

Climate Change and the Canadian Financial Services Sector

by

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract:

Canada is highly dependent on the emission intensive sectors and at the same time, sectors that are vulnerable to variations in weather and extreme events. This makes the Canadian economy especially vulnerable to the impacts of climate change and any efforts to address it. The financial services sector is responsible for the provision of capital to all economic sectors and, therefore, it must consider all climate change-related risks and opportunities in its capital allocation decisions. This study explores the perception of climate change by the financial services sector in Canada and the extent of the sector's response to climate-related impacts to date. The study adopted an institutional view of isomorphism to explain the behaviours of the financial sector in relation to climate change. The research was conducted through qualitative analysis of interviews with representatives of the Canadian financial sector and a review of the latest available responses to the Climate Disclosure Project's (CDP) climate change questionnaire. The research's primary focus was on climate change consideration in the lending and investment portfolios of the financial institutions. The research involved investigation of the industry's awareness of five climate-related risks – physical, reputational, regulatory, litigation, and transition risks – in the Canadian context and the level of substantive actions taken by participating institutions. The study found that the level of the sector's preparedness is low because coercive, normative, and mimetic isomorphic pressures have only existed for a short time. The Canadian financial institutions are in early stages of exploring climate change-related risks and opportunities for their lending and investment businesses. The study concludes with recommendations for the industry and proposals for further research on climate-related risks and opportunities for the financial sector through quantitative methods.

Key Words: *climate change, financial sector, climate change-related risks, transition to a low-carbon economy*

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List of Abbreviations

CDP - Carbon Disclosure Project

FSB - Financial Stability Board

L&H - life and health

Mt CO₂ eq. - mega tonnes (Mt) of carbon dioxide equivalent (CO₂ eq)

P&C - property and casualty

SASB - Sustainability Accounting Standards Board

TCFD - Task Force on Climate-related Financial Disclosures

UNEP - United Nations Environment Programme

1. Introduction

Climate change has been called a problem of extreme, irreversible, highly uncertain, and perilous global risk (Stern, 2006). The climate change impacts on the environment, society, and the economy are far-reaching. From the economic and business perspective, climate related concerns are relatively new considerations. There is still some scepticism around the legitimacy of addressing climate change as a business risk as it has not been widely accepted in the markets (Goldenberg 2012; IHS Markit 2017). However, the narrative on climate science and its impacts is steadily gaining momentum (Matthews & Potvin, 2017). As the entities responsible for capital allocation within the economy, how do financial institutions perceive climate change and their responsibility associated with it? Furthermore, given that climate change is a complex and wide-ranging issue, how do financial institutions assess such risk from the business perspective? This thesis aims to determine preparedness of the Canadian financial sector to the impact of climate change.

The motivation for this thesis stems from the fact that Canada's economy is highly dependent on sectors that are vulnerable to the impacts of climate change, including natural resources and real estate. Canada is abundant with natural resources, with sectors in energy, mineral and metals, and forests accounting for 16 percent of gross domestic product (GDP); the real estate sector represents 13 percent of Canada's GDP. The physical effects of climate-related weather events are already being felt across the country, with significant financial losses incurred by property and casualty (P&C) insurers, the government, and consequently the taxpayers (Insurance Bureau of Canada [IBC], 2016; Office of the Auditor General of Canada, 2016). At the same time, some Canadian sectors contribute to climate change, with the oil and gas and transportation sectors together emitting half of all of Canada's greenhouse gas (GHG) emissions (Environment and Climate Change Canada, 2017). Climate change-related regulatory developments that are on the rise domestically and internationally, continuous technological advancements, and consumer sentiment that is evolving and becoming increasingly environmentally conscious, all pose a financial and business threat for the heavy-emitting industries. The financial services sector is responsible for providing financing, credit, and equity to all industries, and therefore it is

indirectly linked to climate change. In Canada, the financial industry is a significant participant in the economy, managing assets of over \$10 trillion (Government of Canada, 2016). Debatably, its vulnerability to climate change is more significant than each individual sector linked to climate change described above, due to the collective impact of all climate-related risks on financial institutions. Given the financial sector's expertise in assessing and pricing risks, it is also well equipped to understand, evaluate, and anticipate climate change from the business-risk perspective.

The purpose of this research is to understand the perception of climate change in the business context by the financial services sector in Canada and to gauge the extent of the industry's response to climate-related risks to date. It is important to note that the majority of the focus of this paper relates to exploring all five climate-related risks; the emphasis is on the extent to which such risks are represented in the value-creating processes of banks and life and health (L&H) insurance companies, primarily the processes around lending and investing portfolios. While the direct physical risks are also very important and significant to the Canadian market, they are much better understood due to their direct impact on the P&C insurers and because the consequences are already being felt across the industry (IBC, 2016). According to the literature, the practices around climate change-related risk assessment and strategies for financing and investments are not yet well developed in the sector (Boston Common Asset Management, 2015). Therefore, it is important to examine this in the Canadian context.

The study utilised institutional theory to explore the behaviours of financial institutions in relation to climate change. Specifically, the behaviour of financial institutions is examined through the lens of institutional isomorphic change including coercive, normative, and mimetic isomorphism and how such pressures and behaviours influence actions for addressing climate-related considerations. The research data included interviews with representatives of the Canadian financial industry and a review of the latest available responses to the Climate Disclosure Project's (CDP) climate change questionnaire. The analysis of the interviews and the literature was carried out utilising qualitative assessment methodology, and the extent of the discussion on all relevant climate-related risks that could have material consequences was examined. Institutional theory was applied to construct the hypothesis and to explain the

industry's level of preparedness to address climate-related issues. The preparedness was determined based on the extent of the evidence of substantive actions taken to address all five climate change-related risks.

The results of the study indicate that the level of preparedness by the Canadian financial sector to address climate-related impacts is low. This is due to the lack of participants' discussion on all relevant impacts and the treatment of these effects in isolation without the acknowledgement that such risks can have significant impact collectively. The study found that the financial sector is focused on climate-related risk through the lens of its own operations, enhanced environmental due diligence for lending and the development of new products in the case of banks while L&H insurers are at early stages of exploring if climate change-related impacts for their portfolios. The sector is not yet adequately integrating climate change in its risk management processes for assessing its lending and investment portfolio, but some organizations have made some interesting progress in this area. As a result, it was identified that further research will be required to better understand the extent of climate-related risks on institutions' lending and investment portfolios utilizing quantitative methodologies.

This research adds to the body of climate change-related studies in the context of the financial services sector generally, and also specifically for Canada. Furthermore, it adds to the academic discourse on climate change by exploring the behaviour of the financial services sector in response to climate change through institutional theory. The results are significant for the financial industry in Canada because they describe the gaps in business processes and provide evidence as to why this should be examined closer; they also add to the knowledge of climate-related risk assessment.

The following section of the thesis presents the background on how climate change is relevant to the economy and Canada's contribution to climate change. This is followed by the theoretical framework and research objective and question in Section 3. The paper continues with the literature review in Section 4, which explores the evidence of institutional isomorphism as it applies to the financial sector in the context of environmental, sustainability, and climate-related issues. The literature review also includes a detailed exploration of five specific risks that could

have financial consequences to the financial services sector in Canada – 1) physical, 2) regulatory, 3) reputation, 4) litigation and 5) transition/systemic. This is important because it provides evidence for the Canadian financial sector about why climate change is important and how such risk can translate into financial risks. The hypothesis is developed in Section 6, and that is followed by the research method in Section 7. Analysis of the interviews and CDP responses is in Section 8 and, finally, the paper concludes with Section 9, which presents observations, discussion, and conclusions.

2. Background

Climate Change and the Economy

Climate change is one of the most significant and complex challenges faced by humanity today. The scientific community has reached a consensus that human influences are the main reason for the changing climate and there could be severe consequences to the planet. To signify this, scientists proposed defining a new time unit, the Anthropocene, which describes an epoch where human activity has started to significantly alter the planet's climate systems (Lewis & Maslin, 2015).

In addition to the scientific community, economists have recognized climate change as the “greatest and widest-ranging market failure ever seen” (Stern, 2006, p. i). The current economic model, which is heavily reliant on the burning of fossil fuels, was identified as being behind the acceleration in global warming. At the same time, climate change effects pose a threat to the economic system. For instance, extreme weather events can damage physical assets, disrupt business operations, and put human health at risk, causing a decrease in labour productivity. Depending on the development of climate policy and on other societal and economic factors, if GHG emissions continue at the same rate as today, the effects on the planet and society are likely to be extreme and irreversible (Intergovernmental Panel on Climate Change [IPCC], 2014).

The consequences of climate change are expected to vary amongst different countries and regions, and the poorest populations in developing countries are likely to suffer the most. According to a 2006 study, by the end of this century, developing countries are likely to lose more than 10 percent of GDP if there is 5-6°C of warming, and the global average GDP could suffer a 5-10 percent loss (Stern, 2006). At the same time, the cost of action could be as little as 1-2 percent of world GDP (ibid.). It is hard to estimate the real costs of climate change, given the complexity of the conceptual, ethical, and measurement considerations involved. This is coupled with a long-term time horizon which typically makes economic analysis complex and filled with too many assumptions (King, Schrag, Dadi, Ye, & Ghosh, 2015; Stern, 2006). Furthermore, as the scientific and economic research continues, these estimates will continue to be refined.

To reduce GHG emissions, the global economy has to shift away from non-renewable and towards low-carbon or zero-emissions energy sources. While such an energy transition can be challenging and significant upfront investments are required, it is feasible and can present opportunities for growth across all regions (Stern, 2006). As a result, researchers, governments, and industry are now pondering different pathways towards an economy that has little or no impact on the climate (Gros, 2016; Royal Dutch Shell plc., 2016; Locklin & Zindler, 2016). There is increasing evidence that early action, including climate-related policy that encourages technological innovation and other adaptation and mitigation strategies, can produce benefits that outweigh the costs of inaction on climate change (Stern, 2006). Whereas adaptation aims to prepare for the effects of a changing climate, mitigation is a form of intervention that seeks to reduce GHG emissions and thereby reduce the level of change in the climate (IPCC, 2014).

Since 1997, the number of climate-related laws worldwide has increased twentyfold to 1,200, and this reflects growing concerns around the topic (Nachmany, Fankhauser, Setzer, & Averchenkova, 2017). At the international level, the Paris Agreement is a significant milestone and represents a commitment by the majority of nations to tackle climate change through mitigation. Aiming to limit the global average temperature increase to 1.5°C will further encourage an increase in climate-related regulations in individual countries (United Nations Framework Convention on Climate Change [UNFCCC], 2017). Moreover, the markets are also responding to the climate change narrative, and leaders across many industries are showing interest in this topic by collaborating with various stakeholders and incorporating climate change considerations into their strategic planning (Task Force on Climate-related Financial Disclosures [TCFD], 2017; Sustainability Accounting Standards Board [SASB], 2016; Principles for Responsible Investment [PRI], 2017; Royal Dutch Shell, 2016; Aviva, 2016). The financial services industry is one of the main players that ought to take an active role in tackling climate-related issues. It oversees the allocation of capital that is one of the primary variables that influence the global economy and can determine the trajectory of climate-adjusted future (Coleman & LaPlante, 2016).

Canada's Contribution to Climate Change

Global GHG emissions in 2013 were 45,261 Mt CO₂ eq., of which Canada emitted 738 Mt CO₂ eq. or 1.6 percent (World Resources Institute, 2017). While Canada's emissions in 2015 decreased to 722 Mt CO₂ eq., they rose nearly 20 percent over the last 15 years. The main contributors to Canada's emissions are the oil and gas and transportation sectors, which increased their GHG emissions by 76 percent and 42 percent respectively between 1990 and 2015 (Environment and Climate Change Canada, 2017). The oil and gas industry has expanded as a result of conventional oil, which grew by 26 percent from 1990 to 2015, and the tar sands, which increased more than fourfold (ibid.). The most growth in the tar sands' emissions between 1990 and 2015 pertained to in-situ production, a highly energy intensive extraction practice representing the emissions increment of sevenfold (ibid.).

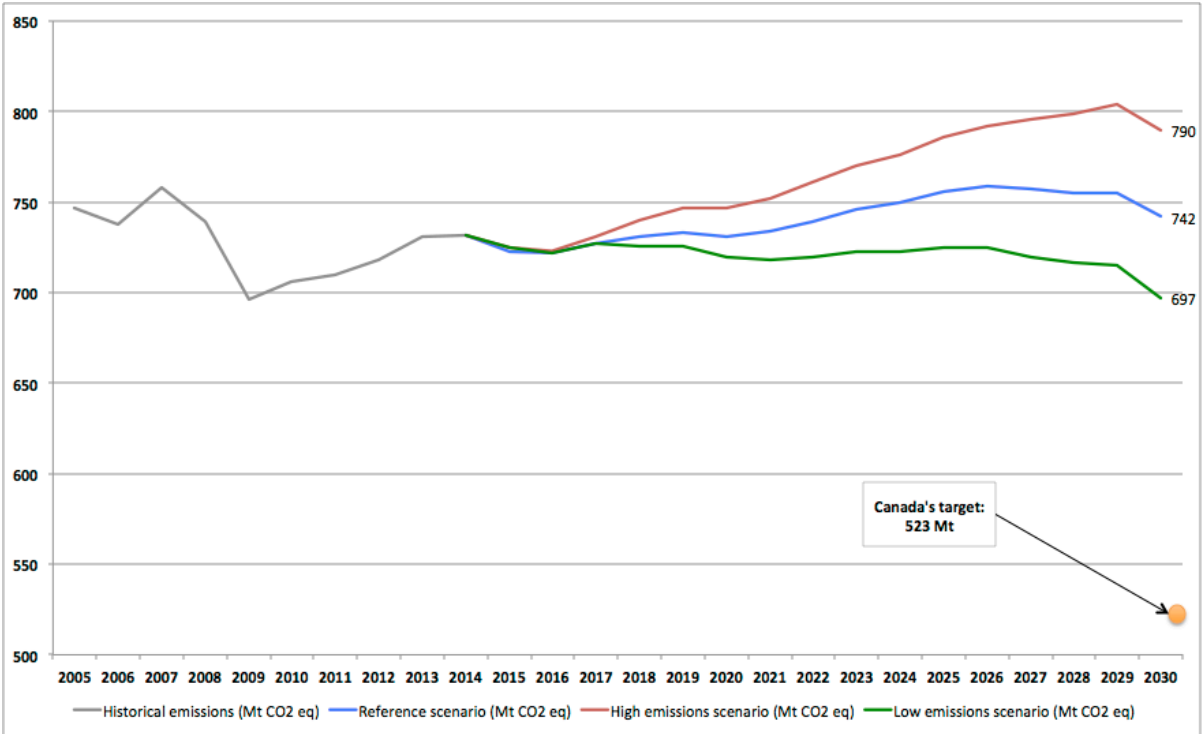
While Canada's total emissions appear to be insignificant on the global scale, its per capita emissions are amongst the highest in the world at 20.1 tonnes CO₂ eq. in 2015; nonetheless, this did decrease over the last 15 years by about 10 percent (1990 was at 22.1 tonnes CO₂ eq.) (World Resources Institute, 2017). In 2013, Canada was in the top 15 highest global emitters per capita, exceeding China, the U.S., and the European Union (28 countries) (ibid.). For the same year, the top emitters per capita in the world are mostly oil producing countries such as Kuwait, 54.48 tonnes CO₂ eq.; Brunei, 46.21 tonnes CO₂ eq.; and Qatar, 39.43 tonnes CO₂ eq. (ibid.).

Not surprisingly, Canada's largest emitting province is Alberta, the main location of its oil and gas industry, followed by Ontario and Quebec, Canada's top two most populous provinces (Environment and Climate Change Canada, 2017). The emissions of the latter two have decreased over the last 15 years to 166 Mt CO₂ eq. (a 9 percent decrease) and 80 Mt CO₂ eq. (a 10 percent decrease), respectively, while Alberta's emissions increased by 57 percent to 274 Mt CO₂ eq. (ibid.).

As per Figure 1, Canada's emissions are projected to be in the range of 697 and 790 Mt CO₂ eq. by 2030. Such projections incorporate historical data as well as any actions taken by the government, consumers, and businesses up to 2014, but exclude GHG emissions from land use,

land use change, and the forestry sectors. The graph shows three scenarios, the reference projection and then high and low versions along with the 2030 target set by the federal government and communicated for the purposes of Paris Agreement. The Canadian government is currently developing a regulatory framework named The Pan-Canadian Framework on Clean Growth and Climate Change to ensure the 2030 GHG emissions target can be reached (Environment and Climate Change Canada, 2017).

Figure 1: Canada’s historical greenhouse gas emissions and projections to 2030 with policies and measures as of November 1, 2016, Canada, 2005 to 2030



Source: Environment and Climate Change Canada, 2017

Financial Services Industry

The predominant role of the financial services sector in a society is to provide credit, liquidity, and risk management services (Elliott & Baily, 2013). The central institutions in the industry are banks, insurance companies, pension funds, credit rating agencies, stock exchanges, and mutual and hedge funds.

Banks

Banks act as intermediaries that transform capital by size, term, place, and risk and channel it from entities that have such resources to the entities that are in need of them (Jeucken, 2004). Typically, banks' primary sources of funding are deposit accounts that can be used to lend to businesses and consumers in the form of loans, mortgages, and securities (Caouette, Altman, Narayanan, & Nimmo, 2008). Banks add value to such transactions by aggregating available capital from individuals and businesses so that larger projects can be financed, and then assessing the risks of potential financial opportunities to ensure efficient allocation of capital. In general, the banks' business models operate under the assumption that the interest charged to the entities financed is higher than the interest paid to entities with the capital deposited in banks' savings accounts. Therefore, the banks that are able to accurately assess risks and price products accordingly will be most profitable (Weber, 2012). Typically, banks provide a range of products and services through their retail, corporate, investments, commercial, and private divisions (Hierzig & Phillips, 2017). See Table 1 for more details on each area of banking.

Table 1: Typical business segments of banks

Area of banking	Role of the bank	Examples of products and/ or services provided
Investment banking	Provision of various services to individuals, companies and governments; acting as the intermediary between entities that have money (generally institutional investors) and those that need it (generally companies)	Capital raising through initial public offerings (IPOs) or bond issuances, leveraged finance, financial advisory, trading platforms, research, etc.
Corporate banking	Provision of financing to companies through debt issuances, structured products, or other banking and investment products	Secured term loans, syndicated loans with multiple arrangers, structured finance-type loans, project finance, etc.
Retail banking	Provision of products and services to individual clients, rather than companies or other banks	Savings and transactional accounts, mortgages, personal loans, debit and credit cards, etc.
Commercial banking	Provision of the same products and services as in retail banking, but to companies	Savings and transactional accounts, small loans, debit and credit cards, etc.
Private banking	Also referred to as Private Wealth Management; retail banking and wealth management for high-net-worth individuals	Savings and transactional accounts, credit and debit cards, tailored lending, investment services, family governance, philanthropy services, etc.

