



Climate Risks

Implications for the Insurance
Industry in Canada



Insurance Institute

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This research report represents the fifth in the Insurance Institute's Emerging Issues Research Series – providing relevant and insightful research reports on the issues impacting the property & casualty insurance industry in Canada. The report joins reports on cyber risks (2015), automated vehicles (2016), the sharing economy (2017) and the changing workforce (2018), as well as the demographics of the P&C insurance industry in Canada that the Institute has been conducting since 2007. For more information, please visit insuranceinstitute.ca/research.

About the author of this report

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Climate Risks: Implications for the Insurance Industry in Canada

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Climate Risks:

Implications for the Insurance Industry in Canada

Executive Summary

"I have found that insurers are amongst the most determined advocates for tackling it [climate change] sooner rather than later. And little wonder. While others have been debating the theory, you have been dealing with reality."

Mark Carney

Severe weather and climate risks have had a significant impact on the insurance industry in Canada over the past 40 years. For the most part, this has been managed well. Claims were paid, and homeowners and businesses were supported in recovery following unprecedented flood, wildfire, and severe wind events. Insurers even managed to earn a modest overall underwriting profit in 14 of the last 15 years, despite paying more than \$22 billion in disaster claims. Other industries are just beginning to prepare for severe weather risks, while the insurance industry has consistently demonstrated its capacity to help Canadians.

Over the next 10 years, change in severe weather and climate risks will present opportunities for the insurance industry in Canada that are expected to exceed the risks. Growth in revenue from coverage for flooding, wildfire, severe wind, and other climate-related risks is expected to keep pace with further increases in severe weather damage claims. The industry continues to build its financial and operational capacity to successfully respond to extreme events. The introduction of residential flood insurance underscores the industry's commitment to serve the evolving needs of property owners in Canada.

Severe weather and climate risks have replaced fire to become the most important peril for property insurance in Canada. Over time, climate-related risks may displace auto coverage to become the leading coverage provided by the insurance industry in Canada. KPMG, for example, predicts that the introduction of collision reduction technology and an increase in vehicle sharing will result in a 60 percent reduction in personal auto insurance premiums over the next 25 years.¹ This will free up capital to support sustained growth in coverage for flooding, wildfire, and severe wind.

Consumers are increasingly defining their relationship with brokers, agents, and insurers through the management of climate-related risks.

This report focuses on the next 10 years, but also includes a warning that prospects over the next 50 to 100 years are not clear. The insurance industry could continue to successfully adapt if decisions are made by major emitters and policy leaders over the next 10 years to stabilize the global climate within 25 years. This is possible, but unlikely. In contrast, a business-as-usual approach to greenhouse gas emissions would result in dangerous warming of the climate, resulting in severe weather damage by the end of the century that would be uninsurable. This is also possible, but unlikely. The long-term path for the climate will become clearer over the next 10 years.

¹ Insurance Institute of Canada, "Automated Vehicles," 31.

CLIMATE RISKS: IMPLICATIONS FOR THE INSURANCE INDUSTRY IN CANADA

This report focuses on three climate-related risks that will impact the insurance industry:

1. **Physical risks** of damage to buildings and infrastructure are expected to increase because of a growing number of people and assets located in areas of risk, aging infrastructure, and more frequent and severe extreme weather events.
2. **Liability risks** may emerge as a result of legal actions over losses resulting from past greenhouse gas emissions and climate action or inaction by governments and private organizations.
3. **Transitional risks** will arise as society transitions to a low-carbon economy driven by market dynamics, technological innovation, policy action, and shifting consumer preferences.

The framing of the business conversation about severe weather and climate risks to focus on physical, liability, and transitional risks differs from the political conversation about carbon taxes to reduce greenhouse gas emissions and adaptation to build societal resilience to climate extremes. The focus of this report is on addressing the expected impact of severe weather and climate risks and the implications for Canada's insurance industry.

The largest impact climate-related risks pose for the insurance industry over the next 10 years will come from random extreme events that strike exposed and vulnerable properties and communities, resulting in loss and damage. There will be some increase in the number of people and assets exposed and a small increase in the frequency and severity of the risk of extreme events resulting from climate change over the next 10 years, but these impacts will be overwhelmed by natural variation in the weather.

In contrast, the largest impact climate-related risks pose for the insurance industry over the next 50 to 100 years may come from the increase in extreme events resulting from global warming. Decisions made over the next 10 years will have a significant impact on the long-term future for the insurance industry.

Over the next 10 years, the insurance industry must consistently demonstrate its capacity to manage physical, liability, and transitional risks. This includes financial and operational capacity to respond to severe weather events; management of underwriting risks associated with policyholder liability exposure; and management of investment and reputation risks associated with society's transition to a low-carbon economy.

This report presents three recommendations for the insurance industry in Canada to address climate-related risks over the next 10 years:

1. Embrace the opportunity and manage the risks presented.
2. Be proactive in disclosing how the industry is handling the risks.
3. Share industry knowledge to motivate action in others.

Embrace the opportunity and manage the risks presented by severe weather and climate change.

Through industry collaboration and individual company action, the insurance industry must address underwriting and operational risks resulting from the impact of climate change on the frequency and severity of extreme events. Consumers and insurers must be confident that pricing, terms, and coverage limits are sustainable and adequately cover expected costs, supported by exposure knowledge, risk reduction information, and loss models. Companies must assess and develop products that meet the evolving severe weather risk management needs of consumers. The insurance industry must continue to demonstrate its capacity to serve consumers following extreme events by investing in an emergency electrical

power supply, the capacity of employees to work from home or remote locations, and the availability of teams trained to respond to an occasional surge in claims. Increasing risk of severe weather damage represents an opportunity for the insurance industry over the next 10 years.

The United Nations' Principles for Sustainable Insurance provides industry-specific guidance. Brokers and insurers should endorse and implement the principles to help them integrate climate risks into decision making. The industry should continue to support development of risk reduction best practices for policyholders and loss data models that inform industry management of flood, wildfire, and other climate-related risks.

Proactively disclose how the industry is handling climate risks.

The insurance industry must address investment and solvency risks. Many consumers, investors, and regulators want companies, including insurance companies, to provide greater disclosure about how they are managing climate-related risks. Legal challenges may affect the value of investments in major emitters. Valuations may change as a result of shifts in regulation, rising carbon taxes, and new technologies to support society's transition to a low-carbon future. Insurers and brokers should measure and disclose their greenhouse gas emissions and targets to reduce their environmental footprint. Low insolvency risk must be rigorously affirmed through stress testing of low-probability, high-consequence extreme weather scenarios, including ongoing evaluation of reinsurance coverage and concentration of risk. Solvency regulators provide an independent, objective assessment of the ability of insurers to pay severe weather claims.

The Task Force on Climate-Related Financial Disclosure is working to develop industry-specific advice on disclosure to inform investors and regulators for eight industries, including insurance. Insurance companies should monitor and embrace these emerging tools to demonstrate their preparedness. Investment risk management can be informed by tools provided to investors that endorse the United Nations' Principles for Responsible Investment. Increased regulatory attention and scrutiny assessing the management of the industry's capacity to pay claims should be welcomed and encouraged by the industry, as it will inform expectations and build confidence in the industry.

Share industry knowledge and provide incentives to motivate action by others.

Action by property owners and governments can significantly reduce the risk of loss from severe weather, like installing a backwater valve or a sump pump with a battery-powered backup. The insurance industry is working to develop effective loss reduction solutions based on scientific study and industry knowledge. Brokers and companies should proactively share this information with property owners, governments, and other decision makers. Awareness building is most effective when accompanied by financial incentives. Insurers that align pricing with risk will reward actions that reduce the risk of loss claims. The Institute for Catastrophic Loss Reduction and the Intact Centre on Climate Adaptation are working to identify specific loss reduction actions that can be championed by the insurance industry.

The insurance industry has much to be proud of. The industry is leading the way to help society manage the risk of physical damage resulting from severe weather. Insurers consistently provide comprehensive financial protection to homeowners and businesses. Consumer, employee, regulator, and public confidence in the insurance industry continues to grow as the industry consistently demonstrates its financial and operational capacity to respond to major loss events. Nevertheless, significant and complex challenges will emerge over the next 10 years and beyond. Increased risk of loss presents both an opportunity and a risk for the insurance industry.

Foreword

The Insurance Institute is proud to publish this fifth instalment in a series of reports on emerging issues impacting the property and casualty insurance industry in Canada. These reports address cyber risks, automated vehicles, the sharing economy, the changing workforce and climate risks.

The intention of this report is to provide research of value to our stakeholders. This research report, and the series of reports in general, offers information and insights to enable insurance organizations to broaden their understanding of how emerging risks will impact the delivery of insurance products and services in Canada over the next 5 to 10 years.

This report provides a broad perspective on what is known about climate change and the potential issues that will impact the insurance industry in Canada in the near and distant future. This report focuses on both the adaptation made by the industry in response to a remarkable increase in severe weather claims over the past 30 to 40 years, and the significant challenges expected to transform the industry over the next 10 years and beyond.

The hope is that this research report is not only interesting and insightful, but also lays the foundation for continued leadership by the insurance industry as society works to address the challenges resulting from climate change.

Sincerely,

A handwritten signature in blue ink that reads "Peter Hohman". The signature is fluid and cursive, with the first name "Peter" and last name "Hohman" clearly distinguishable.

Peter Hohman, FCIP, MBA, ICD.D
President & CEO, The Insurance Institute of Canada

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Introduction

"Start by doing what's necessary; then do what's possible; and suddenly you are doing the impossible."

St. Francis of Assisi

Brian Mulrone and other world leaders participated in the 1992 Earth Summit in Rio de Janeiro. They identified climate change as the top environmental issue and committed to take action to ensure that global warming would not have a dangerous impact on the world. In 2015, the Paris Agreement set out the goal of holding the increase in the average global temperature to well below 2 degrees Celsius relative to the pre-industrial era, and countries that signed the agreement would pursue efforts to limit the increase to 1.5 degrees Celsius.

Over the last 25 years, the policy conversation has been framed around two issues—mitigation and adaptation—supported by a significant investment in science. The climate is expected to stabilize when carbon emissions become “net zero,” which will be achieved when residual emissions are offset by sequestration. The discussion about mitigation seeks to achieve this goal. The discussion about adaptation is working to minimize the adverse consequences resulting from the change in the climate. The Intergovernmental Panel on Climate Change provides scientific analysis to support policy and private action.

This effort is not going well. There is a high risk that warming will exceed the target and result in dangerous changes in the climate. The risk of damage from severe weather is now the top issue identified by business leaders participating in the World Economic Forum. The continuing policy discussion about climate change is now accompanied by a business discussion about managing severe weather and other climate-related risks.

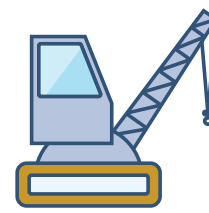
This report is about climate risks and the Canadian insurance industry. The focus is on issues that will emerge over the next 10 years. First and foremost, insurers must continue to demonstrate their capacity to finance and respond to severe weather losses in Canada. Uncertainty emerges when assessing prospects for the industry over the next 50 to 100 years, but over the next 10 or even 20 years, the expected increase in severe weather damage will present opportunities for the insurance industry that will exceed the risks. Climate risks have replaced fire as the peril that defines the insurance industry for consumers in Canada.



Mitigation

Actions to limit the magnitude or rate of long-term global warming and its related effects.

Examples: Phasing out fossil fuels and switching to low-carbon energy sources



Adaptation

The process of adjustment to actual or expected climate and its effects.

Example: Installing flood defences, such as sea walls

Source: Intergovernmental Panel on Climate Change (IPCC)

CLIMATE RISKS: IMPLICATIONS FOR THE INSURANCE INDUSTRY IN CANADA

The policy discussion about climate change is framed to address mitigation and adaptation, but in 2015 Mark Carney, Governor of the Bank of England, reframed the conversation for leaders in the financial community when he identified three broad channels through which climate change can affect financial stability:²

- **Physical risks:** The impacts today on insurance liabilities and the value of financial assets that arise from climate- and weather-related events such as floods and storms that damage property or disrupt trade.
- **Liability risks:** The impacts that could arise tomorrow if parties who have suffered loss or damage from the effect of climate change seek compensation from those they hold responsible. Such claims could come decades in the future, but have the potential to hit carbon extractors and emitters—and, if they have liability cover, their insurers—the hardest.
- **Transitional risks:** The financial risks which could result from the process of adjustment towards a lower-carbon economy. Changes in policy, technology and physical risks could prompt a reassessment of the value of a large range of assets as costs and opportunities become apparent.

The industry-led Task Force on Climate-Related Financial Disclosure and others are working to operationalize this reframing of the policy discussion about climate change to support decision makers in the business community, including the insurance industry, as they manage climate risks. The Task Force has chosen to focus on physical and transitional risks. All businesses are exposed to the risk of disruption resulting from extreme weather and are affected by the transition to a low-carbon economy. Liability risks are viewed by the Task Force as an element of transitional risk, where the possible impact may be very high for large emitters of greenhouse gases but is not material for most organizations. Investors and regulators seeking to compare risk management actions between companies and industries have expressed support for the approach of disclosing climate risks as physical or transitional. The policy conversation will continue to focus on reducing greenhouse gas emissions and adaptation.

This report seeks to identify actions needed to address the risks and opportunities that will be introduced because of the expectation of increases in physical, liability, and transitional climate risks. In particular, this study explores six critical questions:

- What change is expected in Canada's climate?
- Why is an increase in physical damage expected?
- Will anyone be found liable for climate impacts?
- How will society transition to carbon neutrality?
- What regulatory changes may emerge for insurers?
- How have insurers adapted to more extreme weather?

This report is about climate risks facing the Canadian insurance industry over the next 10 years. Between the early 1980s and 2019, the Canadian insurance industry successfully adapted to a twenty-fold increase in severe weather damage claims, with claims paid doubling every 5 to 10 years. Further increase in extreme weather losses over the next 10 years and beyond is expected to drive profound, transformative change in Canada's insurance industry. Increasing damage from flooding, wildfire, severe wind, and other climate-related hazards will introduce risks and opportunity for the industry. The insurance industry is well positioned to build on its recent success, but the path forward will be complex and challenging.

² Carney, "Breaking the Tragedy of the Horizon," 4.

Physical risks

The success of the insurance industry in the management of rising severe weather claims over the past 30 to 40 years is important as the industry prepares for the challenges ahead. First, many extreme weather risks are expected to increase in frequency and severity across Canada—events with the potential to result in direct damage to property. Extreme events present a growing financial and operational risk for insurers and brokers. But increased risk of loss also presents an opportunity to expand the coverage provided to homeowners and businesses. More rainfall in urban areas increases the risk of water damage and sewers backing up to flood basements. The areas that will be burned by wildfires are projected to grow, adding to the risk that fires burn out of control into residential and industrial areas. Rising sea level will increase the risk of coastal flooding. Unless major investments are made to enhance the resilience of buildings and infrastructure, extreme weather events will bring more damage claims.

