforcement activities take place at the provincial level, undertaking systematic analysis of the climate change disclosures from Canada's oil and gas sector will require the creation of a CSA sub-committee. This would likely occur under the CSA Enforcement Standing Committee or the CSA Investor Education Standing Committee.⁵⁹ Once provided with the appropriate mandate, the climate change sub-committee will be responsible for developing an assessment model, perhaps similar to the one used in this research, conducting the analysis, and making the results public. Of particular importance will be the development an easily comprehensible presentation format that is capable of clearly and succinctly articulating the complex compliance information (Cartwright, 2012). Without this component it is unlikely for the compliance information to become salient to investors.

The Alberta Securities Commission (ASC) will likely play a large role in this process. Because of the prominence of the oil and gas sector to the Alberta economy, the ASC maintains a team of specialized oil and gas staff to review disclosures. Since 2004, this team has released an annual Oil and Gas Review Report containing a summary of staff observations on the disclosure practices of sampled firms. Although the review has focussed on assessing technical aspects of issuer's reports, such as statements of reserves data, this mandate could be relatively easily expanded to identify climate change reporting deficiencies. The ASC, in some cases, also carries out detailed issue-oriented reviews of specific disclosure requirements and documents for all firms. This indicates that it has the capacity to conduct systematic analysis across the sector (ASC, 2012). The challenges are the development of an assessment model that can be

⁵⁸ It must be noted that the examples referenced by Kwan and Lau (2011) involved the imposition of fines and other market transaction penalties.

⁵⁹ For a description of the mandate of each of these committees see CSA Secretariat (n.d.).

consistently applied by the multiple provincial regulators and ensuring a long-term funding commitment.⁶⁰

Like the other policy options, there are inherent limitations in the ability of the policy to affect the desired changes in the climate change disclosures of Canada's oil and gas sector. These are:

- The analysis will not consider the voluntary efforts undertaken by firms to disclose climate change information.
- The policy will not systematically address the comparability issues encountered by investors.
- Given the inherent subjectivity of the materiality standard, the development of performance standard will likely be difficult.
- There is significant uncertainty regarding investor uptake and use of the compliance information in investment analysis and decision-making.

Carbon pricing policy option core components and challenges:

In addition to policy options presented previously, there is one policy option outside of the scope of this research that requires mention because of its capability to internalize the cost of carbon, force its inclusion in financial statements, and influence investor decision making; a national comprehensive long-run climate action policy suite. Under the current securities regulations, firms must make forward-looking statements regarding known uncertainties. This has been made difficult by Canada's current fragmented and inconsistent climate change regulatory framework. The introduction of a federal climate change policy regime capable of internalizing the social cost of carbon, therefore, will provide the requisite certainty required by firms and enable them to more accurately calculate the materiality of climate change on their financial condition and competitive position and present that information to stakeholders.

The NRTEE has recommended a policy regime that forms the basic model. There are two main policy requirements: 1) unified and harmonized GHG targets and

⁶⁰ The CSA has established a harmonized continuous disclosure review program to ensure consistent treatment of issuers across the country. (CSA, 2009)

timelines across jurisdictions; and 2) a dedicated carbon pricing regime and governance framework, including both cap and trade and carbon taxation elements, that internalizes the economic cost of GHG emissions (NRTEE, 2009).

The operating assumption of this policy suite is that with greater internalization in the economy of the costs associated with carbon, oil and gas firms will more likely trigger the current materiality standard and disclosure will follow. Although this policy option only indirectly addresses the problem of climate change disclosure, evidence from the European Union indicates that it can positively contribute to climate change disclosure. For example, Townsend and Cofre (2012) indicate that since the introduction of the European Union Emission Trading Scheme, UK firms, which historically have faced similar disclosure requirements to Canadian firms, find it much more difficult to ignore climate change risks in their corporate reports.

There are, however, a number of key issues that will have to be dealt with in the design of the policy suite to ensure increased disclosure:

- The threshold for participation in the cap and trade system will have to recognize the non-point pollution sources inherent in oil and gas exploration and production activities.
- Oil and gas companies with multiple income sources and/or which operate in multiple jurisdictions will likely require a higher carbon tax rate to reach materiality than smaller E&P national firms.
- It doesn't resolve the problem of GHG data being reported in financial statements. Without this it becomes more difficult for investors to cross-reference performance between firms. For example, the reporting of the compliance costs associated with existing policy regimes does not necessarily provide significant information regarding the carbon intensity of operations or trends.
- Implementation and monitoring costs would be high. In addition, its potential revolutionary impact on the Canadian economy raises significant challenges regarding transition costs. These are specifically related to international competitiveness, regional tensions, and political repercussions, among others. However, it has the potential to directly alter investment decision-making throughout the country and therefore deals directly with the source of the Canadian carbon bubble.