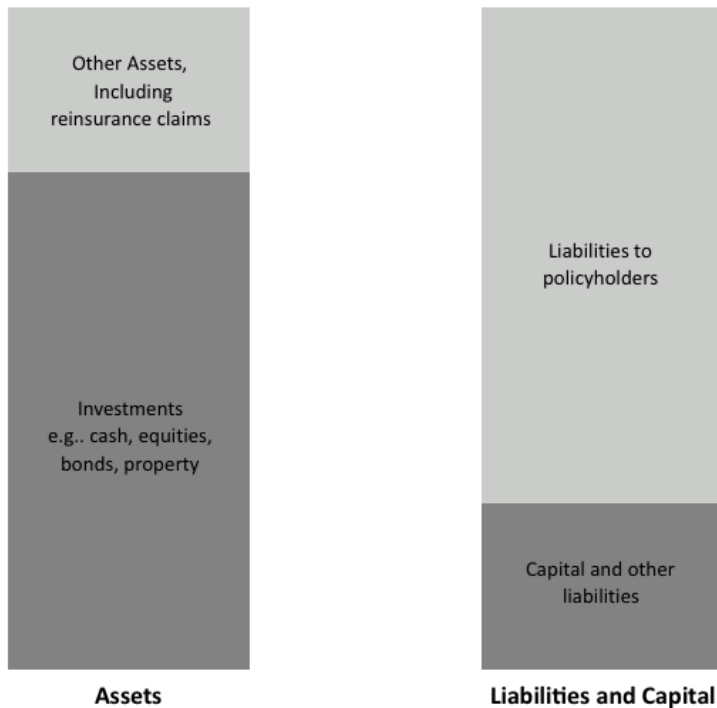
Source: Hierzig & Phillips, (2017), pg. 7

Insurance Companies

The role of the insurance sector is to pool and manage risks, and thus it provides stability by safeguarding its policyholders from loss and uncertainty. There are three main types of insurance companies with different risk profiles requiring different business models: L&H insurers; P&C insurers; and reinsurers (Bank of England & Prudential Regulation Authority, 2015). In order to offset the risks associated with their products, in addition to collecting premiums from policyholders, insurers engage in investment activities. (See Figure 2.) Therefore, the operations of a typical insurer include risk underwriting, marketing, and distribution, and also credit and portfolio management of investments (Caouette et al., 2008).

L&H insurers offer products related to life expectancy and health, which absorbs mortality risk for a fee (Caouette et al., 2008). Such insurance products have a long-term horizon, and therefore L&H insurers rely on long-term investments on the asset side of their balance sheet to ensure they can meet long-term obligations to their policyholders (Bank of England & Prudential Regulation Authority, 2015). This is shown in Figure 2. In contrast, P&C insurers provide coverage against damages to property and other assets arising from accidents, natural disasters, or other losses. The time horizon for P&C products is much more short term than those of L&H due to the shorter duration of a typical policy agreement. Therefore, P&C insurers tend to have a stronger focus on managing the underwriting or liability side of their balance sheet. This results in less reliance on investments to offset the risk of paying claims as they become due, and investments are targeted towards liquidity rather than return (Caouette et al., 2008). Reinsurers support L&H and P&C insurance companies by insuring a portion of risks that primary insurers are not able to hedge (Bank of England & Prudential Regulation Authority, 2015).

Figure 2: A stylised balance sheet of an insurance firm



Source: Bank of England & Prudential Regulation Authority, 2015, pg. 13

Portfolio Managers: Asset Owners and Managers

Another important player in the financial industry is the portfolio manager who manages their own assets or acts as a fiduciary for other asset owners (TCFD, 2016). Portfolio managers invest the available funds in various financial instruments with the aim of profit maximization. They either earn money through price appreciation – by buying low and selling high – or by taking on credit risk through lending activities (Caouette et al., 2008). This group includes asset owners such as pension funds and endowments, but also insurance companies, banks that manage their own assets, and asset managers such as mutual and hedge funds, investment firms, etc.

Portfolio managers focus on both individual and portfolio risks, while banks and insurance businesses tend to focus on individual risks (Caouette et al., 2008). By considering portfolio risk, portfolio managers can take advantage of diversification to construct a portfolio that suits their own risk appetite or that of their client, or any particular investment strategy. The investment decisions are carried out through industry and company research and are at the core of investment management practice. They are typically a lot quicker at disposing of instruments that

are not performing in line with expectations and replacing them with instruments that fit into the investment strategy at any given time (ibid.). This approach is known as total return portfolio management (ibid.). However, it is important to note that the focus differs for each investment manager and some tend to hold their investments longer than others, depending on the investment purpose and strategy (ibid.).

For instance, the primary function of pension funds is to ensure a steady stream of income for an individual when they retire (Caouette et al., 2008). They manage a pool of money that was contributed by the policyholder and their employer or government on their behalf prior to retirement (ibid.). Consequently, such an investment strategy is typically long term, as the liability or retirement payments to individuals would become due in the distant future. As discussed earlier, this is the case for L&H insurance companies as well. On the other hand, other investment managers, such as those managing mutual and hedge funds, tend to have a shorter-term horizon and a primary focus on capital gain and income maximization. Hedge funds can be especially risky as they tend to focus on complex and illiquid products and markets with highly challenging risk profiles, but these risks come with a promise of higher returns (ibid.).

Other Players in the Financial Industry

Other institutions and facilitators that support the financial services industry would also have to be part of any changes or transition that the financial sector undertakes. For instance, the credit rating agencies rate debt securities issuers on their ability to repay the debt and, therefore, provide support to the financial services sector by enhancing understanding of credit management risks (Caouette et al., 2008); European Commission, 2017). Stock exchanges are where financial instruments are bought and sold by issuers and investors (Caouette et al., 2008). Furthermore, credit unions are typically smaller financial institutions owned by their customers; they offer basic services such as deposit accounts and individual loans and mortgages, and share the profits among members (Caouette et al., 2008).

Canadian Financial Services Sector

The main sub-sectors in the Canadian financial industry are banking, life insurers, P&C insurers, trust and loan companies, mortgage lenders and insurers, and credit unions (Government of Canada, 2016). Collectively the industry manages assets of about \$10 trillion, which is approximately more than five times Canada's GDP. In 2015, the industry contributed 7 percent to GDP and provided 790,000 jobs, representing 4.4 percent of all jobs in Canada (ibid.).

On the federal level, the oversight of the Canadian financial system is shared by a number of financial regulatory authorities including the Minister of Finance, the Bank of Canada, Office of the Superintendent of Financial Institutions (OSFI), the Canada Deposit Insurance Corporation, and the Financial Consumer Agency of Canada (Bank of Canada, 2012). There are also regulatory mechanisms at the provincial and territorial levels that govern credit unions and securities firms. For instance, in Ontario, the Financial Services Commission of Ontario regulates the insurance sector, pension funds, credit unions and Caisses Populaires, the mortgage brokering sector, etc. (Financial Services Commission of Ontario, 2017).

The financial sector in Canada is well respected and has been widely recognized by the international community for its performance during the 2008 financial crisis (Bank of Canada, 2012). This achievement was mostly attributed to its size and diversification, and to the strong central regulations around mortgage lending and investment banking when compared to the U.S. A shared approach to regulation of the financial system proved valuable as well (Bordo, Redish, & Rockoff, 2015).

Banks are by far the largest institutions in the Canadian financial industry, and they are regulated at the federal level (Bank of Canada, 2012). The six largest banks are the Bank of Montreal, Bank of Nova Scotia, Canadian Imperial Bank of Commerce, National Bank of Canada, Royal Bank of Canada, and Toronto-Dominion Bank; these entities are responsible for 93 percent of all banking assets (Government of Canada, 2016). The banks handle a variety of product lines, including personal and commercial banking, wealth management, investment banking, securities dealings, insurance services, etc. (ibid.). The main source of business for Canadian banks is

residential mortgages, which represented 26.2 percent of their total assets in 2015 (McKeown, 2016).

The insurance sector is another federally regulated actor in the industry with two main subsectors, L&H and P&C insurers (Government of Canada, 2016). L&H insurers offer products for retirement planning, health, and premature death risks (ibid.). The three institutions dominate the subsector, Great-West Life Assurance Company, Manulife Financial Corporation, and Sun Life Financial Inc., and these companies represent approximately 90 percent of total assets managed by the L&H insurance sector (ibid.). In recent years, in addition to underwriting, L&H insurers have expanded their wealth management businesses and international operations. In total, this subsector manages assets of approximately \$1.3 trillion (ibid.). P&C insurance is a smaller industry with total assets around \$118 billion; it offers products designed to manage risks around private and business property, auto, and business disruption (ibid.). Mortgage insurance provides payouts to lenders in case of default, and is offered by the Canada Mortgage and Housing Corporation (CMHC), a federal Crown corporation, as well as other private mortgage insurers (ibid.).

Credit unions and Caisses Populaires are financial cooperatives that are community-focused, deposit-taking institutions; they are regulated at both the provincial and federal levels (Government of Canada, 2016). This subsector contains 600 institutions with combined assets of approximately \$350 billion. It provides relatively simple products such as savings accounts, and consumer and business lending (ibid.).

Interaction of Climate Change with the Financial Services Sector

There are several important reasons why society must note the connection between the environment and the financial sector. First, the sector is responsible for significant financial capital and it influences whether this capital is designed to work for or against the long-term future. Second, the capital that is being invested today will set the path for the economic development of the future. A growing population, the continuous depletion of natural capital, and the development of the global South will add to the needs of future generations (Schmidheiny & Zorraquin, 1996). Therefore, it is crucial for the financial community to support sustainable

development and channel capital in a responsible manner that supports the needs of the environment, society, and the economy. From this, one can conclude that the financial sector can contribute to the extent of environmental success or failure, and consequently to climate change as well. On the other hand, climate change-related consequences can also impact the financial sector. The sector provides capital to a range of organizations and projects and is, therefore, indirectly linked to all industries. Financial institutions tend to base their capital-allocation assessments on entities' financial viability, and they take a certain level of risk in exchange for an acceptable level of return; by doing so, they influence how capital flows within the economy (2 Degrees Investing Initiative, 2015). This interaction and connection with a variety of industries and projects exposes the financial sector to most of the risks faced by these industries. Climate change is one of these risks, and it can have a range of impacts on the assets, projects, and organizations in which the industry invests.

According to the World Resources Institute and the United Nations Environment Programme Finance Initiative (UNEP FI), firms across all industries face climate-related physical and non-physical risks also referred to as operator's carbon risk. Operator's carbon risk includes a combination of policy and legal, technology, market and economic factors as well as reputational risks that directly affect the companies (Fulton & Weber, 2015). For the financial services sector, climate-related physical risk can translate into operational risk, especially for a bank that has many offices as branches (Weber & Feltmate, 2016). Carbon risk for the operator can translate into carbon asset risk for the financial institutions that finance this operator (Fulton & Weber, 2015). For instance, industries that are GHG emissions intensive but which fail to address climate change while operating in regions where climate-related policies are becoming more prominent expose their creditors and shareholders to credit and market risks. The climate-related policies can impose an additional cost on pollution by requiring investment in clean technology, which in turn would strain the operator's resources and put its assets at risk of impairment; this could reduce its ability to repay its loans and may impact its share price (Hierzig & Phillips, 2017).

Climate change does not necessarily create a new type of financial risk, but rather translates to existing categories of traditional financial risk (Scott, Van Huizen, & Jung, 2017). The sector is

faced with financial risks including credit, market, liquidity, and operational risks (ibid.). Credit risk arises as a result of an increase in the probability that a party would not be able to fulfill its financial obligations to its lender (Weber, Scholz & Michalik, 2010). The companies that fail to mitigate and adapt to climate change can suffer financial losses due to physical or regulatory risks, and this can translate into credit risk for their creditors (Hierzig & Phillips, 2017). Market risk exposure typically arises due to a fluctuation of security prices while the speed of sale determines liquidity risk. Similar to credit risk, companies that are unprepared for climate-related risks are more exposed to financial losses because of an increased probability of a decline in demand for their products and prices of their assets subsequently; this adds to market and liquidity risks for their investors (Hierzig & Phillips, 2017). Physical effects of climate change can increase operational risk by creating challenges around managing business operations after an extreme weather event ((Scott, Van Huizen, & Jung, 2017).

Another climate-related financial challenge for the business community is the issue of ‘stranded assets.’ Climate change-related developments in policy, technology, market, or social norms can influence the economic profile of assets (Hjort, 2016). The Cancun Agreement stated that global average temperatures should not rise by more than 2°C above pre-industrial levels, and it was followed by the Paris Agreement, which extends this target further to 1.5°C (UNFCCC, 2017). According to Carbon Tracker and the International Energy Agency (IEA), the 2°C target would allow a release of approximately 565 to 886 billion tonnes (Gt) of CO₂ by 2050 (Leaton, Ranger, Ward, Sussams, & Brown, 2013; UNFCCC, 2017). However, if all the current fossil fuel reserves reported by the industry were burned, they would produce 2,860 GtCO₂, and consequently, there is a misalignment between the reality of climate change science and the plans of fossil fuel industry. According to the Paris Agreement, 60 to 80 percent of coal, oil, and gas reserves that are currently incorporated in fossil fuel firms' valuations are not burnable. Effectively, further investment in activities and assets associated with this industry is at risk of premature obsolescence due to incompatibility with the trajectory of a climate-adjusted future (Leaton et al., 2013). Additionally, technological advancements and decreasing prices of renewable energy are other factors that put fossil fuel assets at further risk of being stranded. As carbon emissions become regulated, energy from non-renewable sources can be made more expensive to produce while the development of new clean technologies and new subsidies can

decrease the prices of renewable energy and further expand its market share. As a result, all infrastructure and supporting industries relative to the fossil fuel sector, such as pipelines, production plants, rail infrastructure, and maintenance, are at risk of becoming obsolete. Lastly, as new clean technologies for the fossil fuel sector continue being encouraged by new policies and the business case, the existing assets currently supporting the industry will be at risk of premature write-down.

3. Research Objective and Question

The objective of this thesis is to determine the current perception of climate-related impacts in the business context by the Canadian financial services sector and to explore the current level of the industry's responses to such impacts. The study aims to understand the extent to which each institution that participated in this study addresses this issue, and to examine some of the practices adapted by the sector. This thesis explores the following research questions:

What is the level of preparedness of the Canadian financial services sector for climate change?

- a) What is the current perception of climate-related impacts by the Canadian financial services sector?
- b) What are the risk assessment practices and climate change response strategies that have been adopted in the industry to date?

4. Theory

One branch of institutional theory explores institutional isomorphism by examining reasons for similarities in behaviour by organizations in established fields. Essentially, three mechanisms – coercive, mimetic, and normative isomorphism – can explain why organizations adopt similar structures, strategies, and processes (DiMaggio & Powell, 1983). According to this theory, coercive isomorphism occurs as a result of pressures from an organization’s environment, which can take the shape of formal and informal pressures, represented by different stakeholders such as governments or other organizations (ibid.). Mimetic isomorphism can occur at the time of uncertainty in response to a particular situation that may trigger a company to copy its competitor, which may reduce the risk for an organization responding on its own (ibid.). Normative isomorphism occurs because of personnel with similar education, training, and network (ibid.). This theory can be helpful in exploring the financial sector’s response to climate change, because climate change is not yet incorporated in the markets, producing no or very little pressure for companies to respond at this time. However, there is evidence suggesting that institutional pressures can create a response and therefore, institutional theory can be helpful in explaining the nature and extent of such response (Liu & Lin, 2014; Mengze & Wei, 2015; Weber, 2017).

Coercive Isomorphism

One can hypothesize that the current level of interest in climate change-related topics within the Canadian financial sector stems from coercive external forces including the development of a regulatory framework in Canada on national and provincial levels. These are known as formal coercive forces. While regulatory developments are not directly impacting the financial sector, these changes can directly affect its clients and investments. Also, informal forces, such as the pressure from non-governmental organizations (NGOs), can play a significant role in attracting the attention of financial institutions to these issues because of possible reputational consequences if not addressed. Such pressures are likely to prompt interest in climate change by actors in the industry who are aware of climate-related regulatory and reputation risks that stem from such developments. Therefore, one would expect that the Canadian financial services sector would be paying close attention to regulatory changes – including the Pan-Canadian Framework,

carbon markets, and carbon taxes – that governments are implementing across the country (Government of Canada, 2017). Such interest can take the form of engagement with policymakers, creating industry and advisory groups within the sector, and collaboration between institutions to understand the response required to NGOs' inquiries. Also, given the advances of climate-related topic prompted by these two influential stakeholders, the financial institutions could be pressured to participate in the discourse on climate change.

As the regulatory framework continues to develop and as activists continue to raise public awareness about climate change, it is likely that the financial sector's stakeholders in Canada will become more educated about climate-related risks, global regulations, and climate risk assessment practices. Such coercive pressures could be a dominant force that leads the Canadian financial sector to explore climate change in the context of its core business. Thus, this is in line with formal and informal coercive isomorphism of institutional theory.

Normative Pressures

Various associations that are being formed to address climate-related issues could represent normative forces for the financial services sector. For instance, the development of voluntary practices around climate-related disclosure by the TCFD points specifically to the financial industry to consider climate change in its business (TCFD, 2017). The TCFD was formed by leaders of global organizations, including from the financial industry, who are actively seeking to better understand and incorporate climate change considerations into their business strategies, and to develop frameworks and tools to address it. TCFD recommendations cater to the business community and are framed in an accessible and relatable context. Such developments are likely to create pressure for the Canadian financial sector to understand and be able to respond to such developments. Other well-known associations such as UNEP FI and PRI have members across the financial sector with various initiatives that aim specifically to aid in climate mitigation and adaptation (Sullivan, Martindale, Feller, & Bordon, 2016). Such membership organizations also play an important role in spreading climate-relevant knowledge and best practices, and thus create the normative pressure to engage.

Increasing discourse on the business case for climate-related matters could be another normative force that is likely to pressure financial institutions to respond to climate change. The business case translates the benefits of climate-related actions into monetary value and thus converts the environmental benefits of such considerations into business language that adds to the pressure to take into account such topics.

Possible responses to the normative pressures faced by financial institutions would likely take the form of the development of expertise on climate-related issues, engaging with member associations such as UNEP FI, and training personnel with the help of the groups mentioned above.

Mimetic Isomorphism

Since Canada has a relatively small market and is not very diverse when it comes to the lending and investment portfolios of financial institutions, it would be expected that the mimetic forces are relatively high (McKeown, 2016; Government of Canada, 2016). In Canada, the financial services sector is heavily regulated, and therefore one can assume that there is some degree of similarity between how institutions operate and respond to changes. The banks and insurance companies need to answer to the same set of regulations that require an established practice and standard response (Bank of Canada, 2012). Also, factors such as the dominance of mortgages as the primary source of business for banks, the country's relatively small population, and the Canadian economy's reliance on the natural resources industries, could create similarities between how organizations conduct business (Warren & Lemmen, 2014; McKeown, 2016). Therefore, it is fair to hypothesize that any action from financial institutions in response to climate-related matters would put a certain level of pressure on other financial institutions to be able to address and respond on this topic.