The average annual severe weather claims paid by insurers in Canada could more than double over the next 10 years, increasing from \$2.1 billion a year to \$5 billion a year, and must be accompanied by an increase in premium income.

Climate liability risks

Second, greenhouse gas emissions from human activity is the dominant cause of change in the climate and there are many actions before the courts in the United States and a few in Canada seeking to assign legal liability for the consequences of climate change. Some seek to recover the cost of damage resulting from extreme events. Others seek compensation for the expense of investing in protection from future hazards. Actions in Canada have targeted governments. Over the next 10 years, circumstances may introduce a number of risks and opportunities for the insurance industry. Climate liability has not been an issue for larger emitters of greenhouse gases, government agencies, or the insurance industry, but this may change. The industry's experience with tobacco and asbestos informed the management of climate liability. Nevertheless, some uncertainty remains for the industry. This may include issues related to professional liability and the responsibility of directors and officers to disclose material climate risks. There may be scope for insurance companies to recover costs through the courts if governments are held liable for failing to provide critical infrastructure services adapted to the changing climate. Insurance coverage will be tested in the courts. Policyholders will likely challenge the responsibility to defend if the extent of coverage is disputed. All of these factors mean that climate liability risk may become a more complex issue for the insurance industry over the next 10 years.

Transitional risks

Third, there is a growing urgency for society to transition to net zero global emissions to realize the benefits of emerging technologies and to prevent the changing climate from creating unacceptable harm. Canada has committed its support to the Paris Agreement on climate change, seeking to limit growth in the global average temperature to well below 2 degrees Celsius. The Intergovernmental Panel on Climate Change found that this will require a net elimination of global emissions by mid-century. Decisive action to achieve this transition will require trillions of dollars from lenders and investors, which introduces investment opportunities for knowledgeable financial institutions. New regulations, taxes, innovations, and consumer backlash may increase the volatility of investment values, including the risk of sudden reductions. This risk is greatest for energy companies. Climate change is expected to have a growing impact over the next 10 years on investment values, an issue that was largely absent in the past. Failure to actively manage climate risks may introduce investment and reputational risks for insurers.

The next 10 years are expected to bring climate challenges for the Canadian insurance industry that are more complex than merely reacting to the increase in severe weather claims over the last 40 years. The insurance industry will need to include climate risk elements throughout their decision-making and risk management processes. This will continue to be most evident for underwriting and operational risks.

Industry efforts since the ice storm in 1998 to ensure the adequacy of pricing, terms, and conditions will remain under ongoing review as circumstances evolve. Insurers need to monitor the evidence about change in the frequency and severity of extreme events, combined with emerging knowledge about loss prevention best practices. More severe storms will increase expected damage claims for policyholders who fail to protect their property, but the risk of loss may fall for homeowners and businesses that take action. Informed consumers, regulators, and other stakeholders will increasingly expect insurance practices that understand and recognize loss management efforts.

Insurers seek to manage the concentration of exposure in a specific location or region, the benefits of diversification of exposures across perils and location, and their use of reinsurance to reduce insolvency risk. One area insurers will need to do more work is to better understand their exposure to business interruption losses due to severe weather disruptions.

Operational risks

The expected increase in severe weather damage will also impact operational risk for insurers. Power outages will disrupt the capacity to respond. Extreme events will account for a growing share of claims, resulting in a shift in the nature of services needed from adjusters. Moreover, staff needed to manage the response to a major event may be confronted with damage to their own homes, road closures, and other disruptions. Many of these issues emerged for the first time in Quebec in 1998 and frequently in Alberta over the past decade. Operational challenges over the next 10 years may present themselves anywhere in the country. Brokers, adjusters, and companies can learn from the adjustments that some in the industry have made in response to previous extreme events and through planning exercises.

Investment risks

Insurers are investors. Some insurers have begun to request additional disclosures as they manage their portfolios. Climate information will likely assume a growing prominence in investment decisions over time, but best practices and disclosure expectations are only beginning to emerge. Banks, life insurers, pension funds, and rating agencies are working to cope with similar issues, presenting an opportunity to share learnings and emerging practices. Important international efforts are underway that will support better practices in Canada. These efforts welcome new participants and seek to accelerate the development and sharing of emerging practices.

Regulatory risks

Climate change will introduce regulatory risk for financial institutions. The Office of the Superintendent of Financial Institutions is a founding member of the Sustainable Insurance Forum established to strengthen supervisors' understanding of climate change and other environmental issues, as well as inform regulatory responses. The forum and the International Association of Insurance Supervisors published case studies of climate change regulation practices in place around the world. Some jurisdictions, like the United Kingdom and California, regularly challenge industry practices to better disclose climate risks and reduce investment risk. Some insurers in Canada have agreed to voluntarily disclose climate information using emerging international guidance, but mandatory reporting may become a requirement as these approaches mature. Increased regulatory interest in the management of climate risks by the insurance industry is expected to provide welcome affirmation of industry practices. The industry has much to be proud of in its management of climate risks.

A threat to consumers and the industry, however, is the potential for rate regulation. The industry will need to be proactive in defending the importance of innovation and rates that fully reflect the risk of loss.

Alabama, Georgia, Mississippi, and North Carolina have legislation mandating intervention in ratemaking. Insurers must submit a rate plan with actuarial justification and demonstrate compliance with mandated discounts. Florida, Louisiana, Maryland, New York, Rhode Island, and South Carolina require discounts, but do not mandate specific rates.

Some insurers in Canada report their greenhouse gas emissions and have committed to act as leaders working to significantly reduce or fully offset their emissions. Insurers and brokers that do not measure and actively work to reduce their carbon footprint may be vulnerable to reputation risk.

This report will review some actions taken by the insurance industry in response to higher severe weather damage claims and explore actions required by the industry to address new challenges expected as a result of climate-related risks over the next 10 years and beyond.



What change is expected in Canada's climate?

"Science knows no country, because knowledge belongs to humanity and is the torch which illuminates the world."

Louis Pasteur

Canada's climate has changed. There is robust evidence of change across a broad range of indicators. The changes are described in considerable detail in *Canada's Changing Climate Report* published by the Government of Canada in 2019.³ The country is warmer—in fact, the warming in Canada was twice the global average, and the warming in Canada's north was three times the global average. Many parts of the country recorded an increase in precipitation. Local sea level rose in most parts of Canada. The area burned by wildfire increased. In the north, permafrost temperatures increased and began to thaw. Sea ice cover declined and thinned in the Arctic. Glaciers thinned and retreated. Some severe weather risks increased in frequency and severity.

Significant further change is projected. Under all possible scenarios, Canada will be warmer. This will include more extremely hot days that threaten the health of some Canadians. Intense rainfall events are projected to increase in frequency and severity, which threatens more basement flooding. Increased risk of wildfire ignitions and a longer fire season could threaten more communities. Coastal flood risk is projected to increase because of rising sea levels, which threatens coastal infrastructure and buildings. Supports for buildings, roads, and other structures in the north will be increasingly vulnerable to permafrost thaw. Extensive ice-free conditions are projected for Canada's Arctic Ocean.

3 Bush and Lemmen, "Canada's Changing Climate Report."

Human influence has been the dominant cause of climate change.⁴ Greenhouse gases, especially emissions from burning coal, oil, and gas, trap heat before it can radiate to space, resulting in warming of the planet. Removal of forests to create more land for settlements and agriculture reduces the planet's capacity to remove carbon from the atmosphere. The release of soot (black carbon) from vehicle emissions also combines with other pollutants to reduce the amount of sunlight that reaches the earth's surface, cooling the earth somewhat. The processes are complex. Nevertheless, there is a scientific consensus that human activity is the dominant factor driving long-term change in the climate.

In 1992, world leaders met at the Earth Summit. Canada and almost 200 other signatory nations pledged to "stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic [human] interference with the climate system."⁵ Unfortunately, more than 25 years later, there has yet to be a halt in the increase of global emissions. It will take considerable effort to stabilize greenhouse gas concentrations.

Canada's Changing Climate Report concluded that "emissions of greenhouse gases from human activity, particularly carbon dioxide, will largely determine the magnitude of climate change over the next century."⁶ Change in the Canadian climate over the next 15 to 25 years is known with high certainty.⁷ This will be driven largely by emissions released over the past century and by other decisions that have been made by governments, businesses, and individuals. Change in the climate over the longer term, however, depends on emissions that will take place over the next 50 years and beyond. Future climate projections differ little under a range of emissions scenarios when looking ahead over the next 15 to 25 years, but they differ a great deal when looking ahead to the end of the century.

The climate process

"Scientists have understood the basic workings of Earth's climate for almost 200 years...Earth's long-term climate and average temperature are regulated by a balance between energy arriving from the sun...and energy leaving the Earth...When this balance is disrupted in a persistent way, global temperature rises or falls."⁸

The Earth's climate was remarkably stable over the past 10,000 years, following the recovery from the last ice age. Since the 1750s, increasing use of coal, oil, and gas provided much of the energy to power the Industrial Age. The number of people living in the world increased from 1 billion to almost 8 billion, resulting in significant clearing of lands for settlement and food production. The concentration of carbon dioxide in the atmosphere was stable for almost 10,000 years but increased from 280 parts per million (ppm) in the 1750s to more than 400 ppm in 2018, the highest level at any point in at least 800,000 years.⁹ Population growth and greenhouse gas emissions significantly disrupted the natural forces that affect climate.

4 Intergovernmental Panel on Climate Change, "Climate Change 2014: Synthesis Report," 4.

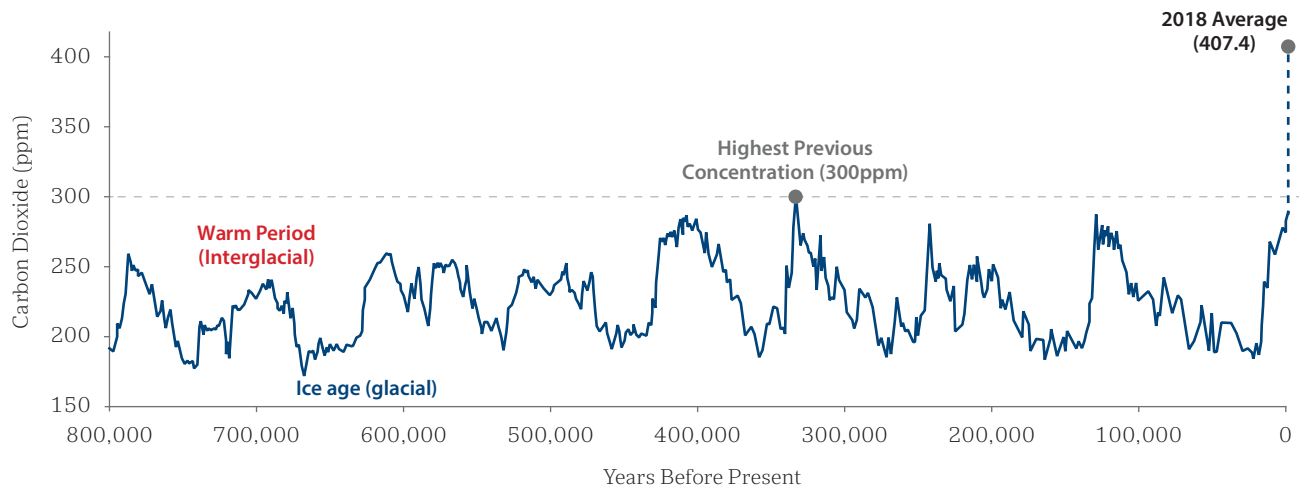
5 United Nations Framework Convention on Climate Change, 4.

6 Bush and Lemmen, "Canada's Changing Climate Report," 160.

7 Ibid., 77.

8 Ibid., 38.

9 Ibid., 46–47.

Graph 1: CO₂ during ice ages and warm periods for the past 800,000 years

Source: NOAA Climate.gov, based on data from Lüthi, D., et al., 2008, provided by NOAA NCEI Paleoclimatology Program.

As early as the 1800s, scientists warned that increased concentration of carbon in the atmosphere from human activity could disrupt the natural greenhouse effect. Radiant heat could be trapped by the atmosphere, unable to escape the planet, and thus the Earth would gradually warm. This would begin with land masses and then extend to the ocean surface and gradually move deeper into the oceans. Natural factors result in considerable variation, but the long-term trend of global warming has been underway for more than a century.

In 1987, the World Commission on Environment and Development report *Our Common Future* identified “environmental trends that threaten to radically alter the planet, that threaten the lives of many species upon it including the human species,” including desertification, climate change, and sea level rise. In 1988, the United Nations established the Intergovernmental Panel on Climate Change to provide an objective, scientific view of climate change, its impacts, and possible response options. In 1990, the first report of the panel was presented as background for the 1992 Earth Summit in Rio de Janeiro, where the United Nations Framework Convention on Climate Change was established.

A description of the fundamental factors that are driving change in the climate were set out in considerable detail in many reports by the Government of Canada, the panel, and others over the past 30 years. There is a scientific consensus about how the climate system works and the need to stop increasing the concentration of greenhouse gases in the atmosphere.

Recent international research demonstrates that warming is driven by the total amount of greenhouse gas emissions released globally since the beginning of the Industrial Age because of the long residency time of carbon dioxide in the atmosphere. This understanding shifted the discussion about climate change beyond the need to reduce annual emissions to now focus on allocation of the global carbon budget.¹⁰ Early and decisive action is needed to transition to a sustainable future.

¹⁰ Ibid., 96–97.

Observed changes

Earth is, on average, almost 1 degree Celsius warmer than it was in the pre-industrial era.¹¹ The last five years (2014 through 2018) were the five warmest ever recorded. Warming was strongest in high northern latitudes and over land. Canada warmed twice as fast as the global average, and northern Canada has warmed three times faster than the global average. Measures affirming that Canada's climate has changed provided in *Canada's Changing Climate Report* are described as "unequivocal, based on robust evidence."¹² Moreover, "additional warming is unavoidable in this century."¹³

Warming is affecting the hydrological cycle. The risk of drought is higher because of increased evaporation with higher temperatures. Rainfall increased around the world because a warmer atmosphere can hold more water vapour. Average annual precipitation in Canada increased by 18.3 percent over the past 65 years; weather stations in northern Canada show an increase in precipitation of 32.5 percent. Precipitation in western Canada fell by 5.9 to 9.0 percent during the winter months, but increased 5.8 to 18.2 percent through the rest of the year. Across the rest of Canada, the data show a 5.1 to 54.0 percent increase in precipitation across all seasons. A growing share of the precipitation in southern Canada fell as rain, not snow, and with warmer spring temperatures this resulted in earlier freshets when the snow cover melts and flows to rivers.

The global mean sea level increased by 1.9 mm a year, on average, between 1901 and 2010. Melt water from glaciers and ice sheets increased the water in oceans. More importantly, oceans expanded in volume as the water warmed. The impact of sea level rise varies considerably across Canada's coasts due to differences in vertical land motion at the coasts related to delayed recovery and uplift since the last ice age. Areas that had the heaviest ice cover, like the Hudson Bay, are rebounding, while land at the edge of the ice cover in Atlantic Canada, Quebec, and southern British Columbia experienced modest uplift or subsidence. Data between 1940 and 2017 show that water levels increased each year, on average, by 3.3 mm in Halifax, 1.9 mm in St. John's, 0.9 mm in Vancouver, and 0.6 mm in Rimouski. Water levels fell by 9.3 mm a year in Churchill and 1.5 mm in Alert, where the land is rising faster than the increase in the sea level. Change in wave heights and reduction in sea ice cover added to the risk of flooding along some of Canada's coastlines.

Sea ice cover is disappearing in Canada's Arctic. Perennial sea ice is being replaced by thinner seasonal ice. Canada's alpine glaciers have also thinned over the past five decades. The temperature of Canada's permafrost increased over the last 30 to 40 years, resulting in increased thawing over large areas.

The climate has changed. There is extensive evidence showing significant and widespread change in the global and Canadian climate. In addition, a continuation of most changes is anticipated as a result of further increases in global population growth and greenhouse gas emissions.

Modelling future change

Canada will become warmer, wetter, and stormier over the next 10 years and beyond. The pace of warming in northern countries like Canada is expected to remain at about twice the global rate. The number of "hot days," when the summer temperature rises above 30 degrees Celsius, will increase. The amount of rainfall will also increase, as will the frequency and severity of extreme rainfall events. The area burned by wildfires will increase. The risk of coastal flooding will increase in Atlantic Canada, eastern Quebec, and southwestern British Columbia with rising local sea levels. There may be an increase in the number of large hurricanes that bring rain and wind to Atlantic Canada, eastern Quebec, and southern Ontario. There may be an increase in hail, tornado, and severe thunderstorm events. There will be a reduction in snowfall across southern Canada. The permanent sea ice cover will effectively disappear in the Arctic. Alpine glaciers will continue to retreat.

11 Ibid. "Canada's Changing Climate Report" provides an extensive, detailed, and current projection of the future climate expected in Canada developed by Canada's leading climate scientists.

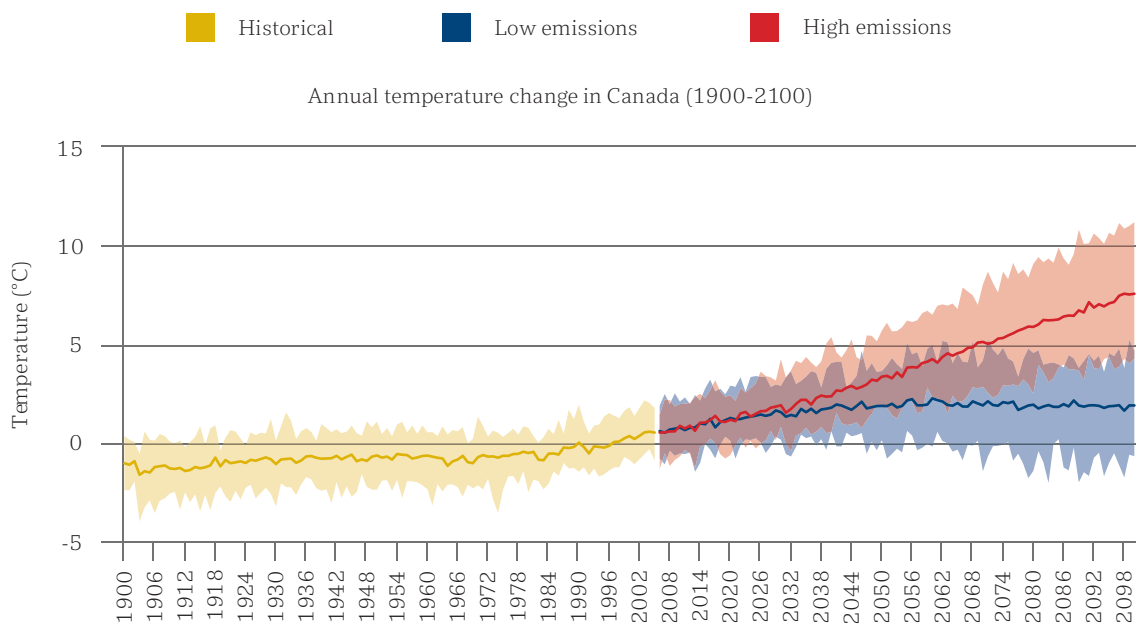
12 Ibid., 28.

13 Ibid., 31.

The pace and extent of change over the next 15 to 25 years will largely be driven by greenhouse gas emissions and land-use decisions that have been made.

Canada will continue to warm at twice the global average rate. The observed average temperature in Canada is projected to increase by 1.5 degrees Celsius over the 2031 through 2050 time period (relative to 1986–2005) under the optimistic, low-emission scenario. A warming of 2.3 degrees Celsius is projected under the pessimistic, high-emission scenario. On average, the temperature is projected to increase by 0.3 to 0.5 degrees every 10 years.¹⁴ Average annual rainfall in Canada is expected to increase by about 1.2 to 1.6 percent every 10 years. The severity of a 50-year extreme 24-hour rainfall event is expected to increase by 1.4 to 2.0 percent. Small changes like these over the next 10 years are predicted with high confidence.

Graph 2: Annual temperature change in Canada



Source: Environment and Climate Change Canada

The change in Canada’s climate through the end of the century will largely be determined by decisions made about global emissions over the next few decades. By late in the century (2081 through 2100), the average annual temperature in Canada is expected to increase by 1.8 to 6.3 degrees Celsius under a low- or high-emissions scenario. The large uncertainty results from the difference between a low-emissions path forward that achieves the reductions in global emissions set out in the Paris Agreement, or a high-emissions future with continued growth in the global population and emissions. Annual rainfall in Canada is projected to increase by 6.8 to 24.2 percent. The severity of a 50-year extreme rainfall event will increase by 7.4 to 24.7 percent. Further differences are expected across the country, with the greatest warming and increase in precipitation expected in the north.

Climate predictions are uncertain because future human behaviour is unknown. Small changes are expected over the next 10 years, but large differences could emerge by the middle or end of the century.

14 Ibid. The warming projections are found on page 132, average precipitation projections on page 167, and annual maximum 24-hour 50-year return value rainfall on page 171.

CLIMATE RISKS: IMPLICATIONS FOR THE INSURANCE INDUSTRY IN CANADA

The global population continues to increase by more than 80 million people each year. Global greenhouse gas emissions increased in 2018 to record high levels despite more than 30 years of discussion about the need to reduce emissions. A path to climate stability has been identified. It requires an aggressive international effort to transition to a low-carbon future, and there are many signals that this may not happen.

Extreme events

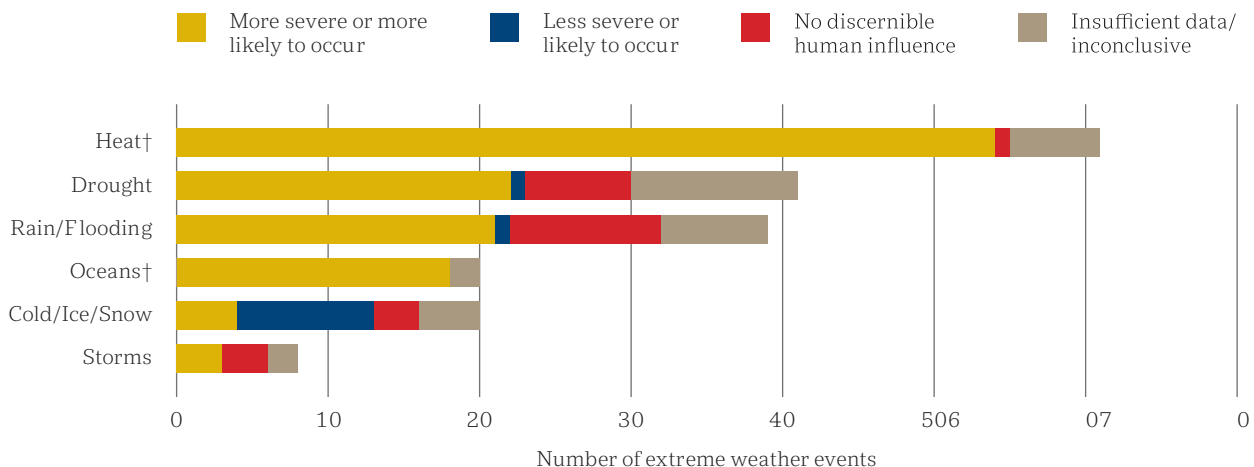
Extreme or catastrophic hazards are, by definition, rare events. Low probability, high-consequence events occur seldom over periods of hundreds of years. The study of extremes is limited by the need for long-term observational records. Moreover, much of the observed change in the climate in Canada and globally from longer-term trends occurred over the past 30 to 50 years, a relatively short period of time for the study of extremes. The absence of data increases the difficulty of assessing the link between change in the climate and change in the frequency or severity of extreme hazards.

Attribution science is a new branch of climate science. “Event attribution...evaluates how the probability or intensity of an extreme event, or more generally, a class of extreme events, has changed as a result of increases in atmospheric GHGs [greenhouse gases] from human activity.”¹⁵ Climate models and historic information are used to assess the likelihood and intensity of an event. Attribution analysis is repeated in a computer simulation removing the impact of greenhouse gas emissions on the climate. This approach found, for example, that it was six times more likely that the fire weather index reached an extreme rating before the wildfire in Fort McMurray as a result of climate change. Research also found that the number of burn days increased as a result of climate change.

Attribution science finds that change in the climate contributed to the likelihood that the fire happened in Fort McMurray and also contributed to the severity of the loss.

Graph 3: Attribution science

Researchers have published more than 170 studies examining the role of human-induced climate change in 190 extreme weather events



Source: Studies from 2004-18 collated by *Nature* and *Carbon Brief*.

†Heat includes heatwaves and wildfires; Oceans includes studies on marine heat, coral bleaching and marine-ecosystem disruption.

15 Ibid., 174–182.

Average annual rainfall is observed to have increased in Canada and globally. “On the global scale, observations indicate an increase in extreme precipitation associated with warming.”¹⁶ This is consistent with basic physics: A warmer atmosphere can hold more water vapour. However, “there do not appear to be detectable trends in short-duration extreme precipitation in Canada...This seems to be inconsistent with global trends.” The expert community is confident that there will be increases in extreme rainfall events in Canada as the climate continues to warm because of the physical relationship between a warming climate and atmospheric moisture-holding capacity.

More weather stations in Canada report an increase in short-duration extreme rainfall than stations reporting a decrease, but there is no overall national trend in the observations. *Canada's Changing Climate Report* finds that “The lack of a detectable change in extreme precipitation in Canada is not necessarily evidence of a lack of change. On the one hand, this is inconsistent with the observed increase in mean precipitation. As the variance of precipitation is proportional to the mean, and as there is a significant increase in mean precipitation, one would expect to see an increase in extreme precipitation. On the other hand, the expected change in response to warming may be small when compared to natural internal variability.”¹⁷

On a global scale, the median increase in extreme precipitation is about 7 percent for each 1 degree Celsius increase in the global mean temperature. This is due to the increase in the water-holding capacity of the atmosphere due to warming. Warming in Canada was twice the global average so a significant increase in the frequency and severity of extreme rainfall events was expected. Weather stations in the United States that are close to Canada observe an increase in average and extreme precipitation.¹⁸ It is puzzling that there is not yet an observed increase in reported extreme rainfall events in Canada or an increase in the severity of extreme rainfall.

The Government of Canada operates more than 2,500 weather stations. Some rainfall records extend back for more than a century, but only a few hundred stations provide long-term observations measuring rainfall. Equipment and methods used to collect rainfall data have changed, including replacement of manned stations with automated observation. “In general, there is insufficient station density to compute national average precipitation with desirable accuracy.”¹⁹ Low station density and an absence of long-term observations increases the difficulty of measuring the change that has taken place in rainfall, particularly at the local level. Analysts apply computational measures to estimate national and regional observed trends, but data constraints increase the difficulty of confidently assessing trends in extreme rainfall and local trends.

There is consensus that global warming will increase the risk of loss from wildfires across Canada. Observations show a trend of increased area burned, but there is large variation in the data. Occasional large fires increase the difficulty in determining a clear trend. Moreover, the area burned depends on the response of firefighters. More than 97 percent of wildland fire ignitions result in less than 200 hectares burned because they are quickly suppressed. Some fires are allowed to burn because they are in remote locations or escape initial attack and account for most of the area burned.

16 Ibid. See pages 168–173 for a detailed discussion about extreme precipitation observations and projections.

17 Ibid., 168.

18 Barbero et al., “Is the Intensification of Precipitation Extremes with Global Warming Better Detected at Hourly than Daily Resolutions?”

19 Bush and Lemmen, “Canada’s Changing Climate Report,” 156.

Table 1: Event attribution analyses relevant to Canada

Event	Brief overview of conclusions
Drought 2015 drought in western Canada	Anthropogenic climate change increased likelihood of extremely warm spring but no contribution to the observed weather pattern was detected. (Szeto et al., 2016)
Flooding 2014 flooding in southeast Prairies	Anthropogenic influence may have increased rainfall, but landscape modification played a key role in increased runoff. (Szeto et al., 2015)
2013 Alberta floods	Increased likelihood of extreme rainfall in this region due to the anthropogenic component; no anthropogenic influence detected for runoff. (Teufel et al., 2017)
Cold extremes Cold February 2015 in North America	Determined event was mainly due to natural variability, although there might have been some contribution from decreased Arctic sea ice and increased sea surface temperatures. (Bellprat et al., 2016)
Extreme cold winter of 2013/2014 in North America	Suggest warming trend made event less extreme than it might have been. (Yu and Zhang, 2015)
Extreme cold winter of 2013/2014	Extreme cold events have become much less likely due to the long-term, anthropogenic warming trend. (Wolter et al., 2015)
Warm extremes November/December 2016 extreme warm Arctic temperatures	Extremely warm Arctic temperatures most likely would not have occurred without the anthropogenic contribution. (Kam et al., 2017)
2014 extreme warm temperatures in eastern Pacific and western Atlantic	Extreme warm temperatures over the eastern Pacific and western Atlantic considerably more likely with the anthropogenic component. (Kam et al., 2015)
Arctic sea ice 2012 record minimum sea ice extent	Record minimum in summer Arctic sea ice extent would not have occurred without the anthropogenic contribution. (Kirchmeier-Young et al., 2017)
March 2015 record low sea ice extent	The observed sea ice extent would not have occurred without the underlying climate change influence. (Fučkar et al., 2016)
2012 record minimum sea ice extent	Record minimum in summer Arctic sea ice extent extremely unlikely to be due to internal variability. (Zhang and Knutson, 2013)
Wildfires 2016 Fort McMurray wildfire	Anthropogenic contribution increased likelihood of extreme wildfire risk and the length of fire seasons. (Kirchmeier-Young et al., 2017) Anthropogenic contribution increased likelihood of extreme vapour pressure deficits, which increase fire risk. (Tett et al., 2017)
2015 Alaska wildfire season	Anthropogenic contribution increased likelihood of extreme wildfire risk. (Partain et al., 2016)

Source: Bush and Lemmen, "Canada's Changing Climate Report," 175-176.