As described above, the coercive, normative, and mimetic isomorphic processes can explain the behaviour of financial institutions regarding climate change-related issues. The period of time that such pressures have existed can also help to understand the extent of the response currently undertaken by the sector. For instance, the coercive pressures, including the regulatory framework, are still under development at the federal level and therefore, it can be expected that

the financial institutions may not yet have a sufficient response strategy to regulative pressures (Government of Canada, 2017). The same can be assumed for the normative pressures such as the TCFD framework (TCFD, 2017). While the coercive and normative pressures from NGOs have existed for longer, these may not have the same influence over the financial sector, and therefore the level of response may be different from such pressures (Barclay, 2008). Thus institutional isomorphism can help to explain the level of progress that the financial services sector has made in addressing climate related risks, if any.

The mechanism through which institutional isomorphic change occurs is used in this study to address the research question on the level of preparedness of the Canadian financial sector to climate change-related risks. This framework is utilised to understand the coercive, normative, and mimetic climate-related pressures that exist in the industry through first exploring the literature on climate-related studies in the industry and second, by undertaking closer study of five climate-related risks for the financial sector in the Canadian context. The findings are then applied to content analysis methodology used to examine the interviews and the responses to the CDP climate change questionnaire by the participating institutions.

5. Literature Review and Hypothesis

The studies outlined below present various motivations behind financial institutions' behaviours towards sustainability-related topics and provide examples of coercive, normative, and mimetic isomorphism. Since climate change is considered to fall under the broader categories of environmentalism and sustainability, one can assume that the academic studies referenced below would also apply to climate change.

Some studies suggest that incorporating environmental considerations into credit risk management can improve prediction regarding defaults. Companies that address environmental matters tend to have a lower cost of debt with higher credit ratings and therefore, lower credit risk (Bauer & Hann, 2010). Sustainability criteria were found to be able to predict the defaults in credit risk management of small- and medium-sized enterprises and developing countries despite the lack of environmental regulations (Weber, Scholz, & Michalik, 2010; Weber, Hoque, & Islam, 2015). Environmental risk was found to influence all parts of the credit management process, including rating, costing, pricing, monitoring, and workout (Weber, Fenchel, & Scholz, 2008). Therefore, one can conclude that companies that apply sustainability considerations to their business operations will, all else being equal, have a better credit score.

Indeed, this is consistent with studies that indicate that sustainability performance can positively influence financial results (Albertini, 2013; Ameer & Othman, 2012; Al-Najjar & Anfimiadou, 2012). However, it is important to consider measurement levels and moderators when assessing the link between environmental or social performance with financial performance, because studies can yield different results (Busch & Hoffmann, 2011; Albertini, 2013). Porter and Linde (1995) pointed out the need for the promotion of both environmental and industrial solutions, and found that these do not need to compete, but rather enhance each other. Thus, by considering sustainability or impact on the environment in business and disclosing such practice, a company can enhance its financial performance. On the other hand, if not considered, then the company may suffer financial losses. For instance, markets penalize firms that have high carbon emissions or fail to disclose their emissions (Matsumura et al., 2014). Such examples presenting evidence

of improved financial performance or the threat of economic losses illustrate normative pressures for organizations.

Weber's (2012) study of Canadian banks found them to be the best in class for incorporating environmental consideration in their credit risk management. This behaviour was linked to the fact that Canada has relatively high exposure to environmentally sensitive sectors. The natural resources industries in Canada and environmental considerations around them are concerned with environmental regulations, industry-specific practices, and the financial implications of environmental management, which represent coercive and normative pressures (Weber 2012).

Another study found Canadian financial institutions to be proactively handling environmental credit risk management and attributed this to normative forces in the form of voluntary codes such as the Equator Principles (EPs) and the UNEP FI (Mengze & Wei, 2015). Interestingly, another study found that being a signatory to environment-related voluntary codes does not necessarily indicate actual behaviour in environmental matters; however, the timing of the study might explain this finding (Cowton & Thompson, 2000). The study cited Canada's reliance on environmentally sensitive sectors as one of the possible reasons for such attention to environmental topics. Other causes identified for the performance of different countries were coercive pressures such as environmental regulations, the presence of an environmental liability system, and government economic incentives for banks to pursue green activities. More generally, the motives associated with incorporating sustainability into the business strategies of financial institutions included negative or positive events or sustainability as a new strategy, value driver, public mission, and requirement of a client (Weber, 2005). Weber's study additionally revealed that owners' attitudes and concern played a significant role in whether financial institutions incorporated sustainability into their business model.

A study of Chinese banks found that pressures from governments, markets, communities, and NGOs have a positive and significant relationship with the environmental risk management behaviour of commercial banks (Liu & Lin, 2014). The influence of each stakeholder created different results, which ranged from passive feedback to enthusiastic behaviour (ibid.). For instance, coercive pressures such as governmental regulations were likely to create passive

feedback and preventative behaviour such as little focus on environmental assessment or considering environmental regulations as an additional cost. On the other hand, normative pressures from markets yielded active participation including investment in environmentally friendly industries; also, pressure from communities and NGOs resulted in enthusiastic behaviour such as pursuing sustainable development returns (ibid.).

It appears that generally the financial sector does not want to be responsible for monitoring environmental performance, but at the same time it can provide a valuable service to companies in need of understanding how environmental issues impact their business (Coulson & Monks, 1999). From an academic perspective on sustainability, the financial sector should be responsible for societal and environmental considerations in addition to its primary business agenda, which is ensuring efficient capital flows amongst stakeholders while maximizing economic return (Weber & Felzmate, 2016). Such values would have to be a primary concern for senior management and the board for these considerations to fundamentally infiltrate the organizations. However, the governmental mandate around sustainability issues can also transform the way organizations work. This is evident in Chinese banks, where a strong coercive, regulatory strategy and frameworks dictate how banks allocate capital (Weber, 2017). Furthermore, an additional reason for incorporating sustainability into business decisions is the fact that sustainability-related risks are in fact connected to the economic success of a business. As a company interacts with all three aspects of sustainability – economy, society, and environment – then each aspect can impact the business. While this was always the case in the past, the increasing population and the depletion of natural resources are limiting the ability of companies to take the environmental and social considerations for granted.

How to Determine Climate Change Preparedness?

Coercive, normative, and mimetic pressures will produce behaviour by institutions that will trigger a response to addressing climate change-related issues. The paper continues to explore the available literature on climate change-related strategies that would constitute various levels of preparedness. The thesis draws from climate change studies, and also from environmental and sustainability literature, because climate change is considered to be a part of these broader

categories. It can be assumed that their strategies will also apply when responding to climate change.

A study on corporate social responsibility (CSR) of international insurance companies assessed their performance in four different pillars of CSR, including environmental responsibility (Scholtens, 2011). The framework for determining environmental responsibility used nine separate indicators to make this judgement. These indicators included the level of transparency of environmental performance and goals, the existence of environmental policies, the extent of environmental risk analysis, sector exclusions, adoption of environmental guidelines, and presence of sustainable financial products. North American insurers scored particularly low in the environmental responsibility category (*ibid.*). One can draw from this study to construct the categories that can apply to climate change. For instance, transparency, policy, risk assessment, and guidelines are adaptable to climate change.

Climate change has to be addressed in isolation in certain processes, like credit risk management, but also more holistically to safeguard the prosperity of the financial services sector (Furrer, Hamprecht, & Hoffmann, 2011). For instance, considerations of the operations of financial institutions, such as the emissions from their own office buildings, are thought to be symbolic. More substantive actions would include integrating climate-related risks and opportunities into business processes like due diligence, advisory services, and equity research. Finally, governance considerations take such actions further by including climate change in management frameworks, risk management, intellectual capital, disclosure, engagement, and leadership (*ibid.*). Therefore, to evaluate the preparedness of financial institutions in Canada for climate-related activities, one should assess the extent of their substantive actions as they relate to business processes and governance. Furrer et al. (2011) grouped the banks they evaluated based on these criteria into four clusters – hesitators, product innovators, process developers, and forerunners. Hesitators employed symbolic climate-related activities in their own operations, if any; product developers focused on new climate-related products and services; process developers focused their activities on governance and did not fully capture these impacts in lending and investment processes; and forerunners implemented all actions including substantive and symbolic.

Weber (2012) found that Canadian banks manage sustainability and environmental issues in isolation from the rest of their business areas. The study noted a few opportunity areas that must be considered by banks and other financial institutions to improve their environmental performance; this would also help them reap the full benefits of incorporating environmental considerations into credit risk management, because it influences the counterparty risk. First, the study suggested that the environment should be considered for transactions from all sectors, not just the sectors that are perceived to have the highest risk. Second, Weber (2012) suggested that financial institutions should report their impact on the environment and sustainable development and better integrate sustainability with business issues. Third, the use of indicators linking sustainability to overall business performance was recommended (Weber 2012). Therefore, the evidence of preparedness for climate change can be evaluated based on institutions' consideration of climate change across all industries with supporting evidence disclosed in its public reporting. Furthermore, linking institutional activities to climate change, and vice versa, and then communicating this through indicators that integrate all institutional activities would also present evidence for preparedness.

Some of the strategies being adopted by P&C insurers in response to the physical impacts of climate change are fundamentally flawed and are not sustainable in the long run (Thistlethwaite, 2012). According to Thistlethwaite, such strategies create obstacles due to regulatory and cognitive institutions and include raising policy premiums, avoiding high-risk markets, and the development of new actuarial models that take climate change into account. However, the self-regulatory institution in the insurance sector, ClimateWise, offers a comprehensive set of principles that define sound management of climate change risks (ibid.). There are six principles in total that are grouped into two categories. The first category focuses on utilising the insurance industry's expertise in pricing climate change risks (ibid.). The second category focuses on engagement, communication, and education, where the industry, as an expert in climate-related risks, could take the lead in advising policymakers, engaging its stakeholders, and educating the public (ibid.). Finally, another principle acts as a quality control in implementation for the rest of the principles (ibid.). Therefore, one can conclude that preparedness for climate change by the

Canadian financial sector has to include climate change risk assessment and active engagement with its stakeholders on climate-related regulations and education.

The preparedness for climate change by the financial sector would constitute disclosure of substantive actions taken within value-creating activities such as lending and investment portfolios. This would include adjustments made to business processes like due diligence, advisory services, and equity research as well as consider climate change at governance level for management frameworks, risk management, intellectual capital, disclosure, engagement, and leadership. Furthermore, such substantive actions would have to consider all climate change-related impacts – physical, regulatory, reputational, litigation and transition/systemic. While some portfolios might have less exposure to certain risks, it is important to consider and disclose such findings. Scenario analysis and stress testing can assist in such assessments (2 Degrees Investing Initiative, 2015; TCFD, 2017).

Evidence of Preparedness for Climate Change by Canadian Financial Institutions

A study of international banks by Furrer et al. (2011) found evidence that banks decouple climate change strategies from their main value-creating processes, such as lending and investments. For North American banks, in particular, the research showed that a majority of the banks have only implemented symbolic actions, if any, like changes in operations that are considered to be an immaterial portion of banks' relationship to climate change. Only 3.4 percent of North American banks were ranked as “forerunners,” i.e., those that incorporate climate change in business and governance in addition to operations (Furrer et al., 2011).

While the overall body of literature on climate change and what it means for the economy is growing, empirical studies for the Canadian financial services sector in the context of climate change are still scarce; hence one has to turn to non-academic sources to explore this subject further. A Canadian advisor in responsible investment practices, the Shareholder Association for Research and Education (SHARE), conducted a study of the five largest Canadian banks and their performance as it relates to the integration of climate change-related strategy, risk management, performance, and disclosure (Rohan & Razafimahefa, 2015). It concluded that the Canadian banks studied had not yet integrated climate change considerations into their core

business strategy and risk management processes. The study further found the banks' climate-related disclosure was insufficient for investors to make informed investment decisions. For instance, according to SHARE, one of the indicators that the banks are not yet thinking of climate change as a key business issue was the fact that discussion of systemic risk and the transition to a low-carbon economy was insufficient. Furthermore, the uncertainty and slow development of climate-related policy frameworks was cited as another reason for low scoring of regulatory risk by the banks, which also indicated a lack of any business-wide analysis done on regulatory scenarios (ibid).

Six Canadian banks were also amongst those engaged in a global study on the level of preparedness of the banking industry across the globe conducted by Boston Common Asset Management (2015). Based on best-in-class scoring, this study concluded that the banks across all regions were not yet integrating climate change risks into their lending and underwriting portfolios. However, it was also noted that out of the three categories assessed – risk management, business strategy, and capitalizing on opportunities – most banks reported the most progress on the development of new products that address climate-related issues (ibid.).

Both studies emphasized that banks tend to focus on short-term benefits and mitigation strategies around their own operational emissions, new products, and services; they lacked adequate disclosure on climate risk analysis conducted with quantitative indicators showing the portion of their portfolios aligned with the transition to a low-carbon economy. Amongst the many concrete climate-related strategies and actions that the researchers were looking for are: 1) overseeing of climate-related issues by the boards; 2) aligning management compensation to long-term targets such as climate change; 3) climate-related stress testing of credit risk and revenue streams; 4) reassessment of pricing of loans with climate-related exposure; 5) company-wide assessment of exposure to and management of climate change risks as opposed to focusing on just individual projects; 6) taking carbon footprints of lending portfolios; 7) analysis of physical and regulatory climate scenarios; 8) disclosure on how risk assessments are conducted, including the portion of portfolios exposed to climate-related risks; and 9) climate targets in core business and exposure to carbon intensive assets in portfolios.

A study that was conducted by CPA Canada (2017) on climate-related disclosure across major industries in Canada included assessment of the financial services sector. It found that 79 percent of all public companies reviewed and 69 percent of those in the financial sector provided climate change-related disclosure but did not provide adequate context (CPA, 2017).

Climate Change-Related Financial Impacts

To further investigate climate change-related impacts on the financial services sector, the following section explores risks and opportunities and their financial consequences for businesses. This, as a result, will impact the financial services industry.

Physical Risks

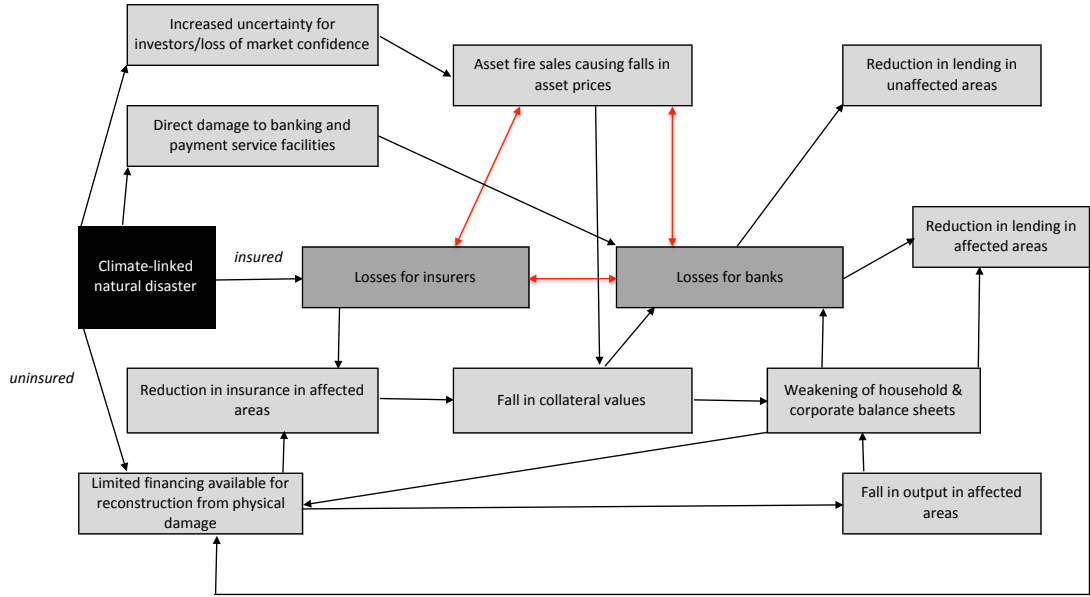
Both the TCFD and the SASB break down the physical aspects of climate risk to acute and chronic. Acute physical risk pertains to the increased intensity of extreme weather events that may disrupt supply and distribution chains, damage companies' tangible assets, and affect insurance liabilities (TCFD, 2016; SASB, 2016). Chronic physical risks relate to the increased frequency of extreme weather events that may affect access to resources such as water, natural materials, and land. Similar to Nikolaou Evangelinos, and Leal Filho's (2015) argument that each industry has its own climate change risk profile, SASB provides its analysis of climate-related risks by industry and outlines specific climate-relevant risks, including physical, that are more relevant and material for each sector or industry (SASB, 2016).

The exposure to physical risks within the financial sector can take various forms. First, P&C insurers are directly impacted by extreme weather events. If insurers do not account for a climate change-related increase in such events, their businesses will suffer a decline in profitability. The rise of weather-related claims could prompt insurers to quickly dispose of their assets in order to pay policyholders, and that could, in turn, decrease asset market prices and have negative consequences for other stakeholders in the financial industry (Batten, Sowerbutts, & Tanaka, 2016). If the properties are not insured, or claim payments are not sufficient to cover all the damages, banks can also suffer losses. In such cases, homeowners are likely to default on their mortgages, and as the value of the property drops due to damages, banks may not be able to recover sufficient value from these assets that are also used as collateral (Batten et al., 2016). See

Figure 3 to review these and other damages that extreme weather events can have on the financial industry. It is important to note that the expansion of economic activities and population growth in urban and coastal regions is a significant factor in the increasing value of damages relative to extreme weather events (Scott et al., 2017).

Secondly, institutions are exposed to extreme weather events such as floods, storms, and wildfires directly, and this impacts their own assets, including office buildings and other real estate assets. This is especially relevant for banks, since they manage many branches and offices across many regions, but also for those that directly manage real estate. Thirdly, changes in the climate such as increasing temperatures can negatively impact staff health and wellbeing, which can result in lower productivity (Stenek, Amado, & Connell, 2010). Finally, exposure to climate-related physical risks can transfer to financial institutions from the companies they finance and invest in. It is therefore important to examine how physical risks can impact all industries; that would, in turn, determine the indirect exposure for the financial sector.

Figure 3: A transition map from a natural disaster to financial sector losses and the macroeconomy



Source: Batten, Sowerbutts, & Tanaka, 2016

The indirect physical aspect of climate change risk for financial sector can take multiple forms and is dependent on several factors for various industries that the sector finances. Business operations may be affected by climate-related physical risks as a result of the increased frequency and severity of extreme weather events; these can incur additional costs of clean up, disrupt current operations, and increase the vulnerability of future operations. Furthermore, the exposure to physical risk is dependent on the level of vulnerabilities for a particular industry (Nikolaou et al., 2015). For instance, the agricultural sector can experience negative consequences as a result of an increased frequency of extreme weather events such as floods or droughts. At the same time, it can benefit; the number of warmer days in a year can extend the typical agricultural season in some areas and, if managed appropriately, this can increase crop yields. On the other hand, the skiing industry is likely to experience more negative impacts, as the skiing season can shorten due to rising average temperatures (Warren & Lemmen, 2014). Furthermore, depending on the vulnerability of a particular industry, companies are likely to incur additional costs due to the implementation of various strategies for climate change adaptation and mitigation; this requires an upfront investment, but can have a positive financial return in the long term (Nikolaou et al., 2015). All of these impacts can significantly alter financial profiles and the annual returns of businesses across almost all sectors, and can translate into carbon-asset risk for financial institutions.