The total area burned by wildfire more than doubled over the past 50 years, with considerable variation about the trend. The number and average severity of large fires increased. Climate change is expected to increase the risk of wildfire. Climate projections warn of an increase in the risk of hot, dry, and windy conditions in most forested zones across Canada. Climate projections anticipate an increase in fire spread days, extreme fire weather conditions, and the length of the fire season. Some studies show the largest changes in western Canada.²⁰

The present understanding of the climate indicates that there may be some increase in the intensity of extreme Atlantic hurricanes in a warmer world, including more precipitation and severe winds in very strong events.²¹ "Model projections of late-summer and autumn storms off Atlantic Canada suggest a slight northward shift in storm tracks and a modest reduction in the intensities of storms, although extreme storms may have increased intensity."²² Sustained winds have resulted in damage to buildings and infrastructure. Water damage and flooding typically were more extensive in Canada than wind damage. Long-term cycles in Atlantic hurricane activity resulting from changes in ocean currents appear to be more pronounced than evidence of the impact of climate change on the frequency and severity of hurricane activity.

Climate science anticipates an increase in the frequency and intensity of severe thunderstorms and storms that can bring tornadoes, hail, and severe wind.²³ This is most likely over regions that are currently prone to these hazards. In recent years, tornado activity has become more variable across North America, with an increase in the number of tornadoes when an outbreak is observed and a decrease in the number of days each year with tornadoes. There are not sufficient observations nor is the capacity of climate models' ability to predict the likelihood or impact of future events reliable enough, but the expectation is that there will likely be some increase in the number of events over the next 10 years, and possibly a large increase through the rest of the century.

Implications for the insurance industry

Most Canadians can cope with minor climate events. Buildings, infrastructure, and behaviour have evolved to successfully cope with a broad range of common weather and climate risks. The risk of loss and property damage primarily results from extreme events. Extreme events have resulted in loss of life, injury, property damage, and disruption of economic activity.

Observed changes in the climate have contributed to increased losses in Canada from extreme events. Anticipated change in the climate will further increase the risk of loss unless current risk management practices improve.

Extreme heat will increasingly threaten loss of life in urban centres. Increased frequency and severity of extreme rainfall events will occasionally overwhelm aging sewer systems and flood basements. Greater areas burned by wildfires will increase the risk that the fire will reach a community. Rising sea level increases the risk of damage to buildings and infrastructure near the coast. There may be an increase in frequency of severe hurricanes and tornadoes, and there may be some change in the locations that experience severe wind events.

20 Ibid., 172–173.

21 Kossin et al., "Extreme Storms," 258.

22 Bush and Lemmen, "Canada's Changing Climate Report," 377.

23 Kossin et al., "Extreme Storms," 262–264.

CLIMATE RISKS: IMPLICATIONS FOR THE INSURANCE INDUSTRY IN CANADA

Extreme events, by definition, are rare. However, climate science warns that changes in many long-term averages will likely be accompanied by changes in the frequency and severity of extreme events. Changes in extremes will be modest over the near term, but could be significant over longer periods.

The greatest uncertainty in climate models involves predictions about longer-term trends, local conditions, and extreme events. Many of the extreme climate-related risks of interest to the insurance industry are expected to increase in frequency and severity, but extreme events are subject to considerable uncertainty. It is possible for low-probability, high-consequence events to occur at any time, given natural variability in the weather.

Change in the average temperature and rainfall over the next 10 years is known with great certainty, and it will be modest. Change over the next 50 to 100 years depends on global population growth and decisions made about current emissions.

It is possible that the climate will stabilize over the next 25 years to achieve the targets set out in the Paris Agreement, but many are concerned that this will not happen. Catastrophic change is also possible, resulting in climate risks that become uninsurable in 50 or 100 years. Awareness of national and international action to address climate change will be of growing importance to the insurance industry in Canada.



Why is an increase in physical damage expected?

"We did not come to fear the future. We came here to shape it."

Barack Obama

The Global Risks Report 2019, published by the World Economic Forum, identifies increased risk of physical damage from extreme weather as the top issue facing society over the next 10 years.²⁴ The insurance industry is at the forefront of managing this risk. It is certain that the climate will change, but there is uncertainty about future severe weather losses. Three primary factors are expected to drive the increase in physical damage risk:

EXPOSURE

The number of people who live, work, and play in zones of high and rising risk is expected to grow. This includes more buildings at risk of damage from urban, riverine, and coastal flooding. Also, there continues to be rapid growth in the number of people and businesses located in the wildland–urban interface at risk of damage from wildfire. Moreover, there is a growing concentration of values in major urban centres at risk of damage from intense rainfall, severe wind, hail, and winter storms. Urban planners champion densification and urbanization, resulting in a growing concentration of risk and increased risk of correlated losses. Changes in exposure mean that large loss events will become larger.



24 World Economic Forum, "Global Risks Report 2019," 5.

VULNERABILITY



Much of Canada's critical infrastructure is increasingly unable to provide the high level of service experienced over the past few decades. These systems were designed to anticipate historic, moderate weather events. They frequently have been overwhelmed by recent extreme events. In addition, most systems were not designed to support populations that have grown over time. Some systems remain in operation despite exceeding their expected lifetime, as measured by agencies like Statistics Canada. Moreover, homes and other buildings are aging. Homeowners report that older structures are in need of repair. Research finds that older structures are more likely to experience damage from extreme events. Maintenance and repair spending are often inadequate, increasing society's vulnerability to loss from extreme events. Canadians are increasingly vulnerable and unable to cope with climate risks, particularly extreme events.

EXTREME WEATHER



The climate is changing. Intense rainfall events that overwhelm storm and sewer systems are expected to increase in frequency and severity. The area burned by wildfire is expected to increase as climate change brings increased periods of drought, a possible increase in lightning strikes, and conditions that support infestations that erode the health of forests. Rising sea levels threaten to flood buildings and infrastructure located near the coast in British Columbia and eastern Canada.

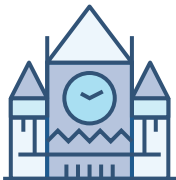
These trends are well established. Increasing exposure, vulnerability, and extreme weather have been evident for several decades. Over the next 10 years, four factors may accelerate or mitigate the trend of rising losses:

HOMEOWNER ACTION



It is possible that property owners may take action to protect their property. Homeowners can reduce the risk of basement flooding if they install a backwater valve or sump pump and ensure their lot is properly graded. Homeowners can reduce the risk of damage from wildfire if they remove vegetation that can burn away from buildings and install a fire-resistant roof, deck, and siding. Appropriate financial incentives and public awareness could significantly increase the number of property owners who work to protect their homes. Property owners have the potential to mobilize quickly and act to better protect their property. Very few property owners made these changes in the past, but this could change.

GOVERNMENT ACTION



Governments primarily respond when disaster strikes and then help rebuild public infrastructure damaged by disasters. It would benefit society if governments actively invest in loss reduction strategies and provide incentives to homeowners and businesses for implementing them. Studies find that each dollar invested in loss mitigation results in three to seven dollars in savings.²⁵ The current trend of rising damage from flooding, wildfire, and other hazards could be reduced if governments invest in prevention and mitigation. Governments could buy out or protect properties located in zones of high risk and build flood defence infrastructure. They could modernize the sewer systems and protect critical public infrastructure. There are some examples when this did happen over the past 30 years, but history warns that public action will likely be insufficient and meaningful change will likely take time.

25 Multihazard Mitigation Council, "Natural Hazards Mitigation Saves," 1.

RISK PREVENTION



The longer-term foundation for disaster resilience requires a commitment to preventing risk creation. Governments should prohibit new development in zones of high risk. Building codes and standards can be used to ensure that the next generation of structures are designed and built to withstand the expected climate extremes through 2100 and beyond. There would be little impact over the next 10 years, but over time a commitment to preventing risk creation will significantly reduce the future risk of loss. Recent efforts to develop new building codes and climate standards are encouraging, while growth in the number of homes and commercial buildings in zones of risk is discouraging.

POST-DISASTER RECOVERY



Significant, perhaps even transformative, improvement in resilience to future losses can be achieved during recovery from large loss events. Governments, insurers, and property owners can build better and smarter structures following loss events. Advanced planning is required before the hazard strikes to realize the opportunity when it arises, because the public and political window of support often closes after 12 to 18 months.

In November 2018, 16 of the leading insurance companies partnered with the United Nations' Environment Programme to develop "a new generation of risk assessment tools to enable the insurance industry to better understand the impacts of climate change on their business."²⁶ The companies involved include Intact Financial, The Co-Operators and TD Insurance. "This initiative will focus on the assessment of climate risks in their core insurance portfolios and products." It will "incorporate the latest scenario analysis to assess physical and transition risk in insurance portfolios. Insurance coverage incentivises risk reduction, puts a price on risk, de-risks investments and serves as a financial shock absorber for communities, businesses and governments." This is a welcome and encouraging discussion.

Options exist to break the trend of rising severe weather damage, but these were seldom implemented over the past 30 to 40 years. Most expect that the risk of physical damage will continue to grow.

More people and assets are exposed to risk

Some of the largest loss events in the world have involved hurricanes striking New Orleans, Houston, New York, and Miami. Hurricane risk has always been present in these communities. Population growth and aggressive coastal development increased the exposure of these communities to loss and damage. Some studies find that all of the increase in hurricane damage over the past 50 years was the result of more people and property located in areas of risk. The evidence is unclear if the vulnerability of buildings and infrastructure is greater or reduced, on average. There is debate if the number and size of hurricanes making landfall has increased. It is clear, nevertheless, that more people and property are exposed to hurricanes.

Similar research has not been completed for Canada to assess the importance of changes in exposure for the increase in severe weather losses. Some examples suggest that increased exposure is important in Canada. Indeed, increased exposure was likely the largest factor that contributed to the observed increase in severe weather claims paid by Canada's insurers.

Several hundred wildfires burn in northeastern Alberta each year. In 1970, after the first oil sands production facility opened in Fort McMurray, the population in the region was 7,000.²⁷ By 2016, the population had grown to more than 125,000 people, driven by the expansion of the oil sands industry. Fort McMurray is now the largest community in northern Canada. Prior to the collapse in oil prices, the population was expected to grow to 205,000 by 2028. The value of oil production facilities, the housing stock, and local infrastructure increased remarkably. Losses resulting from the 2016 wildfire were large because of the number of people and assets now located in the boreal forest in northeastern Alberta.

²⁶ United Nations, "UNEP FI working with 16 global insurers."

²⁷ Kovacs et al., "Fort McMurray."

Many communities across Canada are growing rapidly, increasing the risk of large loss events. The number of people living in the Greater Toronto Area grew from 1.5 million to almost almost 6.5 million since Hurricane Hazel struck in 1954.²⁸ The number of people living in the Montreal metropolitan area increased from 3.1 million to 4.2 million since the 1998 ice storm. The population in Metro Vancouver increased from 0.5 million to 2.6 million since the 1948 floods. Historic extreme events would likely result in greater damage if they were to strike today because of the increase in the number of people and property values. The same hazards result in more losses because of increased exposure.

Table 2: Population growth by census metropolitan area (CMA) - population estimates rounded up to closest 1,000

CMA	1971	2018	Percentage change
Toronto	2,700,000	6,342,000	134.9
Montreal	2,824,000	4,256,000	50.7
Vancouver	1,083,000	2,651,000	144.8
Calgary	419,000	1,487,000	254.9
Edmonton	531,000	1,421,000	167.6
Ottawa - Gatineau	648,000	1,415,000	118.4
Winnipeg	564,000	833,000	47.7
Quebec	513,000	818,000	59.5
Hamilton	504,000	787,000	56.2
Kitchener - Cambridge - Waterloo	239,000	568,000	137.7
London	308,000	533,000	73.1
Halifax	261,000	431,000	65.1
St. Catharines - Niagara	324,000	430,000	32.7
Oshawa	148,000	406,000	174.3
Victoria	200,000	396,000	98.0
Windsor	260,000	350,000	34.6
Saskatoon	141,000	323,000	129.1
Regina	147,000	258,000	75.5
Sherbrooke	130,000	219,000	68.5
St. John's	133,000	213,000	60.2

Source: Statistics Canada, 2016 census data used for 2018 estimates; special tabulation of data for the 1971 estimates based on 2011 boundaries.

In 1867, less than 17 percent of Canadians were living in urban areas.²⁹ By 1990, this had grown to 78 percent. Today, more than 81 percent of Canadians live in urban communities, but this transition is now largely complete. Urban planners facilitate urbanization and often promote densification, with property values concentrated into a small footprint. Hazards are more likely to result in large losses if they strike a dense, urban centre. The risk of large loss events continues to increase as a result of densification.

Provincial and territorial governments assigned local and regional governments across Canada the responsibility of protecting the health and safety of their citizens. Communities enact local development by-laws and provide town plans to regulate future development.³⁰ Legislative powers are in place empowering communities to direct future development, so it does not increase the risk of loss from flood, wildfire, and other hazards. This can include prohibiting development in zones of high risk or requiring additional safety elements.

Since 1990, Statistics Canada reports that the population of Canada increased by almost 10 million and the value of buildings, infrastructure, and other non-financial assets increased fivefold. Canada is a large country, but most of this growth is concentrated in a few urban centres that are exposed to the risk of loss from a variety of hazards. Increasing exposure is likely the primary factor leading to increased severe weather damage over the past 30 to 40 years, and this is expected to continue over the next 10 years.

28 Statistics Canada, "Canada's Population Estimates."

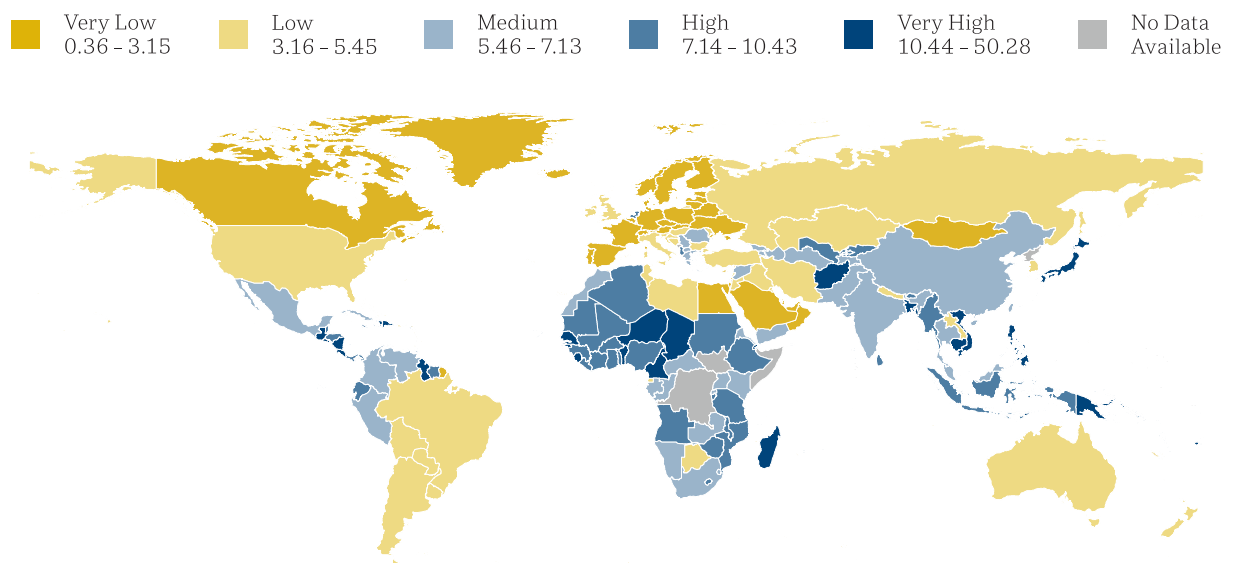
29 Statistics Canada, "Canada Goes Urban."

30 Kovacs, "Development Permits."

Vulnerability

Flood, wildfire, and wind damage have increased. Nevertheless, measured as a share of economic activity, disaster losses in Canada are among the lowest in the world.³¹ Indeed, Canada is ranked very low in vulnerability and susceptibility and high in coping capacity and adaptive capacity in the 2018 *World Risk Report*. Losses in Canada were similar to those experienced in the United Kingdom, Germany, and France. Losses were higher in the United States and Japan. The largest disaster losses were found in Southeast Asia and Africa. Differences between the countries in the risk of property damage is significant. Even larger differences are found in the number of fatalities and injuries, a risk that has largely been eliminated in Canada. Vulnerability measures, like average income and the state of public infrastructure, are important determinants of the risk of loss from severe weather events.

Graph 4: *World Risk Index as the result of exposure and vulnerability*



Source: Bündnis Entwicklung Hilft/ IFHV (2018): World Risk Report 2018. Berlin: Bündnis Entwicklung Hilft

Canada is an affluent country. Most homeowners, businesses, and governments have access to disaster safety knowledge and sufficient financial resources so they can invest in safe homes. Some safe construction practices are mandated in building codes and construction standards. Builders and engineers typically construct buildings and infrastructure that exceed minimum requirements. Thousands of hazards strike each year, and most are an inconvenience and result in no direct damage. Canadians have adapted to cope with most minor climate risks. The risk of loss and damage is greatest for extreme events.

31 Mucke, "World Risk Report 2018," 51. There are 150 other countries that are found to have higher risk of loss from disasters than Canada.

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New buildings and infrastructure are less likely to experience losses from severe weather events. Canadians report, however, that they underinvest in maintenance and upkeep. The National Household Survey by Statistics Canada found that 4.3 million dwellings in Canada are in need of repairs.³² This is about one-third (32 percent) of the homes owned in Canada. Few (8 percent) of the homes built in the past 10 years are in need of repair, but half (47 percent) of the homes built more than 50 years ago need repair.

Public infrastructure demonstrates similar issues. New systems are more likely to perform as designed, but older systems sometimes fail. Some systems, like storm sewers, remain in service well beyond their planned operating lifetime, and many systems are not properly maintained. Canada has a significant infrastructure gap. The level of service provided by public infrastructure today is seldom what was experienced 30 or 40 years ago. “The exact magnitude of Canada’s infrastructure gap is difficult to assess, but it is estimated to be between \$150 billion and \$1 trillion. The federal commitment of \$180 billion over the next ten years is a critical action from the public sector. While this sum vastly increases the historical infrastructure budget, it is likely not enough to close the funding gap. . . . Nearly 98% of infrastructure assets are owned by provinces and municipalities.”³³ The risk of failure and poor performance of current systems is likely to continue.

Over the last 40 years, some national measures of vulnerability have improved. For example, the quality of new home construction and average incomes have increased. Other measures, however, have deteriorated, like the state of Canada’s public infrastructure. The trend in Canada’s vulnerability to loss from disasters is not clear, but society’s overall capacity to cope with extreme events appears to be deteriorating. Important differences in vulnerability are evident across the country and within major cities. The impact of the wildfire in Fort McMurray in 2016 and the flood in Calgary in 2013, for example, differed across the community in part because of differences in the capacity of individuals to cope with a major shock.

Increasing vulnerability contributed to rising severe weather losses. Importantly, Canada’s public infrastructure is increasingly unable to provide the expected level of service and protection. Over the next 10 years, this risk is expected to increase.

More frequent and severe weather hazard events

Climate experts warn that global warming will change the frequency and severity of extreme weather events across Canada. There will be more days in the summer when it is dangerously hot, more extreme rainfall events, an increased risk of coastal flooding as sea levels rise, and fewer very cold days in the winter.

Projected change in climate extremes may be significant over the next 50 to 100 years and beyond. Worst-case scenarios are catastrophic for humankind, with uncontrolled warming. Optimists, on the other hand, have set out a path where global warming is held below 2 degrees Celsius, limiting the impact change will have on extreme events.

There is great uncertainty about the future climate and climate extremes over the long term. The different predictions depend on assumptions about consumer behaviour, population growth, energy use, emerging technology, carbon taxes, and emissions regulations. Decisions made over the next 10 years will greatly impact the climate over the longer term.

Canada’s climate 10 years from now is known with great certainty. The global average temperature will increase by about 0.2 degree Celsius. Warming will be twice as fast in Canada, near 0.4 degrees Celsius. The average rainfall in Canada will increase by 1.4 percent. The sea level near Vancouver will rise by 9 mm. Most change in the climate over the next 10 years will be similar to the change recorded over the last 10 years—small but persistent. Measures of change will continue to be overwhelmed by the natural volatility in the climate. El Nino, the Polar Vortex, the Pineapple Express, Chinook winds, and some Atlantic hurricanes will occasionally disrupt expectations about the weather. In addition, over the next 10 years several

32 Canadian Mortgage and Housing Corporation, “Canadian Housing Observer 2014,” Table 9, 261.

33 Canada, “Expert Panel on Sustainable Finance—Interim Report,” 22.

severe weather events will take place at random across the country. The likelihood and severity of extreme events will increase somewhat, but the impact attributable to climate change will remain uncertain.

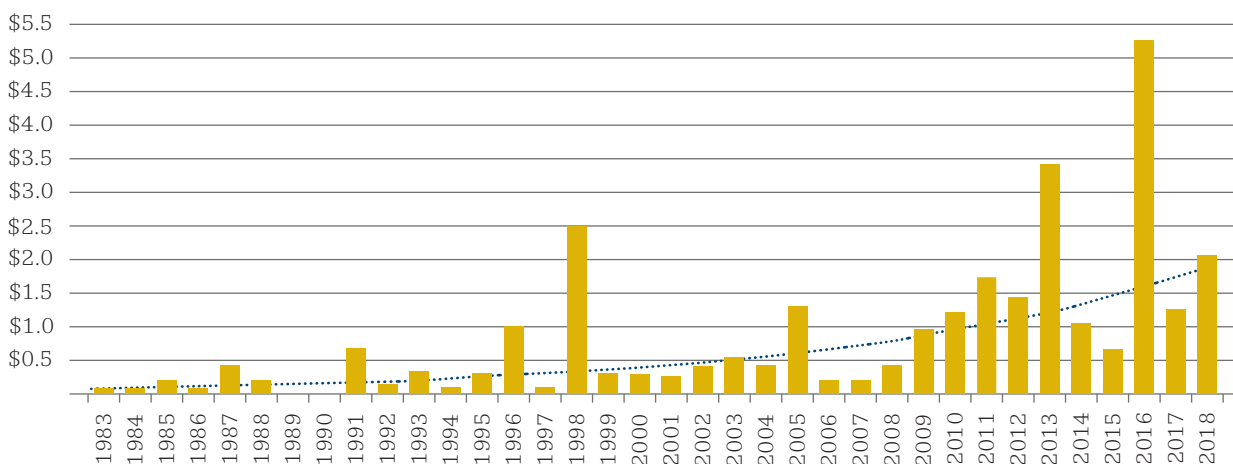
Exposure, vulnerability, and natural volatility have been the primary drivers resulting in increased severe weather damage over the past 30 to 40 years. This will continue over the next 10 years. Change in the climate and a dramatic increase in the frequency and severity of extreme events is possible and perhaps likely over the next 50 to 100 years. Failure to stabilize the climate threatens widespread losses. Climate change may, over the longer term, overwhelm concerns about exposure and vulnerability.

Implications for the insurance industry

The risk of physical damage from severe weather is increasing. Much of the risk of physical damage to homes and businesses in Canada is covered by the insurance industry. More than 70 percent of the direct damage from the wildfire in Fort McMurray in 2016 was covered by insurance, 40 percent of the damage from the 2013 Calgary flood (before residential flood insurance was available), 65 percent of the damage from urban flooding in Toronto in 2013, and perhaps 65 percent of the tornado damage in Ottawa in 2018.³⁴ The major climate hazards largely not covered by the industry are homes at high risk of riverine and coastal flooding, and buildings vulnerable to slow onset events like thawing permafrost.

Graph 5: Insured catastrophic losses for property and casualty insurance sector, Canada (1983-2018)

Loss + loss adjustment expenses in 2018 dollars



Source: 1983 to 2007: IBC, PCS Canada, Swiss Re and Deloitte; 2008 -2018: CatIQ

34 Swiss Re Institute, "Natural Catastrophes and Man-Made Disasters in 2016." See pages 7 and 8 for a discussion about Fort McMurray and the 2013 report for estimates for the Calgary and Toronto floods.

CLIMATE RISKS: IMPLICATIONS FOR THE INSURANCE INDUSTRY IN CANADA

Severe weather and other climate-related claims paid by the insurance industry have increased significantly due to more people and values exposed to risk, aging infrastructure, and an increase in the frequency and severity of extreme weather. Insurers should expect these trends to continue over the next 10 years.

Increased exposure and vulnerability were the primary factors driving losses higher. This could change over the next 10 years, but these trends are well established. The climate may change dramatically over the next 50 to 100 years, but change over the next 10 years will be small relative to the likely increase in exposure and vulnerability. Natural volatility in the climate will bring occasional extreme events that trigger losses.

Climate experts cannot predict the number of extreme events that will strike over the next 10 years, but the insurance industry can prepare by using loss models and scenario testing. The next major disaster will be a catastrophe for the families impacted, but it should not surprise insurance companies committed to demonstrating financial and operational preparedness for extreme events.



Will anyone be found liable for climate impacts?

"Look at the word responsibility—response-ability—the ability to choose your response."

Steven Covey

The climate is changing, but who is responsible? Natural variability is always present. With time, however, observations and analysis have determined that growth in the population and greenhouse gas emissions are the predominant factors driving global warming and long-term change in the climate. Over the past decade, there has been a significant increase in legal actions seeking to hold corporations and governments liable for the consequences of climate change and severe weather events.

There have been very few legal actions in Canada dealing with climate issues, and these actions targeted governments. Legal actions are taking place in other places around the world, but the vast majority are in the United States. The number of actions and the range of issues addressed increased significantly over the last 10 years.

Actions in the United States and elsewhere have implications for Canada. Rights-based rulings in the Netherlands and Pakistan forcing political action led to similar cases coming before the courts in a number of other countries, including Canada.

Major emitters of greenhouse gas emissions have never been found liable for the impacts of severe weather and climate change. New information has recently been included in legal actions. Data are now available to measure historic emissions by the Carbon Majors, companies that account for most of the industrial emissions of greenhouse gases. These data are being used to target large emitters in the courts. Also, attribution science has emerged as a new discipline. Climate scientists assess major events to determine if they were affected by climate change. Information about attribution was not previously available.

Climate liability remains uncertain. It introduces investment risk and perhaps coverage uncertainty for insurers. Over the next 10 years, rulings in Canada and elsewhere will likely bring some greater clarity about legal liability for climate risks. Corporations have not been found liable for the impact of their emissions, but this could change. The courts have ruled that governments, not courts, should make policy decisions, but rights-based actions have succeeded in forcing policy responses in some other countries and are being tested in Canadian courts.

Humans are changing the climate

The most recent scientific consensus reported by the Intergovernmental Panel on Climate Change described the evidence of global warming as “unequivocal.”³⁵ Greenhouse gas emissions and land-use choices by humans were found to be the “dominant cause of the observed warming.”³⁶ The Intergovernmental Panel on Climate Change was established by the United Nations in 1988 and works to provide an objective assessment of the science of climate change, its impacts, and response options. The vast majority of the international scientific community support the panel’s finding that change in the climate is the result of human actions, primarily through the emission of greenhouse gases. “The consensus that humans are causing recent warming is shared by 90%–100% of published scientists according to six independent studies...and are consistent with the 97% consensus reported by Cook et al. based on 11,944 abstracts of research papers...A survey of the authors of those papers also supported a 97% consensus...The level of scientific agreement...is overwhelmingly high because the supporting evidence is overwhelmingly strong.”³⁷

Evidence of change in the climate is widely observed. The debate over the past 30 years focused on attribution. Is the observed change due to natural or human factors? Attribution is difficult given a number of natural factors contributing to considerable variability in observed climate measures. It is warmer during the day than at night. It is warmer in the summer than in the winter. The risk of wildfire, flooding, ice storms, tornadoes, and hurricanes varies through the seasons. Shifts in the oceans result in oscillations in the climate, like El Nino, through phases that last two to seven years. Hurricanes and drought are affected by long-term cycles. Large eruptions from volcanoes disrupt atmospheric systems and cool the planet over several years. Ice ages are the result of Milankovitch cycles over 95,000 to 125,000 years that bring Earth closer to and farther away from the sun.

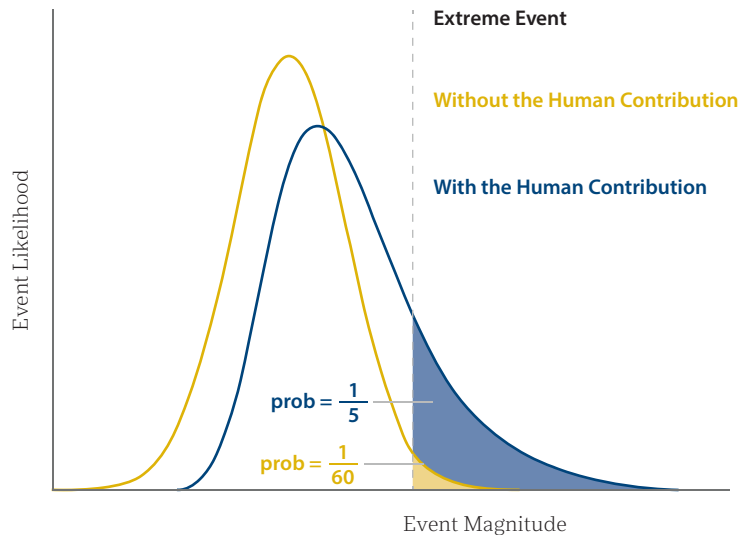
35 Intergovernmental Panel on Climate Change, “Climate Change 2014: Synthesis Report,” 4.