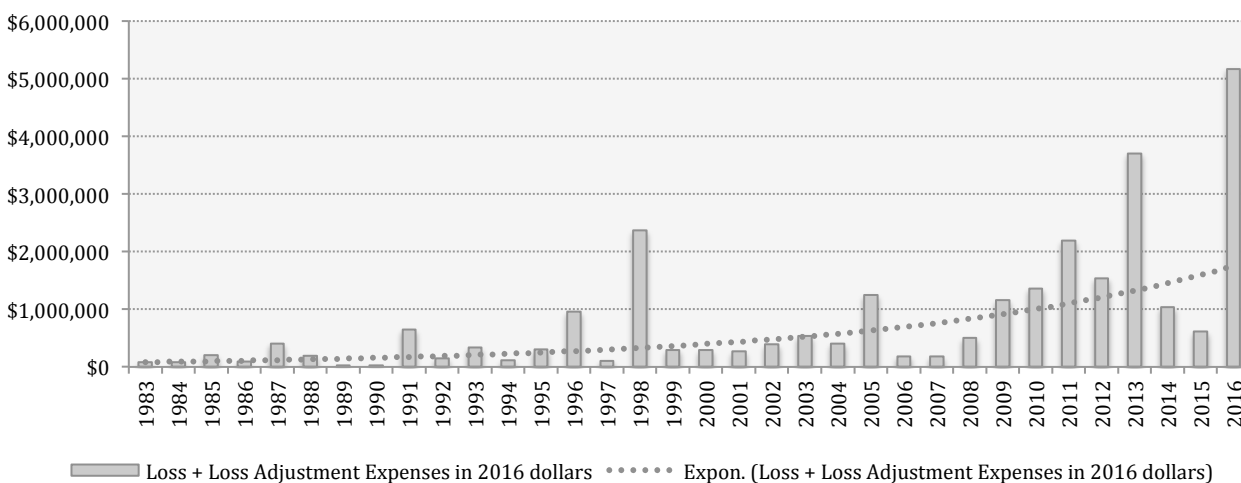
As mentioned previously, a warmer climate also offers opportunities. Agricultural activities in certain regions can take advantage of expansion of the agricultural season and new arable land that can become accessible as a result of melted snow (Nikolaou et al., 2015). Land development is another opportunity that is available for a range of businesses such as real estate developers and tourism. The key is planning for this in advance so that such opportunities can be realized with optimal return on investment. Furthermore, the insurance sector can also benefit from innovation concerning new products and services, and the exploration of new markets that will further protect vulnerable regions from natural disaster (ClimateWise, 2014).

The evidence of changes in the climate around Canada is continuing to grow. Canada's first national-scale science assessment of climate-related changes was published in 1998, and it was followed by an update in 2004 and then again in 2008, when the study focused on climate change

impacts and adaptation (Mayer & Wendy, 1998; Warren & Lemmen, 2004; Lemmen, Warren, Lacroix, & Bush, 2008). In its latest iteration, from 2014, the findings included significant changes in air, temperature, precipitation, and snow and ice cover, with northern regions reporting generally higher rates of change (Warren & Lemmen, 2014). The most frequent weather events for Canada are flooding, wildfires, different variety of storms, depending on the season, and hurricanes (ibid.). Such weather events can impact a broad array of sectors such as the natural resources industry, including power generation, forestry, and mining, but also agriculture, property insurance, tourism, residential construction, manufacturing, and transportation. These industries can suffer damages to their operations, infrastructure, equipment, real estate, inventories, transportation networks, and supply chains. In addition, the changes in season characteristics and predictability are particularly disturbing to agriculture and tourism, but also to other sectors such as mining, utilities, and oil and gas (Warren & Lemmen, 2014; National Round Table on the Environment and the Economy [NRTEE], 2012).

To examine the costs of climate-related damages for Canada, one needs to look no further than the IBC. It is evident that in the last decade the number of catastrophic losses due to natural disasters, and the costs associated with them, is on the rise (IBC, 2016). In 2016, damages from catastrophic losses set the record for insured annual costs and amounted to \$4.9 billion (see Figure 4). While the majority of extreme weather events in Canada manifested as storms and floods, the main disaster that accounted for a majority of the claims in 2016 was the Fort McMurray wildfire that occurred in May 2016 (IBC, 2017). 2016, the record year in catastrophic losses was 2013, with the majority of losses attributable to floods in Alberta. Before 2013, 1998 had the highest losses with \$2.2 billion in insurable damages due to ice storms in Ontario and Quebec (IBC, 2016).

Figure 4: Catastrophic losses in Canada, 1983 to 2016



Source: IBC, 2017

In addition to Canada’s insurable damages, all levels of government have experienced a rise in the costs of severe weather, and this is putting taxpayers’ money at risk. Spending for the federally administered Disaster Financial Assistance Arrangement (DFAA) has increased dramatically, amounting to \$3.3 billion in damages from 2010 to 2015, which far exceeded the costs that were paid out in the first 39 years of program activities (Office of the Auditor General of Canada, 2016).

According to Swiss Re, floods are the leading natural hazard globally and in Canada. However, the insurance coverage is not adequate in Canada for water-related perils, unlike other G7 countries; this has only recently gained attention as a result of the Alberta floods in 2013 that caused disputes between insurance companies and their policyholders. Swiss Re found that in Canada, the average of annual economic losses from floods exceed \$1.2 billion; approximately 67 percent of these are not insured, and therefore the homeowners bear the majority of losses (Honegger & Oehy, 2016). Furthermore, in addition to the insurance industry, disaster damages can also extend to banks and other mortgage-lending companies; this stems from uncertainty around the mortgage holder’s financial position following damages in cases of lack of insurance, or from uncertainty about government compensation to homeowners, as was the case following the 2013 floods in Alberta (Shecter, 2013).

On the other hand, adaptation to the physical impacts of climate change can present an opportunity for business growth and diversification in Canada. For instance, new transportation routes in the North might open up for the mining sector; the agricultural sector may see enhanced crop productivity and opportunities for cultivating new crops as a result of a warmer climate; new information technology applications that help businesses to be more resilient could increase in demand; and the financial industry could see a rise in financing as a result of new infrastructure projects (NRTEE, 2012).

Regulatory Risks

Climate-related regulatory or policy risk emerges from uncertainty around the timing and exact details of regulations and their impact on all relevant stakeholders (Hjort, 2016). It translates into financial impacts due to the cost of compliance with climate change policy (ibid.). Such policies can take the shape of ‘command and control,’ such as legislation that forces firms to adopt climate change-related strategies; ‘market-based’ policies such as carbon taxes, levies, and cap-and-trade systems; and finally, voluntary actions, meaning any actions taken by firms in response to climate change that make business sense (Nikolaou et al., 2015).

SASB defines regulatory risks by mostly focusing on command and control and market-based mechanisms, including international, national, and subnational targets, mandates, legislation, and regulations that address climate change (SASB, 2016). TCFD distinguished between regulations that aim to constrain actions contributing to climate change and those that encourage adaptation (TCFD, 2016). TCFD refers to regulatory risks under the umbrella of transition risk, where most climate-related policies drive the transition to a low-carbon economy. There are different approaches to classifying regulatory risk in the literature. Some refer to regulatory risks independent of transition risk, since other things like market factors and technological innovation can drive transition. Meanwhile, some literature mixes the two. For the purposes of this paper, transition risk is discussed separately, but it is acknowledged that the two are interconnected and that a significant number of policies drive the transition to a low-carbon economy. Some of the financial consequences of regulatory or policy risks have to do with compliance costs, write-offs,

early impairment or retirement of assets as a result of obsolescence driven by regulations (also known as stranding of the assets), and an increase in insurance premiums (TCFD, 2016).

The financial industry can be impacted by regulatory risk directly as climate-related financial sector regulations are on the rise. For example, Article 173 of the Energy Transition Law in France mandates that institutional investors disclose GHG emissions and their contribution to the goal of limiting global warming. In the U.S., the National Association of Insurance Commissioners requires insurers with premiums exceeding \$100 million to disclose climate-related risk and investment management (TCFD, 2016). Yet indirect impact is also significant, and this happens where an operator's regulatory risks can translate into carbon asset risk for financial institutions (Fulton & Weber, 2015). As financial institutions finance and invest in businesses with high emissions, they indirectly contribute to climate change.

At the same time, climate-related regulations also present valuable opportunities. This is particularly the case for market-based regulations, where the market encourages a reduction of emissions and, as a result, can create savings on operational costs in the long term. Such programs can take the form of incentives for investment in clean technologies that lead to cost savings in the future and encourage overall efficiency across business operations through tax incentives and deductions as currently employed in the EU (KPMG, 2015). Furthermore, carbon markets present opportunities to generate income for companies that do not produce many emissions and for the financial institutions that oversee and participate in carbon markets. Compliance with climate-related regulations can result in positive outcomes such as pricing of assets at above market value and positive consequences for the workforce's health, wellbeing, and satisfaction; this, in turn, can increase productivity (TCFD, 2017). Climate-related regulations can drive new sources of revenue for the renewable energy sector as well as new products for insurance companies, banks, and law firms (SASB, 2016).

On the global scale, the latest international agreement contributing to climate-related regulatory risk is the Paris Agreement. The Agreement was signed in April 2016 by 195 countries, 148 of which (including Canada) later ratified it in November 2016. The goal of the Agreement is threefold. First, it aims to limit the global average temperature increase to 1.5°C above pre-

industrial levels. Second, it will focus on adaptation and resilient development. Third, it will align the necessary financing needed for low-carbon and resilient initiatives. All parties, developed and developing, will detail their best efforts to reduce their GHG emissions in a Nationally Determined Contribution, or NDC (UNFCCC, 2017). In order to achieve these targets, the nations will have to develop climate-related regulatory frameworks domestically, and this is likely to have financial consequences for many industries.

During the conservative rule of the federal government in Canada from 2006 to 2015, environmental regulations did not hold top priority on the government's agenda, and this is attributable mostly to a dependency of the economy on natural resources industry (Wingrove, 2014). During this period, there was no national strategy to reduce GHG emissions or any strong regulations around the oil and gas sector, which was rapidly increasing and becoming one of the major sources of emissions (Office of the Auditor General of Canada, 2014; Wingrove, 2014). Canada officially withdrew from the Kyoto Protocol in 2011 and was scored last in environmental performance by the Center for Global Development when considered against 27 wealthy nations in 2013; Canada was also the only country whose performance deteriorated since study's inception in 2003 (Waldie, 2013).

At the same time, some Canadian provinces made significant progress in environmental policies and performance, paving the way for a reduction of emissions by setting their own targets and mitigation strategies. For instance, as part of its Green Energy Act of 2009, Ontario successfully phased out the use of coal in electricity production and supplemented it with financial incentives to increase the use of renewables as a source for electricity generation (Osler, 2017; Potvin & Jodoin, 2015). British Columbia introduced a carbon price in 2008 – now at \$30/per tonne CO₂ – and it proved to be effective in the reduction of the province's emissions (Potvin & Jodoin, 2015). Quebec adopted a cap-and-trade system in 2014 and it is linked to California's carbon market (Potvin & Jodoin, 2015). Alberta announced carbon price implementation across all sectors of \$20/tonne in 2017, and the price will increase to \$30/tonne in 2018; the province has also taken other measures that aim to phase out coal fired electricity and methane emissions (Osler, 2017).

The last Canadian federal election held on October 2015 brought significant changes to the Canadian political landscape. The Liberal Party, led by Justin Trudeau, formed a majority government. This was a turning point for environmental regulations in Canada with a significant number of actions taken in 2016. In December 2015, the Minister of Environment and Climate Change Canada attended the UNFCCC's Conference of Parties (COP) 21 meeting in Paris, France. Canada was one of the 195 countries that adopted the final wording of the Paris Agreement. This was the first signal that the Liberals were serious about their environmental agenda. Following the first ministers meeting in Vancouver in March 2016, commitment was also made via the Vancouver Declaration on Clean Growth and Climate Change, which outlined actions necessary by federal, provincial, and territorial governments. By the end of the year, the federal government ratified the Paris Agreement and launched the Pan-Canadian Framework on Clean Growth and Climate change (Government of Canada, 2017).

The Pan-Canadian Framework outlines a plan for Canada that will reduce its emissions and adapt to the changing climate while growing Canada's economy (Environment and Climate Change Canada, 2016). It balances the needs of environment, economy, and society. However, it is interesting to see that the environment is the leading premise of this strategy. The economy is adjusting to the needs of the environment, not the other way around, and this is different from the strategy of the previous federal government. The central component of the framework is the market-based approach to emissions reduction in the form of a carbon price that aims to incentivize industry and wider society to limit GHG emissions. The federal government declared its intention for Canada to have a nationwide carbon price by 2018, but there will be flexibility for provinces and territories to choose their own mechanisms, and the federal government will provide support by indicating what the minimum price should be to ensure GHG emissions targets can be achieved. The provinces of Alberta, British Columbia, Quebec, and Ontario are already pricing carbon, and Nova Scotia has committed to implement a cap-and-trade system. Secondly, the framework outlines a comprehensive set of complementary actions that are unique to various sectors and regions including electricity, built environment, transportation, industry, forestry, agriculture and waste, government, and internal leadership. The last two pillars are focused on actions around adaptation and climate resiliency, and fostering innovation and clean technology while growing the economy (Environment and Climate Change Canada, 2016).

All of these regulatory actions signal the intention of the Canadian government to transform its economy significantly. It is clear that the framework has innovation and transformation at its core, and the underlying premise is that climate change is inevitable and can act as a catalyst to transform Canada for the better by reducing its vulnerability and tapping into new sources of growth for the Canadian economy. However, if the framework is not implemented fast enough, or if key actions are not taken because they might be too controversial, it will not be effective in reducing emissions in industries that are crucial to Canada's success in achieving the targets to be in line with a 2°C world. The regulatory developments will have to be monitored by the financial industry and be taken into account when assessing businesses for the purposes of financing and investing; the additional risks and associated costs and benefits are likely to impact the bottom lines of many organizations.

Other Regulations and Disclosure Frameworks

In addition to regulations pertaining to tackling climate change as a nation, other developments that address how corporations should address this important issue are also underway. For instance, there have been rapid developments in sustainability and environmental, social, and governance (ESG) reporting and disclosure in many industries. Such frameworks already exist for mandatory disclosure by companies that are listed on stock exchanges or with turnover above specific threshold in several places such as France, the EU, Australia, the United Kingdom and the U.S. (TCFD, 2016).

Voluntary disclosure and guidance have also played an important part in bringing the issue of climate change to the forefront. There are prominent NGOs and initiatives that have a good reputation in this space and they have been instrumental in developing best practices in the field of climate-related economic impacts and disclosure discourse. For instance, the CDP engages the business community in a voluntary annual questionnaire that explores participants' outlook on climate change as a business issue, their carbon emissions, and how the companies address climate change-related impacts. Most Canadian financial institutions are participants of CDP's annual questionnaire (CDP, 2017). SASB develops sustainability accounting standards and disclosure guidance on material sustainability matters for most sectors. It has issued publications

and guidance specific to climate change issues as well (SASB, 2016). The Global Reporting Initiative (GRI) is another organization that provides a framework for reporting on sustainability topics, including climate change. GRI is widely used as a guideline for sustainability reporting, a practice that is voluntary but which is adopted by many publicly listed organizations (GRI, 2017).

Furthermore, several stock exchanges have issued guidance on ESG reporting. As of the end of 2016, out of 82 exchanges examined by the United Nations' Sustainable Stock Exchange (SSE) initiative, 12 already had reporting rules that incorporate ESG issues, and 15 had provided formal guidance for such reporting; also, the London Stock Exchange published its ESG reporting guidance in February 2017 (SSE, 2016).

The Financial Stability Board's (FSB) TCFD is a recent and prominent example of groups that have been instrumental in raising awareness and aligning best practices for climate-related issues. The FSB is an international body that oversees the global financial system. Mark Carney, currently the Governor of the Bank of England and formerly Governor of the Bank of Canada, is the chair of the FSB. Prior to the formation of the TCFD in late September 2015, Mr. Carney gave the infamous speech titled, "Breaking the tragedy of the horizon" at Lloyd's of London. In it, he warned of the financial risks associated with climate change (Carney, 2015). The TCFD was formed later that year and it is chaired by Michael Bloomberg, founder of Bloomberg LP and three-term mayor of New York City. The TCFD has a global membership with 32 participants representing a wide variety of industries (TCFD, 2016). The TCFD published recommendations in March 2017 that focus on the structure of and information for disclosure by financial and non-financial institutions related to governance, strategy, risk management, and metrics; it also includes targets for climate-related impacts (TCFD, 2016). The business community follows the activity of the TCFD closely and several multinational institutions have already committed to adopting the TCFD's recommendations (Aviva, 2016).

Canada has also seen interesting development in this space over the course of 2016 and 2017. The Canadian business community, including some financial institutions, joined the Carbon Pricing Leadership Coalition in July 2016; this demonstrated support for the development of

policies around carbon pricing while at the same time fostering economic growth (World Bank Group, 2016). In March 2017, Canadian Securities Administrators (CSA), responsible for the coordination and regulation of the Canadian capital markets, announced its intention to review disclosure for climate-related risks and financial impacts. Under securities legislation, Canadian companies are required to disclose material information, including environment related matters. At this time, CSA Staff Notice 51-333 Environmental Reporting Guidance serves as guidance for requirements on environment related disclosure (OSC, 2017). The climate-related or environmental risk is only disclosed if the firm deems it material.

The Bank of Canada has also issued a statement regarding climate change and its impact on the Canadian economy; it states that climate change is “one of the biggest challenges facing Canada and the world in the 21st century,” and it could cost the Canadian economy \$21 billion to \$43 billion over the next 40 years. The statement highlighted that Canada is particularly vulnerable to climate-related risks due to the role that the oil and gas sector plays in its economy, along with other exposed industries such as automobile and aircraft (Lane, 2017). Such developments indicate that the regulators of the Canadian financial sector are starting to pay attention to climate-related impacts and, therefore, it is fair to assume that such regulations will continue to develop in Canada.

Liability and Other Legal Risks

Climate-related legal risks can take multiple forms. For instance, they can pertain to any fines or penalties for non-compliance with climate-related regulations (Nikolaou et al., 2015). This will add additional legal expense and may divert the attention of management from key business issues. It can also take the shape of liability risk due to a lack of action taken such as failure to mitigate, adapt or disclose and comply (Batten et al., 2016). This is evident in the ExxonMobil case, where the oil and gas giant is under investigation for potential cover-up of climate change science facts and this is a risk to its business (Hasemyer & Cushman, 2015). Such legal action for fossil fuel companies can indirectly impact the insurance industry through an increase in insurance claims via liability insurance, if covered under the policy of course (Batten et al., 2016). In addition, banks can be impacted by an increase in the probability of loan defaults from clients facing legal action, as this can contribute to a strain on financial resources (Hierzig & Phillips, 2017). Furthermore, climate-related litigation risk can be also linked to breach of

fiduciary duty by companies' directors and officers. For instance, a recent study titled, "Fiduciary duty in the 21st century," produced by UNEP FI and PRI, concluded that the modern interpretation of fiduciary duty in investment practice should include ESG issues, and it is fair to expect that this definition will change in the near future (Sullivan et al., 2016). However, the outcome of some litigation cases may have more significant and longer-term consequences; these include damage to reputation that may negatively impact the demand for companies' products or impairment of assets as a result of court rulings (SASB, 2016).