36 Ibid., 2.

37 Cook et al., “Consensus on Consensus,” 1, 6.

Graph 6: Hypothetical illustration of event attribution

The yellow distribution represents the possible values of a climate variable in a world without a human influence. The blue distribution represents the possible values of the same variable in a world with the human contribution.



Source: Produced by the Pacific Climate Impacts Consortium (PCIC); Bush and Lemmen, "Canada's Changing Climate Report," 178. © Her Majesty the Queen in Right of Canada, as represented by the Minister of the Environment, 2019

Over the past 30 years, climate models demonstrated their capacity to distinguish between natural forces and the impact of humans. The models find that most of the warming of the planet, loss of sea ice cover, changing rainfall, and other climate measures can be attributed to human causes. There is mounting evidence of a growing gap between weather observations and historic experience that can only be explained by a significant and increasing human intervention.³⁸ Models that prove humans are changing the climate also support warnings that significant further change lies ahead. The extent of further change in the climate depends on the choices made by humans. It is possible to keep global warming to less than 2 degrees Celsius, but this requires aggressive global action to reduce emissions, an outcome that will be very difficult. Human choices are changing the climate and will determine the severity of the change ahead.

Corporate responsibility

Recently, there has been an increase in legal action directed at private companies.³⁹ We are not aware of any cases yet in Canada, but several are under consideration here and many are underway in the United States and elsewhere that may have implications for Canada. Three issues that may arise include liability for the impact of climate change and severe weather, liability for failure to adapt critical infrastructure, and potential disclosure liability.

No company, because of its emissions, has been found liable for damages resulting from severe weather or other climate risks.⁴⁰ Challenges in the courts did not succeed. New information, however, is changing the conversation about corporate liability and responsibility. Failure to prove emitters were liable does not mean that emitters will not be found liable in the future. A database now reports historic emissions by major emitters, serving to direct the discussion about liability toward a few large organizations. Also, the new field of attribution science has emerged to assess the impact of climate change on a specific loss event. Several legal cases were recently launched in the United States and may come to Canada seeking to recover expenses incurred. Actions seeking to find corporations liable for the consequences of climate change and severe weather are expected to increase.

38 Bush and Lemmen, "Canada's Changing Climate Report."

39 Burger and Gundlach, "The Status of Climate Change Litigation."

40 Ibid.

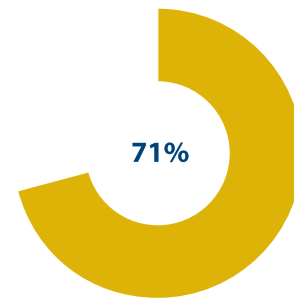
In 2013, Richard Heede, director of the Climate Accountability Institute, created the Carbon Majors Database.⁴¹ Dr. Heede identifies the world's largest emitters of greenhouse gas emissions and provides measures of their annual emissions that now extend back to 1751. CDP (formerly known as the Carbon Disclosure Project) assessed the Carbon Majors Database and found that "over half of global industrial emission since human-induced climate change was officially recognized [in 1998] can be traced to just 25 corporate and state producing entities."⁴² The 100 largest fossil fuel producers accounted for 71 percent of global industrial emissions. This includes 32 public investor-owned, 9 privately-owned, and 59 state-owned producers.

ExxonMobil, Shell, BP, and Chevron are the largest of the investor-owned "companies most affected by the prospect of climate change regulation, which presents myriad risks and opportunities to their future prosperity."⁴³ The report identifies Suncor as the oil and gas company with the highest greenhouse gas emissions intensity in the world.⁴⁴ Several recent legal actions in the United States seek compensation from the major emitters for costs incurred as a result of climate change. Identification of the major emitters coincided with the emergence of a new field of event attribution.⁴⁵

The impact of climate change has been assessed for a number of international severe weather events. Canadian research, for example, finds that change in the climate contributed to the Fort McMurray wildfire. A climate model was used to assess the likelihood of extreme fire danger conditions like those experienced in northeastern Alberta in May 2016. The analysis was modelled using actual global greenhouse gas emissions and a simulation assuming no emissions. The study found that emissions increased the likelihood of extreme fire weather index readings by sixfold, the number of spread days threefold, and the longer (and earlier) fire season more than threefold. The study concludes that the losses resulting from the Fort McMurray wildfire were affected by climate change. A study of the 2013 Calgary flood found that climate change increased the likelihood of extreme rainfall over southern Alberta, but there was no discernable difference in the three-day surface runoff. Attribution science has recently been applied to many extreme events around the world to understand the impact of climate change on major loss events. Attribution is central in debates about liability and responsibility. Some courts have recognized that emissions are the dominant cause of climate change, and attribution science seeks to determine if climate change contributed to a specific extreme weather event.

Several local, regional, and state governments in the United States brought lawsuits in 2017 and 2018 against the large emitters identified in the Carbon Majors Database, including New York, San Francisco, Oakland, and Boulder.⁴⁶ They seek compensation for the cost of adapting to climate change. All cases are being vigorously defended and are progressing slowly. The courts seek to judge the evidence of causation linking the emissions by these companies to the harm experienced.

100 producers account for 71% of global industrial GHG emissions, 1988-2015



Source: The Carbon Majors Database

41 Griffin, "The Carbon Majors Database," 5.

42 Ibid., 8.

43 Ibid., 8.

44 Ibid., 7.

45 Bush and Lemmen, "Canada's Changing Climate Report," 174–182.

46 Poggio, "Next Climate Liability Suits vs. Big Oil Could Come from Western Canada."

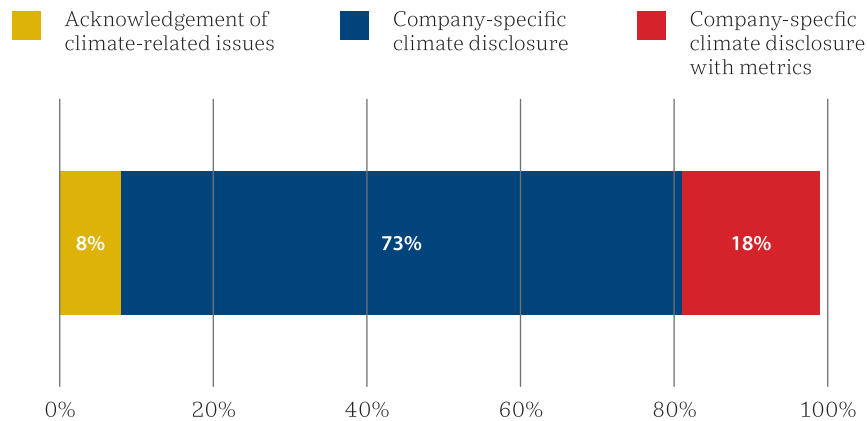
Toronto, Vancouver, Victoria, and a number of other communities in Canada are considering legal action against the major emitters. Victoria representatives note that “We’re having to rebuild the seawalls on our waterfront, in several sections. We’ll have to build to higher standards in anticipation of more violent storms and rising sea levels. . .We directed our staff to begin tracking the specific costs. We’re also seeking legal advice, with respects to litigation, to recover these costs.” A city councillor proposed “a class-action lawsuit against the 20 largest fossil fuel companies.”⁴⁷

Decisions in the United States are expected to determine the extent and pace of action in Canada. Coal, oil, gas, and other energy producers may increasingly be the target of legal actions. The Carbon Majors account for most of the industrial emissions that are changing the climate, but they have not yet been found legally responsible for the impacts.

Private owners of critical infrastructure may be found liable if they fail to adapt to changes in the climate and severe weather risks. This exposure extends to those who develop, design, build, own, operate, or repair infrastructure. This responsibility includes private organizations that contribute to private or public infrastructure. Government immunity from prosecution for some actions does not extend to private contractors. Climate risk may become a growing element of professional liability.

Service providers may be found liable if they cause others to experience a loss because of their failure to adapt to the risk of disruption from severe weather and other climate risks. Providers are expected to apply good practices to ensure continuity of service. These practices may be set out as standards or a performance benchmark. These providers may be challenged in the courts following loss events.

Graph 7: Climate-related disclosure of 75 public companies, attributes



Source: CPA Canada, “State of Play,” 21.

The risk of failure can be managed by designing and constructing facilities that anticipate the impacts of climate extremes over the lifetime of the structure. Climate vulnerability assessments and careful consideration of siting and construction materials can be used to manage this risk. Appropriate maintenance and recurring assessment of performance is critical. Liability risks are best managed by quality design and construction combined with a commitment to ensure continuity of service.

47 Ibid.

Board members and officers of companies may be found liable if they fail to address and disclose material climate risks. Publicly traded companies must report material information in continuous disclosure documents. This includes risks that may impact the decision of a reasonable investor to buy, hold, or sell their interest in the company. This includes physical and transitional climate risks. Some organizations that are not publicly traded voluntarily disclose their climate risks. Disclosure may be included in financial statements, corporate responsibility reports, or management statements. The company determines if the risk is material and the specific information disclosed. A 2018 study by the Canadian Professional Accountants of Canada found that almost half (47 percent) of participating public companies in Canada disclosed that climate or weather could have a material impact on their operations, but none included any information about the nature of the risk or an estimate of the possible consequences.⁴⁸ Reporting guidance on physical and transitional risk is emerging.

Many investors and regulators are not satisfied with the current state of climate disclosure. They seek more information. Regulators in the United States, United Kingdom, France, and elsewhere are requesting increased disclosure by insurers about physical and transitional climate risks. Guidance and expectations about climate risk disclosure best practices for insurance companies are evolving, with the Task Force on Climate-Related Financial Disclosure expected to emerge as the gold standard.

Government responsibility

Some look to hold governments responsible for climate-related impacts. Litigation targeting governments around the world address two issues. First, some seek to compel increased political and policy action to reduce emissions and promote adaptation. This includes some actions taken against governments in Canada. Second, governments and their agents, particularly local governments, have been found liable if they fail to appropriately take into account climate risks, since they provide essential public services. There has been little climate litigation in Canada, but it has all been directed at governments. Some cases before the courts elsewhere in the world may have consequences for Canada.

Governments are responsible for establishing legislation, policy, and regulations. Political and policy decisions in Canada are typically protected from judicial review. Policy choices are viewed as political, not legal, issues. For example, the courts in Canada dismissed an action seeking to hold the federal Government liable for failing to meet emissions reduction commitments made under the Kyoto Protocol. The courts also dismissed an action to hold the government liable for withdrawing from the Kyoto Protocol. The federal judge ruled that “It is not up to the courts to decide if the government acted reasonably in failing to meet its international commitments, and even if it had the power to do so, there was no practical way to enforce a court order. . . The Government had argued that the issue of Canada’s response to the Kyoto agreement should be handled by the voters and not the courts,”⁴⁹ and the courts agreed. Governments are responsible for policy.

Courts protect the rights of citizens. “The flurry of cases follows a ground breaking decision in the Netherlands in 2015, in which the government was found to be disregarding its constitutional duty to protect citizens from climate change. The decision forced the Dutch government to reduce greenhouse gas emissions by at least 25 per cent compared to 1990 levels. Similar legal actions are underway in [Canada], Belgium, Ireland, New Zealand, Switzerland, Colombia, the United States and the United Kingdom.”⁵⁰ ENvironnement JEUnesse argued before the courts that the Government of Canada has not protected the youth of Quebec from the impact of climate change. The case was rejected because it was not properly developed as a class action but is likely to come forward again. Climate change has been viewed in the Canadian courts as a policy issue for governments to decide, but it may be argued that environmental stewardship is a right that the federal Government failed to defend.

48 CPA Canada, “State of Play,” 26.

49 Dowd, “Lawsuit Against Canada Over Kyoto Accord Dismissed.”

50 McCue, “Why Environmentalists Are Taking Their Climate Fight to Canadian Courtrooms.”

The courts in Canada and internationally have found governments liable if they fail to adequately address climate risk in the provision of essential public services.⁵¹ Governments provide storm sewers, fire protection, and other services. Providers may be held liable if they fail to comply with established performance expectations, including resilience to severe weather events and other known hazards. Governments may be held responsible if they fail to design, construct, or maintain public infrastructure that reasonably anticipates climate risks.

Legal findings of liability against governments in Canada have found evidence of the government's failure to comply with established standards directly resulting in harm. Local and provincial governments own and manage nearly 98 percent of the public infrastructure in Canada, and their practices are expected to increasingly be challenged in the courts by those experiencing severe weather losses.⁵²

Implications for the insurance industry

The insurance industry emits few greenhouse gas emissions. Legal actions seeking to hold emitters liable for the impact of severe weather are expected to target major emitters, not insurance companies and brokers. Insurance exposure to the risk of a finding of corporate liability is present through investment and perhaps coverage risk. The value of investments in the oil and gas industry, for example, would fall if courts find major emitters liable. This is a risk that can be evaluated and managed. Emerging climate risk disclosure practices are expected to require that insurers assess and disclose to investors and regulators how they assess and manage climate risk in their investments.

The insurance industry is exposed to climate liability risk through the coverage it provides. The intention of insurance companies is that a finding of policyholder liability for the consequences of past emissions is not covered by insurance—that is, the potential liability of the emitter was not transferred to their insurer. The industry has been working for many years to state this clearly in policy wordings. This coverage will likely be tested in the courts, however, particularly by the major energy producers that are likely to be subject to repeated legal action. Insurers may be challenged when they refuse to defend policyholders.

The insurance industry will be exposed to professional liability risk associated with climate change and severe weather. Directors' and officers' coverage will likely be challenged over the next 10 years by growing investor and regulator attention to disclosure of physical and transitional risks. Rising expectations about the nature, extent, and timing of disclosures may present challenges for insurers.

Insurers may consider legal action against local governments that fail to design, build, and maintain public infrastructure to anticipate severe weather risks. Insurers may recover some of the costs they incur in the provision of disaster claims if they can prove that public agencies failed to appropriately manage climate risks, resulting in damage to private property.

Considerable uncertainty remains in the assessment of liability for climate change. Legal actions increased in the United States over the past 10 years and may begin to emerge in Canada. The insurance industry learned from liability costs incurred by the tobacco and asbestos industries and has been working to ensure that any finding of liability for major emitters will not transfer to the insurance industry.

51 Zizzo, Allan, and Kocherga, "Stormwater Management in Ontario."

52 Canada, "Expert Panel on Sustainable Finance," 22.



How will society transition to carbon neutrality?

"The world as we have created it is a process of our thinking. It cannot be changed without changing our thinking."

Albert Einstein

Canada is transitioning to a low-carbon future. This is driven primarily by the increased availability and the falling cost of alternatives to coal, oil, and natural gas, but over the next 10 years policy action and shifting consumer preferences are expected to become important drivers. Per capita greenhouse gas emissions in Canada peaked in 2000, 20 years ago, and have declined by 20 percent since then.⁵³ Measured relative to gross domestic product, Canada's carbon intensity peaked in 1992 and has declined by 37 percent. Vehicle fuel efficiency improved considerably since 2004, including the introduction of electric vehicles and the success of hybrids. Canada is a major producer of hydroelectric power, an important source of renewable energy. Many new energy production facilities use solar or wind. The use of thermal coal has been eliminated in most provinces, and the Government of Canada announced plans in 2018 to phase out all traditional coal-fired electricity by 2030.⁵⁴

53 Environment and Climate Change Canada, "Canadian Environmental Sustainability Indicators," 6.

54 Environment and Climate Change Canada, "Canada's Coal Power Phase Out Reaches Another Milestone."

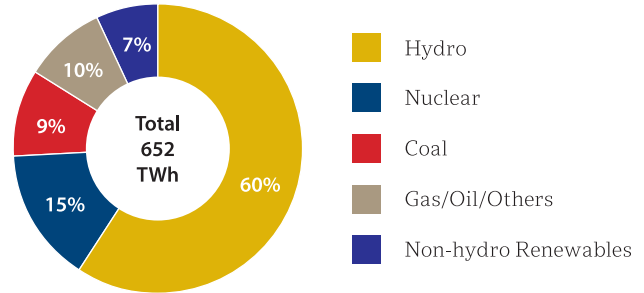
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The world has also begun the transition to a low-carbon future. The cost of providing energy from solar, wind, and other renewable energy sources is increasingly competitive with coal, oil, and natural gas across a broad range of uses. "Since 2010, the benchmark price for solar had dropped 84%, offshore and onshore wind by 49%...Solar and onshore wind have now won the race to be the cheapest source of new 'bulk generation' in most countries."⁵⁵

Research by the Standing Senate Committee on Energy, the Environment and Natural Resources identifies significant potential to improve the energy efficiency of buildings.

"Incorporating energy efficiency and emissions reduction measures into new buildings is practical because new buildings can be designed to be higher-performing from the outset. For existing homes and buildings, energy efficiency investments pay for themselves over time through reduced energy costs."⁵⁶

Electricity Generation by Source in Canada, 2017



Source: Natural Resources Canada

Worldwide, however, greenhouse gas emissions increased in 2019 to the highest level on record.⁵⁷ The transition to low carbon needs to accelerate to prevent dangerous changes in the climate.

The 2019 Global Risks Perception Survey of international business leaders found that "The results of climate inaction are becoming increasingly clear...Survey respondents are increasingly worried about environmental policy failure."⁵⁸ The Intergovernmental Panel on Climate Change warns that resolution requires "system transitions unprecedented in terms of scale, but not necessarily in terms of speed, and impl[ies] deep emissions reduction in all sectors, a wide portfolio of mitigation options and a significant upscaling of investments in those options" from a large number of decision makers around the world.⁵⁹ Social, political, and cultural differences across countries make the issue of climate change difficult to address on a global scale. Offered solutions frequently uncover other aspects of the problem that need to be addressed. Stakeholders have different perspectives on the problem, resulting in alternative preferred solutions.

Climate change has been described as a "super wicked" problem.⁶⁰ Four elements of the problem greatly increase the difficulty of finding a solution:

1. Time is running out.
2. Those who caused the problem seek to provide the solution.
3. No one has authority to impose a solution.
4. Decision makers fail to fully account for longer-term consequences.

Indeed, efforts to secure a solution have failed for more than 25 years, as global emissions continue to rise, resulting in the risk of dangerous warming.

⁵⁵ Broom, "The Cost of Generating Renewable Energy Has Fallen," 3.

⁵⁶ Senate of Canada, "Reducing Greenhouse Gas Emissions from Canada's Built Environment," 10.

⁵⁷ Harvey and Gronewold, "CO2 Emissions Will Break Another Record in 2019," 1.

⁵⁸ World Economic Forum, "Global Risks Report 2019," 6.

⁵⁹ Intergovernmental Panel on Climate Change, "Global Warming of 1.5°C," 17.

⁶⁰ Levin et al., "Overcoming the Tragedy of Super Wicked Problems," 1.

Canada is heavily dependent on oil and gas as a source of energy and employment. “Canada is currently the fourth largest oil producer and exporter in the world, with a similar position in natural gas...[T]he sector is a vital source of wealth, prosperity and social value for Canada...[I]t supports employment...and attracts the largest proportion of capital investment in any sector.”⁶¹ Transitional risk is an issue for specific companies but also for communities, regions, and the nation.

Emissions are higher, on average, in Canada than in most other countries.⁶² Canada is one of the 10 largest emitters in the world.⁶³ The transition to a low-carbon future will be difficult and disruptive. The impact will be significant in the energy sector, given the large commitments in place and the time required to bring about change. For the Canadian insurance industry, the transition to a low-carbon future may introduce reputational and investment risk.

Table 3: Top 10 highest per capita emitters of CO₂ measured in T (metric tons) and MT (metric megatons)

Rank	Country	CO ₂ Emissions (per capita)	CO ₂ Emissions (total)
1	Saudi Arabia	16.3T	572MT
2	Australia	16.2T	392.4MT
3	United States	15.0T	4833.1MT
4	Canada	14.9T	540.8MT
5	South Korea	11.6T	589.2MT
6	Russian Federation	9.9T	1438.6MT
7	Japan	9.0T	1147.1MT
8	Germany	8.9T	731.6MT
9	Poland	7.7T	293.1MT
10	South Africa	7.4T	414.4MT

Source: Union of Concerned Scientists, with data compiled by the International Energy Agency, fuel combustion only, major developed countries and emerging economy nations, 2016

Background

In 1992, Canada partnered with 200 countries to develop the international convention on climate change.⁶⁴ The goal was to stabilize greenhouse gas concentrations to prevent the risk of a dangerous impact on the climate. There have been a number of policy efforts over the past 25 years seeking to achieve those commitments. These efforts involve actions by the federal, provincial, territorial, and local governments. Some were successful, and some were not. Canadian greenhouse gas emissions per capita are among the highest in the world.

In 2015, Canada and most other countries around the world signed the Paris Agreement on climate change.⁶⁵ The goal is to substantially reduce the adverse impact of climate change by keeping the increase in global average temperature to well below 2 degrees Celsius above pre-industrial levels.

61 Canada, “Expert Panel on Sustainable Finance—Interim Report,” 25.

62 Burck et al., “Climate Change Performance Index,” 9.

63 Environment and Climate Change Canada, “Canadian Sustainability Indicators,” 9.

64 United Nations, “United Nations Framework Convention on Climate Change,” 4.

65 United Nations, “Paris Agreement on Climate Change.”

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In 2016, the federal, territorial, and most provincial governments developed the Pan-Canadian Framework on Clean Growth and Climate Change.⁶⁶ The national plan seeks to reduce emissions by 30 percent by 2030. Some policy proposals discussed in the plan include carbon taxes and cap-and-trade regulations. The plan also identified priorities for adapting and promoting clean technology.

In 2016, the federal government published Canada’s Mid-Century Long-Term Low-Greenhouse Gas Development Strategy. The strategy “examines an emissions abatement pathway consistent with net emissions falling by 80 percent in 2050 from 2005 levels. This is consistent with the Paris Agreement’s 2°C to 1.5°C goal.”⁶⁷

In 2019, Canada’s Expert Panel on Sustainable Finance found that “Canada has the means and the opportunity to stand among these global leaders as a decision-maker rather than a decision-taker in the global market for sustainable products, services and investments.” They further advise that “climate change opportunity and risk management need to become business-as-usual in financial services, and embedded in everyday business decisions, products and services.”⁶⁸

There has been considerable political debate in Canada concerning severe weather and climate change policy options. Recent discussion brings an increased sense of urgency. Early and bold action is needed to prevent dangerous change in the climate. Progress to improve energy efficiency needs to increase in Canada and around the world.

In 2018, the Intergovernmental Panel on Climate Change released *Special Report: Global Warming of 1.5°C*.⁶⁹ The panel found that the average global temperature had increased by 1 degree Celsius. Emissions made over the past 150 years will continue to cause further change in the climate, such as sea level rise, for many centuries. Nevertheless, future emissions will determine if temperatures increase by more than 1.5 or 2 degrees Celsius. Reaching and sustaining net zero emissions by 2050 could halt global warming and stabilize the climate.

Table 4: The difference between 1.5° and 2° C above pre-industrial levels

	1.5°C	2°C
Status of Arctic summer sea ice	Sea ice will remain during most summers	Ice-free summers are 10 times more likely
Sea level rise	0.40 meters	0.46 meters
World population exposed to severe heat at least once every five years	About 14% of the population	About 37% of the population
Increase in urban population exposed to severe drought	+350 million people worldwide	+411 million people worldwide
Species losing more than half of their range	6% of insects 8% of plants 4% of vertebrates	18% of insects 16% of plants 8% of vertebrates
Status of coral reefs worldwide	Decline of between 70% and 90%	Coral reefs “mostly disappear”, with 99% decline
Global annual catch from marine fisheries	Down 1.5 million tonnes	Down 3 million tonnes

Source: Levin, Kelly. “Half a Degree and a World Apart: The Difference in Climate Impacts Between 1.5°C and 2°C of Warming.” World Resources Institute, based on data from IPCC report, 2018: Global Warming of 1.5°C.

66 Canada, “Pan-Canadian Framework on Clean Growth and Climate Change.”

67 Canada, “Canada’s Mid-Century Long-Term Low-Greenhouse Gas Development Strategy,” 3.

68 Canada, “Expert Panel on Sustainable Finance—Final Report,” iv.

69 Intergovernmental Panel on Climate Change, “Global Warming of 1.5°C.”

Global transition to net zero emissions over the next 30 years will be very difficult. It would require rapid and far-reaching changes. These transitions would be unprecedented in scale and require deep reductions in all sectors. The Intergovernmental Panel on Climate Change finds that all pathways “project the use of carbon dioxide removal... to compensate for residual emissions,” including reforestation, land restoration, direct air carbon capture, and ocean alkalization—approaches with considerable uncertainty.⁷⁰

Reputational risk

Insurance is founded on trust. Consumers provide an annual premium to purchase the peace of mind of knowing their insurer will respond and support recovery if a covered loss is experienced. This may include support to recover from an injury or rebuild a home destroyed by fire. Consumers trust their insurance representative to secure coverage that is best suited to their unique needs. Many employees seek to join and stay with organizations aligned with their values and goals.

Trust is earned when promises become action. It takes time to build trust with consumers and employees. Trust can be broken, however, with a single incident. The Canadian insurance market is very competitive. Consumers have many alternatives when they decide to purchase coverage. “Consumers are increasingly looking for services and products with a smaller environmental footprint... Sound environmental stewardship is increasingly intersecting with market access and becoming a critical source of sustained competitive advantage.”⁷¹

Presently, only a handful of insurance companies in Canada actively speak with consumers and their employees about sustainability and climate change. Some insurers disclose their greenhouse gas emissions and have targets to reduce their environmental footprint. Emissions reductions efforts may be underway, but they are often not readily evident to interested stakeholders.

Over the next 10 years, a growing number of consumers and employees are expected to demonstrate support for organizations committed to social responsibility, including action to address climate change. Actions taken, and how this is communicated, will impact the reputation of brokers and insurers. Failure to achieve commitments introduces reputation risk.

Insurance companies and brokerages produce few emissions.^{72,73} This is confirmed by the organizations that disclose. Some insurers are transitioning to net neutral emissions through a combination of sustained reduction in emissions and the purchase of quality carbon offsets. A focus on environmental stewardship can extend throughout the corporate culture.

The United Nations’ Principles for Sustainable Insurance were published in 2012.⁷⁴ Most of the largest property and casualty insurance companies in Canada are signatories.⁷⁵ Participating companies voluntarily commit that “We will embed in our decision-making environmental, social and governance issues relevant to our insurance business.”⁷⁶ This includes consideration of issues like climate change and severe weather in underwriting decisions and investment management. The four principles are set out in Appendix I along with possible actions that can be taken by insurance companies.

Failure to address and report on actions to reduce emissions may, over the next 10 years, introduce reputational risk that may impact efforts to attract and retain consumers and employees.

70 Ibid., 19.

71 Canada, “Expert Panel on Sustainable Finance—Final Report,” iii.

72 The Co-operators, “The Co-operators Integrated Annual Report 2017,” 99–109.

73 Intact Financial Corporation, “2018 Social Impact Report,” 20.

74 United Nations, “Principles for Sustainable Insurance.”

75 United Nations, “Principles for Sustainable Insurance: Signatory Companies.”

76 United Nations, “Principles for Sustainable Insurance,” 4.

Insurance companies, brokers, and others in the industry should measure their emissions, actively work to reduce their footprint, and disclose information about their progress. The environmental footprint extends beyond the organization to include employees and suppliers. Insurance companies will increasingly be expected to understand and monitor emissions management by brokers and agents. All organizations involved in the insurance industry can help employees reduce their footprint by sharing information and providing incentives.

Companies should commit their support for the United Nations' Principles for Sustainable Insurance and work to build environmental considerations throughout their decision-making process.

Bold industry leadership should also extend to policyholders. Companies confident that they have their own house in order may work to inform consumers about how to measure and reduce their impact on the environment. This could be coupled with advice about resilience. Consumers expect loss reduction advice from their insurer and insurance representative, so they may welcome additional information about how to reduce their carbon footprint.

Awareness most often results in action when accompanied by financial incentives and other actions to encourage and reward change. The insurance industry is developing a corporate culture focused on managing and reducing the impact of extreme weather on Canadians. This approach can extend, with time, to wide-ranging action to promote awareness of environmental stewardship and responsibility.

Investment risk

The transition to a low-carbon future introduces investment risk for insurers and other asset holders. Valuations for public companies may become more volatile as new technologies and processes emerge, taxes and regulations change, and consumer preferences shift. Some company values will benefit, while others will fall. Unanticipated changes may have a sudden impact on investment values. Insurance companies are investors, and they must develop strategies to manage this risk. Several insurance companies are publicly traded, so they must provide ongoing disclosure to shareholders and investors about the management of material risks, including climate risks.

The property and casualty insurance industry invests more than \$100 billion in Canada each year.⁷⁷ Company investment portfolios are very low risk. This reflects the objectives and culture of the insurance industry in Canada.

Security and liquidity are priority considerations. Insurers do not participate in high-risk, high-reward ventures. Many insurers, however, have not assessed the potential impact on their investments of transitional risk, which is a common exposure of many investment opportunities in Canada. This may be found in equity and bond holdings.