Litigation and legal risks are closely linked to regulatory risk and these are often classified in the same category by the TCFD and SASB. For instance, SASB's definition of regulatory risk includes breach of fiduciary duty, disputes over climate change regulations, and litigation against those deemed liable for the physical effects of climate change (SASB, 2016). Furthermore, other consequences of the development of climate-related regulations and any legal actions associated with climate change include an increase in demand for legal services and for consultants specializing in this topic.

Canada has yet to see its first climate change legal case. However, there are a few prominent cases around climate change in developed countries that are worth noting, because they could be an indication of how similar developments could become important for Canada. The legal actions that are relevant for the purposes of this paper are those that pertain to industry lawsuits. Nonetheless, it is important to note the emergence of and success of other types of lawsuits, such as legal action against governments or other authorities, as this indicates how the subject of climate change is developing in legal systems (Wood, 2016).

One of the world's largest publicly traded coal companies, Peabody Energy Corporation, was under a two-year investigation by the New York State Attorney General's Office in relation to its disclosure of climate change's impact on its business in its Securities and Exchange Commission filings. The investigation resulted in a settlement in late 2015 whereby the coal giant agreed to revise its disclosure and indicate that climate change "could have material adverse effect" on its business (Wentz, 2015). Peabody Energy filed for bankruptcy in spring 2016 due to decreasing

coal prices, but was able to emerge from bankruptcy in spring 2017 after it agreed to manage its environmental liabilities (Rucinski, 2017).

In another prominent case, ExxonMobil, the largest publicly traded oil and gas company, is the subject of several investigations in relation to climate change. It has been uncovered that the company did its own scientific research in the 1970s and 1980s and was aware of the link between the burning of fossil fuels and climate change, but failed to disclose this to its stakeholders; instead, it was an active promoter of the ‘science’ behind climate change denial for decades (Hasemyer & Cushman Jr., 2015). Additionally, the attorneys general of New York and California, as well as other states, have opened investigations into whether the oil and gas giant intentionally did not disclose the science of climate change and failed to disclose how climate change impacts its business, amongst other matters. In late 2016, Exxon’s shareholders filed a class-action lawsuit for failure to disclose climate-related risks to its business (Hasemyer, 2016).

As a result of the legal actions pertaining to the link between the fossil fuel industry and climate change described above, Chevron formally recognized the regulatory/legal risks it faces; the company raised concerns around legal actions it could face and economic consequences to its business model as a result of climate change targeted policy, calling it “economically infeasible” (Johnston, 2017, para. 3).

In addition, class-action lawsuits against governments are adding to the risks of legal action for climate-related matters. A historic case filed by the Urgenda Foundation against the Dutch government claimed that it failed to protect its citizens from the consequences of climate change and did not take enough action to reduce the country’s GHG emissions. The Hague District Court ruled in favour of the plaintiff. Following the ruling in 2015, Canadian lawyers and the press have warned the public and industry that similar lawsuits could be launched in Canada (Wood, 2016; Gray, 2015). Another lawsuit, this one against the U.S. government, was filed by a group of 21 children ages nine and up, and is the first of its kind to be filed at the federal level. Its premise is that the government continues support of the fossil fuel industry and its failure to reduce GHG emissions has violated the constitutional rights of the plaintiffs to a healthy environment and climate. Such cases demonstrate an increased concern among the younger

generation for environmental issues and it is possibly an indicator of an increase in the prominence of such matters to the general public in the future (Harvey, 2017).

The automotive industry has also suffered legal consequences with respect to climate-related regulations. Volkswagen (VW) made headlines when the U.S. Environmental Protection Agency (EPA) uncovered that devices in VW vehicles were used to circumvent the emissions standards set by the Clean Air Act. The case has since been settled, and VW was found responsible for over \$20 billion in fines and penalties; there were also criminal charges for seven of its executives, a significant drop in its stock price, and a decline in sales (Vlasic, 2017). In addition, the EPA alleged that Fiat Chrysler Automobiles NV (FCA) violated the Clean Air Act by installing similar software to that of VW's device in some of its vehicles. Two Canadian law firms launched a class-action lawsuit and it resulted in a sharp decline in FCA's share price at the time of announcement and it has the potential to impact its credit rating, as indicated by DBRS, a Canadian credit agency (Owram, 2017). In May 2017, the U.S. government announced that it filed its second such lawsuit, this time against FCA, about devices that falsify emissions tests (Associated Press, 2017).

Interestingly, there is some evidence to suggest that environmental disputes faced by natural resources organizations can directly impact the financial institutions that provide capital to such companies. For instance, some banks were held liable under the U.S. Comprehensive Environmental Response, Compensation, and Liability Act of 1980 for financing and thus, participating in the management of a contaminated site (Weber, 2012). Therefore, financial institutions must take note of climate-related legal developments.

Reputation Risks

Neither the SASB nor the TCFD classifies reputation risk separately; rather, it is included as part of transition risk (SASB, 2016; TCFD, 2017). For the purposes of this research, reputation risk will be discussed separately. However, it is acknowledged that reputational considerations have a close relationship with transition risk.

Climate-relevant reputational factors can have a direct and indirect impact on the financial services sector. As climate change issues become more important for the average consumer,

businesses involved in environmentally damaging practices will suffer negative impacts to their reputation. The existence of corporate strategy in response to climate change is crucial for some industries to communicate their stance on climate change to stakeholders (Nikolau et al., 2015). Essentially, action or inaction on climate-related issues can alter the perception of brand value to customers, staff, suppliers, and investors, and could be particularly important to brand-sensitive industries such as the automotive or airline industries (Cambridge Institute for Sustainability Leadership, 2015). Therefore, the financial sector will suffer indirectly as a result of financial strains on its clients and the firms in which they invest as a result of reputational considerations. The economic consequences of reputational risks are typically difficult to quantify, but generally, brand value, revenue, and expenditure can all suffer negative consequences (TCFD, 2016). The importance of reputation in climate-related matters is also evident in the cases of the above-discussed VW and FCA lawsuits for emissions deception devices. The drop in the value of their stock price following the announcement of investigations and lawsuits are good examples of the reputational damage to the brand and the consequences that it can have on investors as well as lenders (Cremer, 2015; Vlastic, 2017; Owram, 2017).

The financial services sector can also be impacted by climate-related reputation risks directly. Banks, insurance companies, and pension funds can be targeted through ‘naming and shaming’ by NGOs and the markets if they finance and invest in ‘dirty’ companies (Coulson, 2009). At the same time, embedding climate change risk management as part of the core business strategy can positively impact a firm’s reputation and raise its corporate profile, and this can, in turn, increase revenue or solidify customer loyalty. As the prominence of the transition to a low-carbon economy increases, it is expected that the financial institutions that support the transition can gain additional benefits for their reputation (TCFD, 2016).

The Canadian financial industry has been criticized for financing carbon-intensive industries, particularly the oil sands (Rubin, 2016). In its 2008 report titled “Financing Global Warming,” the Rainforest Action Network focused specifically on Canadian banks and their activities around the fossil fuel industry, and urged all stakeholders to rethink where their money flows. It demonstrated the significance of carbon emissions from the fossil fuel industry in the banks’ financing portfolios and related this back to individual bank customers (Barclay, 2008).

BankTrack is another NGO that monitors the financial sector to ensure that environmental and social considerations are taken into account in all financing activities. Canadian banks were identified amongst those funding the coal industry in its report, “Banking on Coal 2014” (Rohan & Razafimahefa, 2015).

The P&C insurers experienced the importance of addressing climate-related risks and their impact on reputation and brand firsthand during the Alberta floods in 2013. In recent years, flooding became “the leading cause of losses among all natural hazards” (Honegger & Oehy, 2016). As the severity and intensity of extreme weather events increases, insurers have to incorporate such projections in their catastrophe models to ensure their business models yield adequate profits; otherwise they need to adjust the insurance coverage that they provide. Essentially, if the increased number of projected claims as a result of climate change affects the profitability of the business, the underwriting will have to be more selective, or the prices of the policy will have to increase to ensure the claims can be paid and the business is still profitable. In the case of the Alberta floods, some insurers denied claims for flooding or did not provide adequate compensation for the damages suffered by the policyholders, and this suggests that the event was not anticipated in the catastrophe models of the insurers (Nelson, 2013). In Alberta’s case, the dispute had to do with the specifics of the type of flooding that was not covered by the policies. This resulted in customer backlash, and ‘naming and shaming’ the P&C insurers involved. The P&C insurance market is fragmented in Canada, and its reputation is critical and relevant to the success of these businesses (ibid.). Many insurers decided to reverse their decision, paying the claims and incurring a loss that year (ibid.). Some of Canada’s P&C insurers at that time were part of bigger banks such as TD and RBC. The damage stemming from their P&C businesses could have easily transferred to their retail and mortgage businesses and potentially created financial consequences.

Systemic or Transition Risks

The response to climate-related factors can affect the whole economic system as a result of a combination of climate regulations, technological advancements, changes in investor sentiments, scientific developments, and reputational considerations (Bank of England & Prudential Regulation Authority, 2015; TCFD 2016). The increase in climate-related regulatory developments is motivated by scientific and economic research which concludes that the costs of

the consequences of climate change far exceed the costs of adaptation and mitigation to climate change today (Stern, 2006; Garver, 2015). Regulatory developments contribute to the transition to a low-carbon economy directly. In addition to that, increased concern and public awareness of climate change issues can accelerate developments in clean technology and influence the markets; this can indirectly contribute to a low-carbon economy.

In addition to regulatory and market forces that are pushing the economy to decarbonize, other systemic issues add to the importance of climate-related transition considerations. As there is evidence to suggest that climate-related risks are not yet properly incorporated in financial or corporate decision-making, the consequence of climate-related developments individually or collectively can cause abrupt re-pricing of financial assets (Bank of England & Prudential Regulation Authority, 2015). Furthermore, given the global nature of the current economy, the physical change in the environment and more frequent and intense extreme weather events can lead to food price shocks, mass migrations, and resource conflicts (Hierzig & Phillips, 2017).

On the one hand, the need to transition is a source of great opportunity for new or existing businesses that are innovative, climate savvy, and open to change. Businesses can utilise climate policy, technology, and other market incentives to become more efficient and productive, which in turn can save operational costs in the long term. New climate-resilient infrastructure projects can stimulate the economy by attracting investment and creating jobs. Also, with new infrastructure and technology that is climate resilient, there is less likelihood of disruption in the future and therefore, less spending as a result of extreme weather events. A shift towards renewable energy sources may stabilize the prices of energy due to the abundance of solar and wind power, which would avoid the fluctuations experienced with oil in recent years (Rubin, 2016). All of these can have a positive, indirect impact on the financial services sector.

On the other hand, organizations that fail to adapt to and mitigate climate change risks and which do not take advantage of the incentives offered might suffer adverse financial consequences. This can be observed in the automotive industry, where the development of electric vehicles is on the rise. Tesla is continuing to innovate and lower the price of an electric vehicle with an aim to make it affordable for the mass market (Gibbs, 2017). In addition, regulatory incentives for the

adoption of electric vehicles in China, Japan, and the EU, as well as for the development of infrastructure for electric vehicle charging stations, are paving the way for disruption in this industry (Environment and Climate Change Canada, 2016b; Waygood & Maier, 2016). Once the price of an electric vehicle is close to the average price for a petrol or diesel one, and sufficient infrastructure is in place, the automotive companies that are not adapting to changing customer preferences and utilising new technologies might lose their share of the market. Once again, given the interconnectedness of the economy, the industries supporting the automotive industry will feel the consequences as well. For instance, it is expected that cobalt, a metal that is a key component in electric vehicle batteries, will experience a rapid increase in demand (Waygood, & Maier, 2016). Effectively, the financial services sector will have to pay close attention to these developments to ensure it is considering all of the available information when assessing companies for potential financing or investment opportunities.

Financial industries can also play a proactive role in transitioning to a low-carbon economy by promoting the integration of climate change consideration in the financial system. In the last few years, China and the EU have pioneered the concept of ‘green finance,’ which aims to foster sustainable development while strengthening financial stability and economic growth. Green finance is about channelling capital to initiatives that provide environmental benefits such as reduction in the pollution of air, water, and land, climate change mitigation and adaptation, and others (G20 Green Finance Study Group, 2016). Such new ideas and implementation of the concepts require collaboration amongst governments, NGOs, and the financial industry along with extensive research and innovation. There have been exciting developments from G20 members, including the formation of the G20 Green Finance Study Group, China’s Green Finance Committee, and the EU High-Level Expert Group on Sustainable Finance (Bak, 2017). Such initiatives aim to incentivize and attract significant investments with opportunities for participation across the whole of the financial industry and a major overhaul of the financial system.

Canada’s current emissions target, which is also the NDC for the purposes of the Paris Agreement, is the reduction of 30 percent from 2005 emissions levels by 2030 (Environment and Climate Change Canada, 2017). The pathway to achieve this target is outlined in the Pan-

Canadian Framework on Clean Growth and Climate Change, and it likely affects nearly every sector of the Canadian economy. Canada would not be able to achieve this target with current regulations and actions taken by some of the provinces thus far (Environment and Climate Change Canada, 2016a). Furthermore, Canada's Mid-Century Strategy, a report released during the COP 22 meeting, explores the pathways to achieve 80 percent emissions reduction from 2005 levels by 2050. While this is not yet a target, it shows the level of ambition and thinking by the current federal government. At the heart of this hypothetical scenario is energy efficiency and electrification of end-use applications such as vehicles, building appliances, and heating systems; this is another indication that transformation can be rapid if there is the right stimulus from the government (Environment and Climate Change Canada, 2016b).

As discussed previously, a transition is abundant with opportunities. This is evident in the Canadian cleantech sector, the newest industry in Canada that focuses on solving environmental issues around air, water, and earth. While the cleantech sector significantly contributes to the Canadian economy "in terms of revenues, employment and exports," its growth has stalled in recent years as the necessary access to finance for companies to scale up is limited in Canada (Analytica Advisors, 2016, p. 4). Cleantech companies are increasingly shifting their business models from one-time sale to recurring revenues and are typically capital intensive because large investment in research and development is required, especially at the early stages. This makes the risk profile quite unfavourable for a typical cleantech company from a conventional business perspective and therefore, it is less attractive for financing from standard financial institutions. While strong regulations on carbon, innovation, and green infrastructure are needed, new financial solutions are of high importance, as well (Analytica Advisors, 2016). This is an excellent example of how solutions to climate change can present opportunities for the financial sector that would require financial institutions to adjust their risk assessment models to incorporate new business models. As explained previously, one such solution is the development of green or sustainable finance that is gaining momentum in China and the EU. Green finance would require a collaboration of government, the financial sector, NGOs, and others, and can fundamentally change how the financial sector allocates its capital (Bak, 2017).

At the same time, the already existing companies that have more exposure to climate change impacts would have to adjust to the requirements of regulations and markets, and adopt new technologies. This would also require that financial institutions account for climate change impact in their risk assessment models for lending and investment to ensure companies can sustain their business in the climate-adjusted economy. Some of the leaders in the Canadian economy are already thinking about and communicating to investors about climate change. For instance, Suncor recently released a stand-alone report addressing climate change (Suncor, 2017). The report discussed global developments currently occurring in response to the changing climate, and related it back to its business. It provided scenario analysis under various energy-transition pathways that are possible as a result of regulations and technological developments, and concluded that the demand for oil and gas would continue for at least 50 years; therefore, Suncor needs to focus on improving the efficiency of its operations to ensure GHG emissions intensity continues to decline. Such disclosure provides stakeholders with important information to start the dialogue for long-term planning for Suncor in the climate-adjusted future (Suncor Energy Inc., 2017). One of the main issues for the fossil fuel sector in the transition to a low-carbon economy is the question of stranded assets. If Suncor's projections are not correct and the transition away from fossil fuel as a primary source of energy will happen faster than anticipated, Suncor could be significantly exposed. For instance, the Canadian Centre for Policy Alternatives placed Suncor's potential carbon liabilities at a minimum of \$87 billion in 2013 (Lee & Ellis, 2013). Furthermore, other studies suggest that the climate policies which aim to keep average global temperatures below 2°C would deem at least 35 percent of current oil and 50 percent of gas reserves unusable (Gros, Schoenmaker, Langfield, & Matikainen, 2016).

At the same time, the fossil fuel industry is not the only industry in Canada that will be heavily affected by climate change. According to the TCFD (2016), the financial sector, transportation, materials and buildings, agriculture, food, and forest products are amongst those that can be materially affected by climate change. In Canada, the industries impacted by weather and weather extremes have been identified to be power generation, forestry and mining, agriculture, health care, transportation, property insurance, tourism, residential construction, manufacturing, and trade sectors (Warren & Lemmen, 2014). It is important for the financial sector to incorporate climate change considerations across all industries, because the magnitude of the

impact can quickly multiply across many industries that are directly and indirectly affected by climate change.

As described in the previous sections, climate change poses a serious threat to many Canadian industries, and the consequences are already being felt in P&C insurance, amongst other sectors. The risk can manifest itself through physical, regulatory, reputation, litigation, and transition impacts that will have different time horizons and levels of impacts across Canadian regions. Regulatory frameworks are not only being developed in Canada, but also in other jurisdictions with which Canada has strong trade ties, such as the U.S., the EU, and China. There are strong signals that a transition to a low-carbon economy is already underway; these include the level of engagement on climate-related matters and change in the energy sector, developments in the automotive industry, and increasing policy developments that will continue driving the transition further (Matthews & Potvin, 2017). The developments are already creating opportunities for innovation within the financial sector such as green finance initiatives in the EU and China, and the cleantech sector in Canada (European Commission, 2017; Bak, 2016). Such opportunities and risks will continue to grow, and those who do not recognize the potential or the threat are likely to lose in the long term. How does the financial sector in Canada perceive climate-related financial risks? Is the industry prepared to incorporate climate-related considerations in its decision-making, not just to de-risk, but also to expand its business by taking advantage of the transition to a low-carbon economy? This study contributes to the academic literature through exploration and evaluation of how the Canadian financial services sector perceives climate change risks and opportunities through the pragmatic worldview. This thesis explores the overall perception of climate change specifically as opposed to a broader umbrella of environmental risks, and whether the industry looks at this particular issue consistently and holistically. Therefore, it aims to determine how organizations address climate change and whether such considerations penetrate across all organizational functions.

Based on the theory and examined literatures, the following hypothesis is developed:

The level of preparedness of Canadian financial institutions to respond to climate change-related impact is low, because institutional pressures from the government and other stakeholders have only existed for a relatively short time.

6. Research Method

The study included participants from five banks and four insurance companies and 17 interviews were carried out in total. The professional roles of those interviewed ranged across various functions, including environmental and social risk management, CSR, corporate affairs and sustainability, credit research, real estate and mortgages, asset management, regulatory and public affairs, enterprise risk management, asset liability management, and corporate finance.

The interviews were conducted face-to-face and via phone with seven representatives from the Canadian banking sector and ten from the insurance industry. The interviews lasted approximately 60 minutes on average. The questions focused on participants' perception, assessment, and mitigation of climate change-related risks for their businesses. The interview questions were structured around specific climate-related financial risks to ensure all aspects of climate change impacts would be covered. The risks were broken down into five distinct themes that were identified to have a potential financial impact on participating organizations – physical, reputation, regulatory, litigation and systemic risks. See Appendix 1 for the interview guideline, including interview questions.

All but one interview was recorded and transcribed using the NVivo software. The content analysis was conducted using NVivo software and was complemented by manual review and analysis in Microsoft Excel. The manual interview analysis was performed first on a preliminary basis using Microsoft Excel by summarising the content and gathering the highlights of the study. The analysis included interviewees' response summarized by interview questions sections and types of climate risks. The preliminary report contained high-level observations, and highlighted similarities and differences in the responses. The preliminary findings were reported back to the participating institutions to confirm the findings. The results were communicated in a brief report and presented at the UNEP FI meeting of Canadian members in December 2016; this meeting was attended by most study participants.

Following the preliminary stage, a more thorough analysis was conducted with the help of NVivo software, primarily using the 'word frequency' and 'word and phrase search' functions to

gather the themes and similarities and differences between interviewees' responses. The research focused on examining the content for evidence of climate-related substantive actions relative to business processes and governance in response to climate-related coercive, normative, and mimetic pressures existing in the industry. Such actions included climate change integration in risk management, disclosure, due diligence, credit risk assessment, advisory services, equity research, engagement, and leadership. In addition, the content was examined for the extent of discussion on all five climate change-related impacts - physical, regulatory, litigation, reputation, and transition. The frequency of words was analysed by industry groups, banks versus insurance, and generated the word cloud presented as a backup for the analysis included in the following section. The words searched included those for risks and opportunities specified in the study, low-carbon economy, climate scenario analysis, climate-related risk assessment, and climate stress test. This function aided in understanding the similarities and differences in the participants' responses by showing the source and frequency of the word (or combination of words) used by a participant.

Furthermore, to further analyse the industry's response to climate-related impacts, climate change risks and opportunities sections (sections 5 and 6) of the participating institutions' responses to CDP Climate Change information request were reviewed and summarized. (See summaries presented in Table 2 and Appendix II.) The reports analysed were the latest available reports, which were from 2015 and 2016. The content was also analysed using NVivo software, using the same method, functions, and word searches as for interview analysis. Moreover, organizations' ranking of various risks and opportunities was summarised and contrasted by institution type, and included in high-level observations for the financial sector as a whole.

7. Research Findings

Interviews

The interviews were conducted with personnel across various functions and therefore, the structure of the discussions varied. It is important to note that the topic of climate change and its relationship to the financial sector is relatively new for this industry, and this further contributed to the variety of specific topics perceived to be important and discussed by participants. As a result, the following paragraphs are explanatory in nature and capture not only the major themes discussed by participants, but also attempted to capture the whole spectrum of participants' perception and sentiments on climate change across a variety of financial institutions and functions and are supported by relevant quotes from interviews where appropriate.

Perception

All participants demonstrated a good understanding of climate change and how it is relevant to their organizations and the Canadian finance sector as a whole. Those from the banking industry focused the discussion on their own operations, insurance divisions where applicable, and lending business. Those from the insurance industry primarily discussed climate change impacts on their asset management activities and the viability of the underwriting business for P&C and L&H. Most participants highlighted that climate change does not pose risks only, but also presents opportunities for their respective businesses. Specific opportunities discussed were in the area of lending and investment in some aspects of a low-carbon economy, primarily in the form of renewable energy, energy efficiency, and carbon markets. Nonetheless, the scale of such projects compared to other revenue sources was not discussed. At the same time, some participants stressed that climate change was not material for their business as a stand-alone risk and if some aspects of the risks were relevant then it would be already incorporated in business processes. Another group of participants discussed lack of leadership on this topic within their organizations.

“Financial sector is affected in three main areas – our building and physical assets, our lending and investing business activities, and our insurance business. There are also business opportunities – this is a whole new area of business . . . which did not exist 10-20 years ago.”

“We have had more and more investment opportunities in areas of renewable energy and energy efficiency that I think are reflecting a concern in climate change, in carbon, and global warming from the public generally and then that flows into investment opportunities for us. We follow where opportunities are and opportunities follow where popular demand is driving.”

“The view internally among some, we can’t take too strong a position here and alienate our clients. That just says to me that there is at least a segment of our leadership that is really not current on the issue. . . . I just think that awareness isn’t there and I see that the financial risk is a bit hard to define, but if internally we don’t have strong enough understanding of how the future is going to be different and what that means for us, that’s a risk.”

“We feel like a lot of the topics for ESG, we were already thinking about it as part of the rigorous credit underwriting. You end up already covering ESG factors, so we don’t feel like we have to score ESG separately because those factors end up being considered as part of the comprehensive evaluation.”

The top climate change-related impacts were identified to be physical, regulatory, and reputational. See Table 2 summarizing interviewees’ ranking of climate-related risks where 1 indicates the most important risk, 5 the least, and n/a where ranking was not provided. However, the insurance industry perceived systemic risk to be slightly more important than reputation risk.

They define systemic risk as the financial impact associated with a shift to a low-carbon economy, which may change the valuation of certain assets with potentially negative financial consequences to investment and lending portfolios. Litigation risk was perceived to be least important and received limited attention and discussion.

Table 2: Interviewee ranking of climate change-related impacts in order of importance

Participants	P&C Business	Physical	Regulatory	Reputation	Litigation	Systemic / Transition
P1	Y	1	1	2	5	4
P2	Y	2	3	1	5	4
P3	N	2	3	1	1	4
P4	N	3	2	1	5	5
P5	N	1	3	4	5	2
P6	N	1	2	3	5	4
P7	N	1	3	2	5	4
P8	N	1	4	2	5	3
P9	N	1	3	2	5	4
P10	N	2	4	3	5	1
P11	N	3	1	4	5	2
P12	N	2	1	5	5	5
P13	N	3	2	5	5	1
P14	Y	1	2	2	5	2
P15	Y	n/a	n/a	n/a	n/a	n/a
P16	Y	n/a	n/a	n/a	n/a	n/a
P17	N	n/a	n/a	n/a	n/a	n/a
Total Ranking		1	2	3	5	4

Physical aspects of climate change were perceived as most significant due to direct and indirect effects on organizational assets and products as a result of increased frequency and severity of extreme weather related events. Financial sector operations, such as offices and branches, are impacted by such weather events with increased risk for business continuity disruption. P&C insurance divisions have suffered directly through an overall decrease in business profitability, which prompted a review of the long-term viability of their business models. However, some participants from the banking sector did not perceive the risks as being significant to financing divisions, and referred to the fact that a majority of this business is related to mortgages, which typically have insurance that would cover the financial losses associated with physical risks. Most participants also discussed probable physical impacts on credit ratings as a result of the direct consequences of climate change, both favourable and unfavourable, on organisations they finance and invest in; however, there was no certainty about the magnitude of such impacts. For instance, agriculture may benefit from increased yields as a result of warmer temperatures and at the same time, the increased probability of droughts and floods can have negative effects on operations. In addition, opportunities discussed were new insurance products, such as flood insurance, and one of the more significant opportunities identified was the financing of new measures to adapt to the physical affects of climate change, such as major infrastructure projects.

“The whole insurance industry in Canada is seeing significant claims, mostly water-related claims. It affected our profitability.”

“On the physical side it is mostly our own footprint, if you think for the corporate area, and then personal and commercial banking, that’s where mortgage business lies. But I don’t think the assessment has been done. I think it would only be if people default on a mortgage, but it really goes first to the insurance level, which we don’t have . . . so it will be very much secondary because insurance will be first and we don’t have that business.”

Reputational sensitivity to climate change was perceived to be applicable to the finance industry in the context of any actions taken on this particular issue by each individual organisation. Those that play an active role by engaging, investing in research and development, and communicating their activity in this space can benefit, and vice versa for those who do not. Some participants from the insurance sector emphasized a significant increase in the number of inquiries from their stakeholders regarding their investment practices, and this concerned them in relation to the impact on their organization’s reputation.

“The frequency at which we are getting special contacts asking us why we are invested in one company versus another has changed a lot in the last five years that I have been in this role. Once a year to now once a month.”

“It is generally acknowledged that we have to be seen to be doing our part as a good corporate citizen to reduce our [carbon] footprint on the planet.”

All participants were well informed about the **regulatory** aspect of climate change and its increased prominence. Most participants mentioned the uncertainty around the direction of climate change-related regulations in Canada, but their conclusions varied from an increase in the risk factor due to this uncertainty to an indication that such regulations will not pose any material threat to the industry. Some participants from the banking industry discussed how only a small fraction of their lending portfolio includes clients from high-emitting industries, which minimized regulatory exposure for their institution. Three participants from the insurance sector

cited example of California Insurance Commissioner call for coal divestment and the impact that it had on the organization in the short term, but emphasized that this was not a concern going forward. While the impact on the industry was perceived to be mostly indirect, the participating institutions discussed the importance of engagement with policymakers on climate change-related topics such as carbon price. Furthermore, it was noted that organizations with investments outside of Canada are exposed to additional risks associated with regulations in the respective jurisdictions and industries. One participant within a P&C insurance division highlighted additional exposure to regulations specific to its business, including building codes or governments' management of disaster recovery programs. It was also discussed that the anticipated changes in the regulatory environment also present opportunities such as carbon trading. However, one participant highlighted how new voluntary disclosure requirements such as TCFD's recommendations, which may become best practice, can increase the need for additional resources and expertise that the Canadian financial sector may not yet have. This, in turn, might pose a short-term risk for the industry. Another interviewee noted that climate-related discussion at the federal level in Canada may be politically motivated and lack significant substance, and this may pose a political risk to financial institutions.

“[California insurance commissioner’s call for coal divestment is] an extreme case of a regulator using climate change to gain publicity and attention. It is really exceptional and it will not happen in the long term. It is an isolated case.”

“The magnitude of [regulatory risk] and its financial implications are unknown, because we don’t know how the policies are going to develop. But, given our exposure, it is fairly low.”

Systemic/transitional aspects of climate change, such as a rapid change in the valuation of companies and assets due to a transition to a low-carbon economy, received mixed reactions from participants across the finance industry, with some participants not familiar with a definition of systemic risk. There was a group of participants who did not believe that climate change posed systemic risk to the finance sector, and they supported their argument by indicating that a transition to a low-carbon economy is likely to be slow and that the government would support the industries impacted the most. Furthermore, there was a view that by taking advantage of the opportunities associated with climate change, such as investments or financing of

renewable energy initiatives, the organizations would effectively reduce exposure to systemic risk. On the other hand, there was a group of participants who believed that systemic risk could pose a serious threat to their organizations, which would be brought on by a rapid transition to a low-carbon economy that causes a shift in valuation of assets in industries that are most vulnerable to climate change-related risks. Some representatives from the banking sector stated that banks tend to have portfolios with a horizon that is shorter in term and more diversified than those of the L&H insurance sector; banks were therefore less exposed to climate-related systemic risk, as that risk is more long term in nature.

“... no governments are going to bring regulations that will ruin an industry in a short period of time. This is all going to be slowly phased in...”

“...and that’s what I am most concerned about, that there will be a significant shift in the valuation and pricing. We won’t take sufficient actions to de-risk our portfolio before that happens.” – On systemic/transition risk

To raise awareness of environmental risks, including climate change, certain institutions conducted environmental courses for their lending, risk and operation managers and will continue doing so on a regular basis. Some participants pointed out that the interest in and activity around climate-related topics in their organizations in the previous few months (January to June 2016) was more than they had ever seen before, and they pointed to public statements made by their executives relative to carbon pricing and climate change in general.

“We developed an environmental e-learning course and distributed it to our lending and risk management people, including the operational risk people. It was made mandatory and we have a great take up on it. . . . There is a climate change module . . . it is something that will be required to be taken by our lenders and risk management people every two years.”

“We are becoming more active [in climate change-related leadership] . . . in the last six months is more than we have done in a long time.”

Assessment

Overall, assessment practices for climate-related issues are still in the very early stages of development, and these were mostly discussed in the context of environmental risks, which by definition include climate change. But climate change was not always discussed on its own. Some participants mentioned that the tools available for environmental assessment are separate from the platforms used in the core business for financial risks, and this was perceived to be a barrier for the integration of environmental issues in normal business practices. In the banking sector, climate-related issues surrounding investing practices were not always discussed in detail due to the function or expertise of the participants, and because of the time and scope limitation of this study. In banking, the lending and investing divisions tend to function separately, which may also explain why it was not discussed. At the same time, some participants stated that although the expertise on environmental issues, including climate change, exists within institutions, the environmental issues were not always perceived to be important within the core business, which was another barrier for integration. For instance, the banks' clients did not always disclose the information needed for adequate climate change assessment, stating that it was not material; this was perceived to be a barrier for adequate integration and assessment. Interestingly, institutions that have operations in countries with more developed climate-related regulations were identified to have developed climate change-related expertise and therefore, Canadian institutions with such operations could benefit through the internal knowledge transfer.

“The disclosure right now is pretty poor as far as climate change goes, even with large clients. . . . Generally the statements say it is not material to the company.”

“[Carbon footprint] is part of our [due diligence assessment] guidance . . . one of the tools that they have at their disposal. And it is definitely one of the questions that we pose for them to engage with our clients, especially the ones in oil and gas sector, the higher GHG companies. If you ask me if it is effectively done, I would say it is not well done or understood at this point.”

“We have established processes for managing these types of risks. It is not like we are setting up separate structures to manage carbon risk. There are groups that look at regulatory risk across all sectors in Canada. We wouldn't have a special one on carbon risk, it would be just embedded into the regular risk management processes that we have in place.”

“I don’t think we looked at assessing different commercial entities. What we do know that everybody is looking at, all the healthy companies are becoming more efficient and greening their buildings. Because a) being efficient saves you money and b) you can use it for brand enhancement. But I don’t think we would independently try to track it across different companies. I don’t think it would translate in differentiating performance.”

Physical

Operations

Most participants stated that they track and monitor weather-related events and patterns and apply the findings to how it impacts their own operations and their exposure to business interruption risk. Such assessments have resulted in the improvement of business continuity plans.

Transactional

The organizations that have P&C insurance divisions have adopted more sophisticated technology to aid in forward-looking assessment, adjusted underwriting processes, pricing, and policies to reflect the increase in risks. All banks indicated that they have enhanced the due diligence process for their clients and suppliers with respect to environmental matters that include climate change-related considerations. The enhanced due diligence process in these institutions applies to transactions that have undergone an initial environmental screening that identified exposure to environmental issues. However, it is important to note that this discussion took place in the context of environmental concerns, not specific to climate change. In addition, most participants indicated that investment transactions employ ESG criteria, which by definition includes climate change, but they did not discuss the extent to which ESG is incorporated. Those organizations that directly manage assets, such as real estate or natural resources assets, referred to specific, rigorous environmental assessment and management practices that include climate change considerations.

“The sectors that we enhance [environmental] due diligence on are pipelines, oil and gas, power and utilities, forestry, and mining. If it is a deal in one of those industries, it will take longer.”

“In our real estate operations . . . when we are buying a building . . . we look at flood plans to understand physical risk.”

Portfolio

Some participants referred to the assessment of physical risks on the portfolio level and the difficulty associated with such assessment and measuring future climate-related physical risk in general. P&C insurers referred to assessment done as a result of an increase in claims due to various weather-related events, which undermined the viability of their sector; this resulted in the introduction of new products and technologies, in collaboration with governments, and other initiatives that aim to de-risk insured properties and communities. One L&H insurer referred to carrying out assessments on natural disaster risks. Some participants indicated that they take part in industry group initiatives that allow research and collaboration associated with climate-related physical risk assessment and called for further collaboration.

“We needed to purchase flood mapping [for the P&C business]. . . . We had to know frequency, hazard, severity . . . we purchased a program that goes down to postal code and shows specific risks for each household.”

“We have a comprehensive operating risks management strategy in terms of physical risks. All of our assets [have] a comprehensive insurance policy . . . [including] environmental insurance.”

Regulation

Some of the banks indicated that they employ an internal price of carbon or have conducted a stress test incorporating different carbon price scenarios in loan and investment portfolios. In addition, climate change-related regulatory criteria are used in credit risk assessment at the transactional level, if applicable, and are monitored on an annual basis. It was emphasized that it is difficult to conduct an assessment of regulatory risks without concrete regulatory frameworks proposed and, as such, the quality of these assessments would be evaluated when such information becomes available.

All participants made considerable efforts in assessing and reducing their own GHG emissions. They track and report on Scope 1 and 2 emissions on an annual basis and are making a

continuous effort towards reduction. Such efforts appear to be driven mostly by the business case, as there are clear benefits to organizations' operations. Three participants indicated that they assess the financed emissions as part of Scope 3, but do not yet report it publicly. Another participant indicated that the assessment of financed emissions is not a useful form of assessment; this is due to issues with carbon data integrity, and confusion regarding how such analysis should be used and the responsibility associated with it.

All participants actively collaborate with different levels of government, NGOs, and various industry groups in the development of climate change-related regulatory frameworks and disclosure. Some participants referred to joining the Carbon Pricing Leadership Coalition earlier this year. In addition, all participants were aware and enthusiastic about the opportunities that arise as a result of climate change regulations, such as investment in and financing of the low-carbon economy in the form of renewable energy projects, clean technology, and carbon trading.

"... We are looking at . . . carbon footprint data that is available in the industry. We are looking at things like carbon risk intensity of the different bonds, borrowers . . . what metric should we use, how should we use them, what limit should be set? What type of returns should we be looking at for different risks... We are looking at where the opportunities will come as a result of climate change."

"We don't do stress tests on new coming regulations. Our peers don't do it. It is something that we need to explore at a macro level."

Reputation

The assessment of the reputational aspects of climate change discussed included engagement with external stakeholders and staying up to date on current events and trends. It was highlighted that quantifying the reputational dimension of climate change is complex, but there were clear risks and opportunities that the participants referred to, and continuing to closely monitor this particular area was perceived as important. One participant referred to complexity of assessing climate-related reputational consideration for lending clients where such assessment has been reactive.

“The most important one is reputational . . . because it is so difficult to quantify. It would come about largely from our lending and investing activities, where we lend and invest in companies that would be deemed to be more responsible for climate. We definitely have exposure to those companies.”

“As long as the company is mainstream and well managed and it is not standing out as a bad actor in the scheme of things, then we don’t feel like there is more reputation risk with that company than there would be with a peer in their industry.”

Systemic

While some participants acknowledged the importance of the systemic impact of climate change, the assessment of systemic risks is still in its infancy. Some participants indicated that carbon footprint calculations might be useful in such assessment, but stressed that it is not enough and further information in quantitative or qualitative form may be necessary. Three organizations indicated that their assessment has started utilizing the carbon footprint method, but there is still more work that needs to be done to fully account for all aspects of climate change in portfolios. For instance, it was pointed out that the assessment should incorporate the current work that some organizations are doing to de-risk themselves, because organizational risk exposure could change in the future. One participant indicated that assessment was carried out for climate change as part of emerging risks, but it was not identified as one of the key emerging risks for that organization. Another participant performed a stress test relative to un-burnable carbon for their energy and utility loan and investment portfolios, assuming that top companies would default. The stress test determined that the losses would be immaterial. Another participant mentioned that such stress tests are only conducted on the price of oil, and not yet on carbon price.

“We may do a stress test to support the [risk] assessment. We considered climate risk . . . broadly it is not enough. If we had a bigger P&C insurance [division] then it would be. We have done a natural disaster stress test, but not climate change.”

“I think on climate change what comes together, the negatives would be stranded carbon on oil and gas. It is still important for transportation and fuel and a time for a price on petroleum globally, [it] feels like

that will emerge gradually; so we are probably okay over our investment horizon, so we haven't factored that in."

"We are certainly looking [at carbon footprint], but we do have concerns about data integrity. . . . It maybe is enough as a filter on certain level decisions, but we will need a lot more. Maybe more quantitative, but also qualitative when we look at specific investments and loans and borrowers..."

Mitigation

All participants indicated that the government's leadership on climate change is key to mitigation. The financial sector looks to the Canadian government to be a strong leader on this issue by providing direction and strong regulations, while also supporting research, providing incentives, and guiding the industry in the transition to a low-carbon economy.

"Somebody has to make the decisions, to take taxes, and put it into research. They have been playing a huge role. Like Ontario's decision to shut down all coal plants, it seemed at the time a bit aggressive, but it turned out to be the right decision. They have the biggest role to play."

On the other hand, any further financial-sector-specific regulations, particularly on climate change, were not supported by the industry. The voluntary codes of conduct were favoured instead. Some participants praised the EPs and the United Nations' PRI, stating that these were helpful in initiating the dialogue internally and provided some guidance and framework. At the same time, some participants stated that too many of the voluntary initiatives are not descriptive enough, and this carries the risk that they are becoming too general and creates a potential threat to their effectiveness.

"Financial sector regulations are inappropriate. Mandatory climate risk reporting, those aspects of it coming from OSC for all industries, then yes. Some people may think it is appropriate, but let's not confuse regulation with central planning."

"The problem with these voluntary codes. These organizations are great for knowledge sharing, sharing best practice, helping to push leading peers, to bring it to the next level, but at the end of the day, with

respect to voluntary codes, it is diluted. It is paradox; you are trying to increase the tents, and bring more people, and the only way to do it is to lower the standard. “

There was strong support for the standardization of climate change-related disclosure for all industries. However, some participants indicated disapproval of disclosure for financed emissions. Overall, there was a sense that once a strong governmental regulatory framework comes into play, the financial industry will make the necessary adjustments to comply and disclose. Furthermore, while most participants thought that initiatives driven by finance sectors in other countries were helpful in the mitigation of climate change for Canada, one participant stated that the difference in the culture and the regulatory environment in Canada’s recent history is limiting its progress in this space currently. Most participants indicated that further collaboration amongst organisations in the financial sector would help in addressing and mitigating climate change-related risks, particularly for insurance businesses.

“I think [standard] disclosure will be most helpful. I am not so sure that [financial sector] regulation will do it; there is a cultural shift that will have to happen from both the consumer and corporate perspective, which I think is starting to happen. The mandatory risk reporting and mandatory reduction of loans, the problem with that is if other markets aren’t doing the same, then you are not becoming competitive and then you have other issues.”

As for divestment as a mitigation strategy, there was a strong agreement amongst participating institutions against divestment. Majority of the participants stated that it was not the financial sector’s role to regulate, but rather to support clients in transition. There was a strong consensus around and enthusiasm for engaging with various industries and supporting them in the transition to a low-carbon economy.

“If these companies lost their access to capital, there would be negative consequences in terms of energy supplies and it would probably accelerate the deterioration of our own capital. . . . With more capital, they might be able to do it better, more efficiently and more cleanly, and reduce carbon footprint. I don’t think the absolute boycott of carbon-intensive businesses is in our economic interests.”

Finally, many organizations have started developing new financial products for mitigation and adaptation, such as those focused on emissions reduction, renewable energy, clean technologies, and incentivising energy efficiency in retail and corporate banking. However, one institution admitted that it did not yet take full advantage of this opportunity.

“We are behind the other [institutions] on [green/climate-related products]. . . . [My institution] likes to be more conservative; we are not aggressive in leading change, but we don’t want to be the last. . . . Not because we don’t care, we just haven’t had the right conversations with the right kinds of business line partners and since the election, there is more noise. People are ready to have these kinds of conversations now. It is interesting that we are so far behind.”

Initially, the interviews were structured around specific climate-related risks. However, some participants noted that it is important to also focus on the opportunities side of climate change. It is interesting to note that when the content from the interviews was analysed using the ‘word frequency function’ in NVivo software, the word ‘risk’ was used significantly more than ‘opportunity,’ 2.73 percent and 0.25 percent, respectively. (See Figure 5 for a word cloud representing frequencies of words used by participants during the interviews.) While it is not surprising that risks were a dominant lens through which climate was discussed, given that the financial sector’s core expertise is the evaluation of risks, it also begs the question of the degree to which Canadian institutions are knowledgeable about the climate-related opportunities that are rapidly becoming available. For instance, the concept of green finance was not brought up, but some of its features were discussed in isolation.

Figure 5: Word cloud generated from interviews

the risks that the financial sector is already considering. But it is also amplified by the fact that all of these can manifest at the same time and impact significant parts of the economy, not just the fossil-fuel sector. One of the responses mentioned that the transition period would allow its organization to adjust and take the necessary actions in response to the transition. Litigation risk was also not extensively discussed, and this is inconsistent with the extent to which this risk is discussed in the literature (ibid.). Furthermore, there was limited discussion of the reassessment of the pricing of loans, quantifying carbon exposure, scenario analysis, or stress testing that was emphasised as important by SHARE and Boston Common Asset Management (Rohan & Razafimahefa, 2015; Boston Common Asset Management, 2015). Consistent with the interviews, responses included discussion of environmental and ESG considerations, and were not always climate change specific; this indicates that financial institutions are still learning about climate change specific impacts for their businesses.

For the full summary of all climate change-related impacts, see Appendix II. This summarizes all risks and opportunities, along with impacts and responses that participating institutions included in their CDP climate change information request responses.

Regarding regulatory risk, institutions outlined impacts on their own operations related to increases in energy costs and potential investment in new assets for compliance with new regulations. Some of the risk management methods for this included reduction of energy consumption and investment in energy efficiency. Concerning lending and investment practices, the impact on high-emitting industries was recognized, as was possible uncertainty for the renewable energy and green sectors. The risk management responses included integration of climate change, environmental, and ESG considerations in lending and investment portfolios, increasing support for low-carbon industries, sponsoring industry climate-related events and research, and promotion of renewable energy and the low-carbon economy products and services associated with it. It is important to note that a significant number of responses discussed environmental or ESG considerations not specific to climate change. Regulatory opportunities that were noted include carbon trading, clean energy financing and advisory services, energy efficiency, the cleantech industry, opportunity to decrease energy use and costs associated with it, and an increase in employee engagement. To respond to the opportunities as they arise,

participating institutions plan to stay up to date on the development of climate-related regulatory frameworks and to draw on internal knowledge of low-carbon industries.

For physical risks, institutions cited operational risks such as energy consumption and business disruption, and identified robust business continuity plans as a response action. Insurance underwriting was also discussed as a main concern, including P&C and H&L. Responses for P&C included a major overhaul of such divisions, such as a change in premiums, pricing, products, and policy and underwriting structure, coupled with extensive research and continuous development of climate simulation models to continue to be able to respond to physical risks. For the lending and investment businesses, potential impacts for real estate and other businesses vulnerable to physical consequences of climate-related events were discussed. Institutions' actions to address this included improvement of risk management, policies, and procedures as they related to climate change and environmental issues. Physical opportunities discussed included new products and services as they relate to adaptation to physical impacts, and the potential increase in price valuation of natural resources such as agriculture and timber due to possible extension of the growing season.

Table 3: Summary of participating institutions’ ranking of climate change related risks and opportunities from responses to CDP’s climate change information request

Institution	Magnitude of impact							
	Physical		Regulatory		Reputation		Other: Customer demand / Employee Engagement	
	<i>Risk</i>	<i>Opportunity</i>	<i>Risk</i>	<i>Opportunity</i>	<i>Risk</i>	<i>Opportunity</i>	<i>Risk</i>	<i>Opportunity</i>
I1	Low - Medium	Not substantive	Not substantive	Not substantive	Not substantive	Not substantive	Not substantive	Not substantive
I2	Low - Medium	Low	Low - Medium	Low - High	Low	Medium	Low	Medium
I3	Low	Low	Low	Low - Medium	Unknown	Low	n/a	Low - Medium
I4	Low - Medium	Low - Medium	Low - Medium	Low - Medium	n/a	n/a	n/a	Low - Medium
I5	Low	Low	Low	Low - Medium	Unknown	Low	Low	Low
I6	Low - Medium	Low - Medium	Low - Medium	Low - Medium	Medium	Medium	Low - Medium	Medium
I7	Med - High	n/a	Not substantive	Low	Med - High	Low	n/a	Low
I8	Low	Low - Medium	Low - Medium	Medium	n/a	Low - Medium	Med - High	n/a
I9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Source: Participants’ responses to CDP climate change information requests 2015-2016

8. Discussion and Conclusions

Overall, the Canadian financial sector is in the early stages of addressing climate change-related matters and, therefore, the level of preparedness is not yet sufficient for alignment with the kind of low-carbon and resilient economy that is necessary to avoid material and devastating losses in the future. However, P&C insurers appear to be better prepared than others due to the consequences of physical impacts that they are already experiencing. The perception of participating institutions ranged between those that did not think that climate would be a substantial or material topic for a long time to come and at the other end of the spectrum uncertainty on whether climate change could be material. The actions taken at the time of the interviews were mostly symbolic, with a focus on own operations, participation and membership in environmental initiatives, some development of new products, and the focus of environmental or climate risk assessment only on a small portion of industries. At the same time, there were some indications of an intention to conduct more substantive actions, but uncertainty clouded such discussions. Given that there are no regulations for the financial services sector on climate change-related matters and since there is an overall lack of sense of direction from the government on the role of the financial sector in climate change-related issues, it is not surprising that financial institutions are content with the status quo. Interestingly, there was no discussion about the role of the financial sector as a leading actor in creating opportunities in this space in the form of green finance, resiliency, and public-private partnerships. The role that the sector takes is as a supporter of economic development, rather than a driver of it.

The findings of this study are consistent with the proposed hypothesis that the level of response correlates with coercive, normative, and mimetic pressures from various stakeholders, and that the degree of preparedness is low because such pressures have only existed for a short time. The change in the Canadian federal government in 2015, the increase in the prominence of climate change-related discourse, and plans for regulation have generated interest in the discussions that institutions are having about regulatory and reputation aspects of climate change. In addition, TCFD's work was also of high concern to the participants, who anticipated that the recommendations are likely to become soft regulation in the near future. However, given that such developments are relatively recent, the level of preparedness for addressing climate change

is at the very early stages with mostly symbolic actions taken by the industry. The banks and insurers are actively following the developments and each other's responses, but were not yet certain about their strategies. Furthermore, there was a consistent call for collaboration amongst institutions when addressing climate-related matters; this further indicates that most are still learning about this topic and there is no sufficient internal expertise. It was evident that the motivation for addressing climate change-related matters for institutions that have P&C divisions had to do with the business losses already being felt in the industry. Therefore, it can be concluded that the Canadian financial services sector is generally reactive to climate-related regulatory developments and material physical losses that are tied to reputational considerations. Again, a strong call for collaboration, general interest in each other's activities, and the similarities in responses for interviews and the CDP, are consistent with the mimetic isomorphism pillar of institutional theory.

The normative pillar of the theory can be supported by the fact that most participants stated that climate change is immaterial to their organization, and cited the long-term horizon of climate-related risks, uncertainty around regulations, inconsistency in time horizons with banks' portfolios, appetite for risk at certain level of return, etc., as some of the reasons for such conclusions. These responses are in line with risk assessment methods of the financial services sector that are short-term focused, which Mark Carney called "the tragedy of the horizons" (Carney, 2015). Therefore, it can be argued that there are normative pressures that exist to actually not take any actions relative to climate change due to the inconsistency of time horizons of a typical bank portfolio and short-term outlook for business planning in the industry. This is evident in the mimetic pillar as well, where the lack of action can be justified by the fact that their peers are not yet considering climate change in business processes of lending and investment activities. However, it is important to note the development of a discourse about how the risk assessment of systemic and complex issues such as climate change cannot be captured by existing methods designed for standard financial risks (Onischka, 2008; Naqvi et al., 2017). Therefore, new expertise would have to be acquired by financial institutions in order to assess climate-relevant risks.

One of the main indicators that the financial sector is not prepared is the lack of attention that transitional risk received during the interviews and in CDP responses. Transition risk is one of the most significant risks discussed in the literature, and it both accounts for a combination of financial risks and emphasizes that all these risks collectively can increase the magnitude of impact. This is indeed consistent with the findings of a SHARE study from 2015 that was based on 2013 and 2014 company documents, and suggests that there has not been much progress in this area (Rohan & Razafimahefa, 2015). Furthermore, the focus of interview discussion and CDP responses on companies own operations and the use of isolated examples such as high-risk clients/projects (or only some sustainability funds) to demonstrate the response to climate change is also consistent with the narrative presented in the Boston Common Asset Management study from 2015; this once again demonstrates that little progress has been made. New products and activities in 'green' sectors were discussed at length, but these activities are not yet substantive when compared to all sources of revenue for financial institutions. Opportunities associated with transition risk are much more substantive, but would require active participation and innovation from the financial sector. While the participants noted the importance of considering climate-related opportunities, it was not discussed at length during the interviews; however, more discussion of this was included in some CDP responses. This indicates that Canadian financial institutions are still learning about the opportunities that could be available as a result of climate change. It also might be an indicator of a lack of such opportunities in Canada, and addressing that would require significant initiatives and the collaboration of all stakeholders across the financial system.

According to Weber (2012), Canadian banks were found to be best in class for credit risk management for environmental matters. This study confirms that while environmental practice for credit management is well developed within the banks, climate change specific issues are not always addressed individually, but rather are grouped with other environmental matters. Therefore, it was difficult to determine if it was addressed sufficiently. Some of the interview discussions pertained to general environmental considerations, not climate change specific ones. In addition, Weber (2012) indicated that not all stages of the credit risk management process incorporate environmental considerations and that it applied only to certain projects or clients that were deemed to be riskier. Further research would have to be carried out to determine if this

is the case for climate related matters, but it is fair to assert that climate change is not yet integrated into standard processes.

At the same time, this is a completely new topic for this industry and there are no sufficiently developed practices. Therefore, any advancement in this field would require investment in new expertise and resources without the guaranteed short-term results that the industry is used to. The premise of a low-carbon economy assumes a reduction of emissions, which inevitably targets the fossil fuel industry. This industry is significant to the Canadian economy and is also heavily subsidized by the government (Environment and Climate Change Canada, 2016a). It is fair to assume that it is difficult for a heavily regulated Canadian bank to deny a loan to an oil sands company based on views pertaining to the long-term outlook of the economy that may not be consistent with those of the government. Furthermore, a lack of substantial ‘green’ opportunities in Canada is another barrier to action by the institutions (Hunt, 2016). Therefore, it appears that government, regulators and the financial sector will have to work together to challenge the status quo. China can serve as a good example of how fast progress can be made when the strategy is developed and executed from the top (Weber, 2017).

Recommendations

As the next step, it is recommended that the Canadian financial sector further research the advancements made to date on climate-related developments by China and the EU. Specifically, it is recommended that Canadian financial institutions examine and test their lending and investment portfolios for physical and transition risks to further understand the climate-related vulnerabilities and opportunities in each sector. Second, the industry must explore the concept of ‘green’ finance and the opportunities it presents, which include investments in clean industries and infrastructure in the form of public-private partnerships and blended finance. Third, engage with the federal and provincial governments to act as an advisor on climate-related policies and their impacts on industries in Canada. The sector must provide its risk expertise to the government to ensure a smooth transition to a low-carbon and resilient economy.

Further Research

Further research should focus on more detailed quantitative assessment of financial institutions' portfolios in order to understand already existing vulnerabilities and to also understand the medium- and long-term impacts. Such research should be quantitative and first examine the existing assessment methodologies that can be utilised by institutions in aiding climate-related assessment. It is important to note that the assessment should account for all climate change-related impacts discussed in this thesis to fully capture all climate-related threats and opportunities. In addition, such assessment has to be region specific. Essentially, the impacts discussed in this paper as they apply to Canada should be tested quantitatively, first by understanding the relationship between each industry or asset and climate-related risks, and then by examining the extent of each vulnerability. Such analysis can be the first step in the development of stress-test or scenario analysis for financial institutions; this would enable the financial sector to understand the industries and assets that are most vulnerable to the physical and transitional factors of climate change.

As part of this research study, the evaluation of such models was conducted in early 2017 and presented to the participants of the study. However, the shortage of funding and time constraints did not allow for further exploration of the assessment models. It is recommended that this preliminary work be utilised in further studies of climate change in the context of financial services sector.

Limitation of the Study

It is important to note that the interviews in this study were conducted between June and September 2016. In the last year, there have been many significant developments in the responses to climate-related matters across the globe and in Canada; specifically, there were developments around the TCFD's recommendation for climate change-related financial disclosure, which presented a framework for and structure around disclosing climate-related topics to financial institutions and other industries. It is expected that such recommendations and the increased discourse on the subject within the financial sector might have contributed to participants' knowledge on this topic and might have also provided the framework, definitions, and terminology to respond to questions that we posed during the interviews. Hence, it is

reasonable to assume that the responses to the questions we posed to the participants last year might have evolved, and this should be taken into account when reviewing them.

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Appendix I - Interview Guideline

Dear *Ladies and Gentlemen*:

This letter is an invitation to consider participating in a study we are conducting as part of our research in the School for Environment, Enterprise and Development (SEED) at the University of Waterloo. The project is conducted by Dr. Olaf Weber (Professor at SEED) and by Olena Kholodova (Master's Student). We would like to provide you with more information about this project and what your involvement would entail if you decide to take part.

Based on scientific evidence, the global community has agreed that in order to avoid dangerous impact on the climate system, the average global temperatures should not rise by more than 2 degrees Celsius of the pre-industrial times. In order to achieve this, the greenhouse gas emissions produced by human activity will have to be significantly reduced and limited as soon as possible. This means that emissions intensive nations and industries are likely to be under increasing pressure to make substantial reductions to their carbon footprint in the coming years. This phenomenon is relevant for the Canadian banking and financial sector as it creates potential risk for the lending, investment, and asset management business. As carbon emitting industries are likely to face additional costs as well as declining sales and returns as a result of new government regulations, pressure from the market, NGOs and media, it will be important for banks and other financial institutions to be prepared to evaluate what this will constitute for their clients' long-term profits and its impact on lending, investment and asset management businesses. The purpose of this study, therefore, is to analyze how climate change and its consequences such as carbon pricing, regulatory activities, and declining sales of fossil fuels affects the risks and returns of the lending, investment portfolios, and the asset management of Canadian banks and other financial institutions.

We believe that because you are actively involved in the management and operation of your organization, you are best suited to speak to the various issues, such as climate change and financial risks. Participation in this study is voluntary. It will involve an interview of approximately one hour in length to take place in a mutually agreed upon location. You may decline to answer any of the interview questions if you so wish. Further, you may decide to withdraw from this study at any time without any negative consequences by advising the researcher. With your permission, the interview will be audio recorded to facilitate collection of information, and later transcribed for analysis. Shortly after the interview has been completed, we will send you a copy of the transcript to give you an opportunity to confirm the accuracy of our conversation and to add or clarify any points that you wish. All information you provide is considered completely confidential. Your name and the name of your organization will not appear in any thesis or report resulting from this study, however, with your permission anonymous quotations may be used. Data collected during this study will be retained for 5 years in a locked

cabinet in Dr. Weber's office. Only researchers associated with this project will have access. There are no known or anticipated risks to you as a participant in this study.

If you have any questions regarding this study, or would like additional information to assist you in reaching a decision about participation, please contact me at 519 888 4567 ext. 38065 or by email at oweber@uwaterloo.ca.

I would like to assure you that this study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee. However, the final decision about participation is yours. If you have any comments or concerns resulting from your participation in this study, please contact Dr. Maureen Nummelin in the Office of Research Ethics at 1-519-888-4567, Ext. 36005 or maureen.nummelin@uwaterloo.ca.

I hope that the results of my study will be of benefit to those organizations directly involved in the study, other voluntary recreation organizations not directly involved in the study, as well as to the broader research community.

I very much look forward to speaking with you and thank you in advance for your assistance in this project.

Yours Sincerely,

Olaf Weber

The aim of this interview is to understand participants' perception of the climate change related risks and any current practices employed by the financial institutions in assessment and mitigation of such risks. To gain most insight into this subject, the aim of the study is to interview managers across different divisions within each participating financial institution such as lending, investment, asset management and sustainability.

Climate change related risks:

Climate change may pose financial risk to businesses and economy as follows:

1. *Physical risk* – extreme weather events may have direct impact on businesses in the form of mitigation and adaptation tactics or indirect impact by disrupting the operations (Nikolaou et al., 2015).
2. *Regulation risk* – businesses will incur additional costs when implementing climate change strategies as a result of governmental or market-based climate change policies (ibid.).
 - a. Command and control
 - b. Market based
 - c. Stakeholder response
3. *Reputation risk* – climate change issues are becoming more important for the average consumer and therefore, businesses involved in environmentally damaging practices will suffer negative impact to their reputation (ibid.).
4. *Litigation risk* – the firms that are not compliant with climate change policies will incur extra costs in the form of fines (ibid.).
5. *Systemic (transformational) risk* – a shift towards low-carbon economy will create disruption across various industries and may require for financial sector to change risk assessment criteria for investments, financing and credit businesses.

Interview questions:

I. Perception of Financial Risks Caused by Climate Change:

Do you believe that financial services sector is affected by climate change?

If yes:

How is the financial sector affected? Which businesses would be affected the most?

What are the financial effects of the following climate change risks for your business?

- *Physical risk*
- *Regulation risk*
- *Reputation risk*
- *Litigation risk*
- *Systemic (transformational) risk*
- *Other risks*

Are there any particular risks from climate change related risks (physical, regulatory, etc.) that are more relevant to your business?

Were these risks always relevant for the banking sector? If not, why?

If no:

What are the reasons for climate change not having an effect on the financial sector?

Why does climate change does not have a financial effect on your business?

Can climate change impact become more relevant for the financial sector in 20-50 years?

II. Assessment of Financial Risks Caused by Climate Change:

How do you currently assess the following financial risks for your business caused by climate change?

- *Physical risk*
- *Regulation risk*
- *Reputation risk*
- *Litigation risk*
- *Systemic (transformational) risk*
- *Other risks*

Which risks does the assessment address?

What are the results of the assessment?

- *Physical risk*
- *Regulation risk*
- *Reputation risk*
- *Litigation risk*
- *Systemic (transformational) risk*
- *Other risks*

How could this method be improved to better assess the financial risks of climate change?

- *Physical risk*
- *Regulation risk*
- *Reputation risk*
- *Litigation risk*
- *Systemic (transformational) risk*
- *Other risks*

How does the assessment differ from a typical business risk assessment methodology employed by your business?

What is a typical time frame in which the risk assessment is conducted for your business?

How do you balance long-term climate change risks with short to medium-term financial risks (for instance, phasing out fossil fuels until 2050 vs. 5 to 10 year loan duration)?

Which particular industries are exposed to climate change related risks more than others?

Does carbon footprinting help in assessing climate change risk for your business?

III. Mitigation of Financial Risks Caused by Climate Change:

What is the role of _____ in mitigation of financial risks caused by climate change (physical risk, regulation risk, reputation risk, litigation risk, systemic (transformational) risk, other risks)?

- a) Financial sector regulations, for instance, mandatory climate risk reporting, mandatory reduction of loans to high GHG emitters, or financial incentives for green lending and investment.
- b) Government
- c) Financial sector's voluntary codes of conduct:
 - United Nations Environment Programme Financial Initiative (UNEP FI)
 - United Nations Principles for Responsible Investment (UNPRI)

- Equator Principles (EP)
- d) Standardized indicators for climate change risks in the financial sector
- e) Regulations, voluntary codes of conduct and standardized indicators in other sectors
- f) Standardized reporting from clients
- g) Financial sectors in other countries
- h) Environmental reporting
- i) Any other factors (i.e. sale, insurance)?

Could a shift away from doing business with polluting industries help to mitigate climate change risks for the financial sector

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Appendix II - CDP Climate Change Information Request – Risks and Opportunities sections

Table 4: Summary of climate change-related risks and opportunities as reported in CDP climate change information request by participating financial institutions

Regulatory Risk Cap and trade schemes, Carbon taxes, Fuel and energy regulations, International agreements and targets, Product efficiency regulations and standards, Renewable energy regulation, Voluntary agreements, Uncertainty surrounding regulations, Lack of regulation	
Potential Impact of Risk	Risk Management Method
<p><i>Operations:</i></p> <ul style="list-style-type: none"> • Rising energy costs can increase operational costs • Rising energy costs can increase prices of goods and services purchased by FI • Additional capital required to invest in new, more energy efficient assets, for compliance <p><i>Lending/Investments:</i></p> <ul style="list-style-type: none"> • Lack of regulation for renewable and clean sectors can impact demand for green financial products <p>Potential impacts on clients in high emitting industries with negative consequences to financial performance and credit risk profile:</p> <ul style="list-style-type: none"> • Project delays, reduced operating capital, volatile pricing that affects revenues, competitive disadvantage or divestment of assets • Increase in compliance costs • Lack of management practices of climate-related regulatory risks • Uncertainty around compliance obligations, technological requirements, project schedules, operating costs and reputational impacts 	<p><i>Operations:</i></p> <ul style="list-style-type: none"> • Report, monitor and manage GHG footprint • Integrate environmental considerations in procurement policies • Implement Energy Management System (EMS) • Continuous efforts to reduce energy consumptions – retrofits, new projects, repairs, improvements etc. • Bulk fuel/electricity purchase contracts to insure against price increases <p><i>Lending/Investments:</i></p> <ul style="list-style-type: none"> • Incorporate climate change in credit portfolio assessment • Enhanced environmental due diligence and specific guidelines for clients operating in emission-intensive industries with high to medium environmental risk • Assessment of clients costs of compliance • Annual review of lending and investment portfolios for ESG considerations including climate change and carbon regulations • Engagement with clients to understand nature, extent and potential significance of environmental risks on business including climate change • Incorporate ESG considerations in investment decisions • Grow low carbon portfolio including investment in renewable energy • Sponsor industry events and research to exchange knowledge and gain better understanding of these risks • Ongoing regulatory review, market analysis, sponsorships and support of clean technology initiatives • Thought leadership and low carbon financing, including renewable energy • Utilize public relations, digital and social media and advertising to promote the use of small scale renewable energy and the low carbon economy • Calculate carbon footprint for investments with aim to reduce it overtime • New financial products geared toward reducing energy consumption and GHG emissions

Physical Risk	
Change in precipitation extremes causing floods and droughts, Change in temperature extremes, Tropical cyclones (hurricanes and typhoons), Sea level rise, Uncertainty around physical risks	
Potential Impact of Risk	Risk Management Method
<p><i>Operations:</i></p> <ul style="list-style-type: none"> • Higher cooling and heating costs for facilities and will increase as organizations grow • Reduction and disruption in production capacity due to own or suppliers with impact on own building and operations, employee and customer accessibility with negative impacts to business in the form of increased insurance, building repairs, employee support and reduced customer revenue • Increase in operational costs with impacts on branches in the short-term and reallocation of resources to cover costs of climate change in the long term <p><i>Insurance Underwriting:</i></p> <ul style="list-style-type: none"> • Increase in potential financial loss that may arise where the amount, timing or frequency of benefit payments under (re)insurance contracts exceeded expectation • Health risks and increased mortality resulting from pollution and climate change and its impact on water and food supply and changes in distribution of organism borne, food borne and waterborne infectious diseases. This could conceivably affect life expectancy in affected regions, and therefore increase life insurance payouts and insurance risk <p><i>Lending/Investing:</i></p> <ul style="list-style-type: none"> • Default on residential and commercial real estate loans on properties located in areas prone to extreme weather events • Potential increase in credit losses for business sectors vulnerable to physical aspects of climate change such as agriculture • Business losses and disruptions caused by climate change resulting in disruption to water, air and food supplies 	<p><i>Operations:</i></p> <ul style="list-style-type: none"> • Implementation of robust business continuity management policies adopted to climate change-related risks • Monitoring weather and scenario testing of potential impact of a range of natural events on organizations • Implementing EMS for continuous improvement of energy use and related costs • Adoption of Energy Star Portfolio Manager to manage energy use of real estate portfolio • Building new branches in compliance to local and international build standards <p><i>Insurance Underwriting:</i></p> <ul style="list-style-type: none"> • Increase in premiums, changes in pricing, product/policy and underwriting structure • Maintain clear underwriting guidance, limits • Terms and conditions communicated clearly in policy agreements • Funding and participating in research and working groups relevant to physical aspects of climate-related risks • Memberships with organizations domestically and internationally that allows sharing of experience, research and access to existing best practices • Generating wide media coverage on the issue including education of clients on physical climate-related risks to individual and business • Continuous development of climate simulation models • Geographical diversification of clients • Raise awareness about inherent risks of climate change such as water damage <p><i>Lending/Investing:</i></p> <ul style="list-style-type: none"> • Adopting policies and procedure to value and manage financial and non-financial security (collateral) and to review and negotiate netting agreements • Environmental risk management program is maintained to help protect investment assets from losses due to environmental issues including real estate, mortgage and private fixed income portfolios • Integrating ESG in investment underwriting • Account for risk mitigation provided by governments-sponsored programs • Integrate climate change in credit risk policy • Educate credit managers about climate change risks

Other climate-related developments: Reputation, Changes in consumer behaviour	
Potential Impact of Risk	Risk Management Method
<p><i>Reputation:</i></p> <ul style="list-style-type: none"> • FIs that do not adequately identify, manage and mitigate, where appropriate, their contribution to climate change face increasing censure from their stakeholders including investors, clients, employees and the general public resulting in damage to firm's image and loss of business • Stakeholder expectations around environmental performance and if FI perceived to be contravened can reduce demand for goods/services and reduce new business opportunities • Non-compliance with increasing regulations of clients FIs finance and invest in can attract direct civil action and social media targeting and can disrupt our day to day business operations impacting customer access to affected branches where civil action is occurring • Failure to meet stakeholder expectations to promote climate change mitigation and adaptation can lead to loss of clients <p><i>Changing in consumer behaviour:</i> Inability to develop environmental products and services or attract environmentally conscious customers, employees and investors can result in loss of competitive advantage, profitability and market value decline</p>	<p><i>Reputation:</i></p> <ul style="list-style-type: none"> • Management makes an effort to consider climate change in investment decisions (risk management programs, insurance, business continuity, etc.) • Use of a framework of corporate-wide policies, procedures and processes to manage reputational risk relative to climate change • Incorporating ESG factors in lending and investing decisions • Develop guidance for environmentally sensitive sectors that assessed client's commitment and track record based on developing regulatory issues and other material environmental matters • Credit risk management policy includes escalation process to environmental department and reputational risk committee • Continuous review and tracking of related social issues such as resource depletion and population growth • Engagement with stakeholders and participation in multi-stakeholder groups • Developing of products and services that promote climate change adaptation and mitigation • Support public policy and raise awareness • Partner with non-for-profit to promote awareness and education • Add climate change as environmental priority including business indicators • Awareness and training of our staff on environmental policies and climate change-related information • Maintaining committees and centres of environmental and climate change expertise • Research and thought leadership on environmental and climate change-related topics • Manage and reduce own carbon footprint <p><i>Changing consumer behaviour:</i></p> <ul style="list-style-type: none"> • Conduct ongoing market research to assess customer perception and behaviours • Each business unit implements a reputational risk policy and procedures • Partner with NGOs and educational institutions to promote research and education into climate change topics

Table 5: Summary of climate change-related opportunities as reported in CDP climate change information request by participating financial institutions

Opportunity Driver	Opportunity Description	Monitoring Opportunities
<p><i>Regulatory Opportunity:</i></p> <ul style="list-style-type: none"> • GHG related regulations • Cap and trade schemes • Carbon taxes • Fuel and energy regulations • International agreements and targets for GHG emissions • Product efficiency regulations and standards • Renewable energy regulation • Voluntary agreements 	<p><i>New Products and Services:</i></p> <ul style="list-style-type: none"> • Carbon trading • Clean energy financing • Clean energy advisory services • Financing CleanTech industry • Financing projects and assets that improve energy efficiency and address climate change issues • Increase in demand for energy efficiency properties owned by FIs • New products designed around government incentives for energy related initiatives <p><i>Reduced Costs:</i></p> <ul style="list-style-type: none"> • Reduce GHG emissions and operating costs • Increase energy efficiency in buildings resulting in costs savings <p><i>Other:</i></p> <ul style="list-style-type: none"> • Increase employee engagement and positive reputation impact 	<ul style="list-style-type: none"> • Staying up to date on regulatory developments via research, memberships, workgroups, collaboration projects • Draw on extensive knowledge and capability in renewable energy investing within organizations • Dedicated team of project finance professionals responsible for evaluating opportunities in the renewable energy sector and related industries.
<p><i>Physical Opportunities:</i></p> <ul style="list-style-type: none"> • Changing climate patterns and effects 	<p><i>New Products and Services:</i></p> <ul style="list-style-type: none"> • Accelerated damage and deterioration of existing infrastructure increases the need in infrastructure redevelopment which creates opportunity for financial institutions to participate in financing of projects such as upgrades, repairing or replacement of roads, docks, airports, buildings, and sewer systems to make them more resilient to climate change • Adaptation to climate change may require significant capital expenditure • Provide financing solutions to public agencies, businesses and individuals enabling them to prepare for physical impacts • Increase in demand for new insurance products such as flood insurance • Increase for demand of financial products and services by industries positively effected by climate change (agriculture and timber, increase in growing season) • Loans for home renovations to create energy efficiencies and cost savings • Program providing suite of resources to help customers save money by saving energy and reduce their impact on climate change 	<ul style="list-style-type: none"> • Monitor and evaluating market opportunities • Potential acquisitions are screened with attractive risk/return incorporating climate change considerations • Continue to actively assess building infrastructure for opportunities to upgrade equipment, retrofit for improved efficiency and refine operating processes to reduce costs and overall emissions impacts

	<p><i>Reduced Operating Costs:</i></p> <ul style="list-style-type: none"> • Increased temperature could decrease the need for heating costs • Retrofits and construction of new facilities in response to changing physical climate can lower energy consumption and costs <p><i>Investments:</i></p> <ul style="list-style-type: none"> • Increase in stock price or market valuation as a result of increase in value of assets such as timber and agriculture land that can experience longer growing season with increased productivity 	
<p><i>Opportunities due to other climate-related developments:</i></p> <ul style="list-style-type: none"> • Reputation • Changing consumer preferences • Employee engagement 	<p><i>Reputation:</i></p> <ul style="list-style-type: none"> • Companies with superior environmental performance attract premiere investors, customers and employees • FI’s stakeholders will be increasingly drawn to companies with a commitment to and proven track record on major environmental issues such as climate change • FI’s management of its environmental impacts creates positive perceptions of its existing and potential customers, employees and investors enhancing its brand and reputation and contributing to its competitive advantage and increased market share • Being proactive in climate change initiatives could have a positive impact on our brand and reputation as a green economy leader in Canada • FI reputation as a leading owner and manager of green commercial real estate has a positive impact on its ability to attract and retain high quality tenants and also positively influence our employees who work in those buildings. <p><i>Changing consumer preferences:</i></p> <ul style="list-style-type: none"> • Investment perspective in energy efficiency, public transit and renewable energy. • New offerings to the market and make capital investments to address climate change issues while creating value for FI attracting environmentally conscious customers and employees • Ability to develop environmental products and services or attract environmentally conscious customers, employees and investors can result in competitive advantage, profitability and increase in market value 	<p><i>Reputation:</i></p> <ul style="list-style-type: none"> • Enhanced communication • Use of a framework of corporate-wide policies, procedures and processes to manage reputational risk relative to climate change • Incorporating ESG factors in lending and investing decisions • Develop guidance for environmentally sensitive sectors that assessed client’s commitment and track record based on developing regulatory issues and other material environmental matters • Credit risk management policy includes escalation process to environmental department and reputational risk committee • Continuous review and tracking of related social issues such as resource depletion and population growth • Engagement with stakeholders and participation in multi-stakeholder groups • Developing of products and services that promote climate change adaptation and mitigation • Establish coherence between climate change strategy and external communications <p><i>Changing consumer preferences:</i></p> <ul style="list-style-type: none"> • Development of products and services allowing members and clients to reduce their climate impacts • Internal knowledge that have been at the forefront of financing renewable energy projects, including wind, hydroelectric, solar, biomass, biogas and district energy systems • Ongoing market research to assess customer perceptions and behaviours • Engaging with customer and stakeholders through customer insights, stakeholder

	<p><i>Employee engagement:</i></p> <ul style="list-style-type: none"> • Action relative to climate change and its on-going commitment to absolute carbon footprint reductions and carbon neutrality can have a positive impact on employee engagement and attract new employees 	<p>engagement, and social media monitoring</p> <p><i>Employee engagement:</i></p> <ul style="list-style-type: none"> • Introducing a number of programs to raise awareness amongst employees and engage them in climate change activities
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