Regulators in the United States, the United Kingdom, and France have assessed climate risk in insurance investment portfolios by using the Paris Agreement Capital Transition Assessment Tool.⁷⁸ The tool was developed by the 2° Investing Initiative, a “think tank working to align the financial sector with 2°C climate goals.”⁷⁹ It is available online at no cost to users, and investors can use it to conduct a scenario-based analysis of their portfolio. The insurance regulator in California reported that “scenario analysis reinforced our earlier conclusion” to prohibit insurers from investing in thermal coal companies.⁸⁰

77 Insurance Bureau of Canada, “2019 Facts of the Property and Casualty Insurance Industry in Canada,” 14.

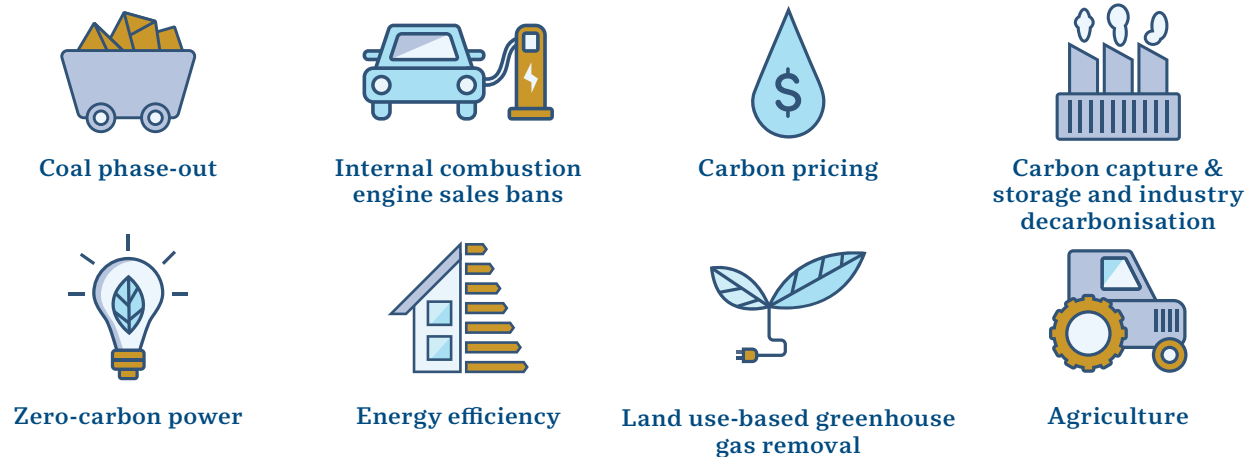
78 International Association of Insurance Supervisors, “Issues Paper on Climate Change Risks to the Insurance Sector.”

79 PRI, “Launch of First Online and Free Climate Scenario-Based Analysis Tool.” See <https://2degrees-investing.org>.

80 *Ibid.*, 3.

In 2006, leading institutional investors worked with the United Nations to develop the six Principles for Responsible Investment (PRI) set out in Appendix II.⁸¹ More than 2,000 signatories representing more than US\$80 trillion in assets under management have committed to responsibly manage their investments.⁸² In 2018, PRI launched the Inevitable Policy Response project to assess how actions announced by some governments responding to the repeated failure to achieve global climate change goals may result in widespread policy action.⁸³ The project anticipates aggressive government action over the next 10 years, such as a ban on the use of coal, wider introduction of carbon taxes, regulations that new vehicles be emission free, and completely decarbonizing the building stock. Investment portfolios can be assessed for risk in relation to a variety of policy responses.

Table 5: Inevitable Policy Response (IPR) key policy levers to transition to carbon neutrality



Source: PRI, "The Inevitable Policy Response: Policy Forecasts."

The Montreal Climate Pledge was established in 2014 by the Principles for Responsible Investment and the United Nations Environment Programme Finance Initiative.⁸⁴ Participating investors committed to measure and publicly disclose each year the carbon footprint of their investment portfolios. More than 120 investors with over US\$10 trillion in assets under management signed the Montreal Climate Pledge, often as part of their commitment to the goals of the Portfolio Decarbonization Coalition.

Practices to measure and manage climate risk in an investment portfolio are emerging. Pension funds, banks, life insurers, and other major investors are actively working to develop tools. Disclosure is the foundation for management of climate-related risk.

Investors are pressing for more information from companies with a material climate risk. Increased disclosure will advance in parallel with improved capacity to manage investment risk. Companies are asked to describe and quantify their physical and transitional risks. Ideally, this will include information about risk reduction targets and governance.

⁸¹ PRI, "Principles for Responsible Investment," 5.

⁸² PRI, "PRI Signatory Directory."

⁸³ PRI, "Inevitable Policy Response."

⁸⁴ Montreal Pledge, "How-to." See <https://montrealpledge.org>.

CLIMATE RISKS: IMPLICATIONS FOR THE INSURANCE INDUSTRY IN CANADA

The Task Force on Climate-Related Financial Disclosure (TCFD) is leading the international effort to improve public- and private-sector disclosure of physical and transitional risk.⁸⁵ The insurance group is developing best practices to disclose climate-related financial risks facing insurance companies to inform shareholders, investors, and regulators. Several other industries are also working with the TCFD to develop industry-specific disclosure practices, including banks, asset managers, asset holders, electric utilities, and energy, materials, transportation, real estate, agriculture, food, and forestry companies.⁸⁶ The objective is to better inform regulators and investors, including insurers, about the management of climate risks. Better disclosure empowers responsible investment decisions.

In 2019, the Canadian Securities Administrators provided new guidance about reporting climate-related risks for public companies.⁸⁷ It provides a reminder that public companies are required to disclose material risks, including physical and transitional climate risks. The guide applies to all companies exposed to climate change-related risks. It suggests that a longer time horizon may help identify material risks. Companies are also encouraged to consider quantitative and qualitative factors. Where possible, it is important to quantify potential financial impacts.

The common focus across most emerging guidance is on grouping climate-related risks to include physical and transitional risks. Physical risks include the impact of the increasing severity of extreme weather events that may damage assets or disrupt supply chains. The Canadian Securities Administrators define transitional risks to include regulatory and policy risks, reputational risks, exposure to legal action, risk of demand shifts, and technological risks.⁸⁸ In 2018 legislation was proposed in the United States to amend the Securities Exchange Act “to require issuers to disclose certain activities relating to climate change.”⁸⁹ The bill targets specific sectors, including finance, insurance, transportation, electric power, and non-renewable energy.

Public companies must disclose risks when a reasonable investor’s investment decision would have been influenced and changed if the information had been omitted or misstated. All companies can voluntarily disclose information, including information about climate risks. Voluntary disclosure may be included with continuous disclosure documents or in sustainability reports.

Industry-specific guides developed by the insurance industry will support disclosure of information that best informs investors and regulators. Nevertheless, each insurance company is unique. Industry guides need to be adapted to fit the specific circumstances for each company.

ShareAction, at not-for-profit organization promoting responsible investment, assessed the climate risk disclosure of 80 of the world’s largest insurers. Several have introduced prohibitions on investments in thermal coal, and a few chose to also refuse to offer insurance coverage. “Ceasing underwriting and investing in thermal coal is becoming a barometer of commitment to climate action.”⁹⁰ Some insurers have also chosen to ban coverage to oil sands producers, both property and construction covers, and cover for pipelines that serve the oil sands.⁹¹

85 Task Force on Climate-Related Financial Disclosure, “Final Report.”

86 Task Force on Climate-Related Financial Disclosure, “2019 Status Report.”

87 Canadian Securities Administrators, “CSA Notice 51-358: Reporting of Climate Change-Related Risks.”

88 Canadian Securities Administrators, “CSA Notice 51-354: Reporting of Climate Change-Related Disclosure Project.”

89 United States Congress, “S. 3481.”

90 ShareAction, “Got It Covered?” 5.

91 AXA Group, “2019 Climate Report,” 31.

Implications for the insurance industry

Canada is transitioning to a low-carbon economy. Favourable economics and emerging technologies are driving the change. Policy actions and changing consumer preferences are expected to also become important drivers over the next 10 years.

The insurance industry should assess and manage reputational risks associated with the transition to a low-carbon future. Brokers and insurers should measure their greenhouse gas emissions, develop a plan to reduce their carbon footprint, and disclose their progress. Brokers and insurers should commit their support for the United Nations' Principles for Sustainable Insurance and embrace sustainability.

Insurance companies should actively manage the impact physical and transitional climate risks may have on the value of their investment portfolio. The United Nations' Principles for Responsible Investment initiative has identified several potential policy actions and advised investors to assess the impact these actions may have on the value of their portfolio. This may include tightening emission caps for large emitters, increasing carbon taxes, and increasing incentives for consumers to buy electric vehicles or for contractors to build energy-efficient buildings. Insurance companies need to understand and manage the climate risks of their investments. Overall, the value of investing in companies with large emissions will likely become more volatile over the next 10 years as a result of the transition to a low-carbon future.

Regulators and investors are expected to increasingly seek greater disclosure by insurance companies about their management of climate-related risks. The Task Force on Climate-Related Financial Disclosure is developing guidance for the insurance industry that will likely become the standard for insurance companies. Insurers should monitor or participate in the development of this guidance and prepare to voluntarily apply the emerging disclosure practices.

Insurers will have considerable knowledge and experience concerning cost-effective actions to reduce the future risk of damage from extreme events. Insurers may use this understanding to identify opportunities that may not be recognized by other investors, like the potential for growth in companies that produce mechanisms that reduce the risk of damage to homes. Potential may emerge to participate in public and private partnerships investing in public infrastructure, like modern sewers.



What regulatory changes may emerge for insurers?

"I follow three rules: Do the right thing, do the best you can, and always show people that you care."

Lou Holtz

Climate-related risks for the insurance industry are attracting the attention of insurance regulators and policymakers, including the Office of the Superintendent of Financial Institutions, Autorité des marchés financiers, and the Canadian Council of Insurance Regulators. This interest is expected to grow as the impact of severe weather loss and damage increases. Greater attention from regulators and policymakers will likely benefit consumers and the insurance industry. Industry practices have been effective in serving the evolving needs of consumers and are based on sound actuarial practices for the pooling of risk. Insurers have been innovative in new product offerings. Increased interest from solvency and market conduct regulators could help the industry address consumer issues like concern about the ability of insurers to pay following a large event and recurring questions about myths like exclusions for acts of God. Greater regulatory interest in solvency and market conduct regulation is expected over the next 10 years. Regulators are expected to challenge the insurance industry, and their attention should be welcomed by consumers and the industry.

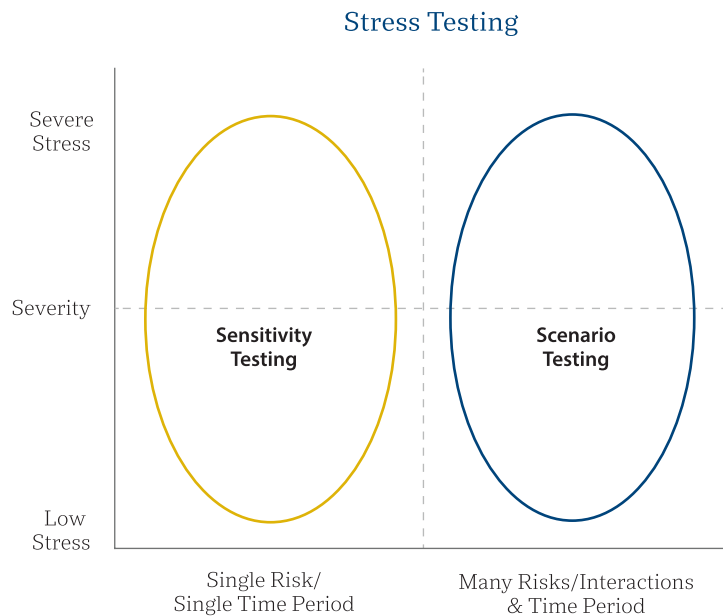
One threat involves the risk of price and product regulation. Consumers across Canada presently benefit from a competitive insurance market. The market is responsive and flexible in serving the needs of consumers. There are differences in how companies approach coverage for severe weather risks, and that choice should be recognized as good for consumers. Companies, brokers, and agents actively work to develop and provide coverage that meets consumer needs. The market is evolving and is generally working well for consumers while generating

consistent, moderate returns for insurers. Government interference in price regulation and product design has disrupted the auto insurance markets across Canada to the detriment of consumers and the insurance industry. Insurers need to be vigilant to challenge the risk of political interference in residential and commercial insurance markets. At the same time, insurers should anticipate and ultimately welcome actions by regulators pressing the industry to demonstrate its capacity to pay claims following extreme events and be more transparent with consumers about coverage terms, conditions, and underwriting practices.

Solvency regulation

Increasing loss and damage as a result of severe weather events may introduce solvency risk for insurance companies. Only one insurer failed in Canada over the past 50 years as a result of an extreme weather event.⁹²

Nevertheless, there is some future risk associated with catastrophic events. Some companies did experience financial hardship following wildfire events in British Columbia and Alberta. Nine insurance companies in Florida failed following Hurricane Andrew, and one failed in California because of the Camp Fire in 2018.⁹³ The vast majority of insurers, though, successfully responded to thousands of extreme events. Solvency risk is low and is managed well by insurance companies. Increasing regulatory attention to this issue will serve to assure consumers and public officials about the effectiveness of current industry practices.



Source: Office of the Superintendent of Financial Institutions

Solvency regulators require insurance companies to regularly test and report on their financial capacity to respond to low-probability, high-consequence events. This includes the application of models depicting extreme weather events with a much greater impact than those of the past. Stress testing has been regular practice for many years for the insurance industry. The federal regulator published a guideline for stress testing by insurance companies in 2009, focusing on “exceptional but plausible events.”⁹⁴ Over the next 10 years, solvency regulators will expect insurance companies to conduct stress tests for a variety of severe climate-related risks, including flooding, wildfire, tornadoes, and hurricanes. Beyond the responsibility of prudential regulators, members of the board of directors, senior management, the chief risk officer, and the appointed actuary are motivated to ensure the financial health of their insurance company. Insurers regularly assess their capacity to cope with extreme events.

92 Kelly and Stodolak, “Why Insurers Fail,” 6.

93 Kelly, “Why Insurers Fail—2016 Update,” 3.

94 Office of the Superintendent of Financial Institutions, “Guideline—Stress Testing.”



More than 25 years ago, the Canadian insurance industry identified the risk of a catastrophic earthquake as a potential solvency threat. The industry supported development of earthquake models to better quantify the risk and ongoing research to inform management of this risk. The insurance industry partnered with the Office of the Superintendent of Financial Institutions, Autorité des marchés financiers, and the Financial Institutions Commission to establish regulations to oversee management of solvency risk for a major earthquake.

This process provides assurance to policyholders, policymakers, and other insurance companies of compliance with established, required practices. Insurance companies in Canada regularly report to senior management and their solvency regulator on their capacity to respond to a severe earthquake.

The industry has been proactive in supporting the accumulation of industry loss history data for flooding, severe weather, wildfire, hail, and other hazards, as well as the development of severe weather loss models. Insurers should expect greater supervision of solvency risk management for severe weather. This may involve documenting company best practices and promoting industry discussion about solvency risk management. Concerns have been raised about the possible solvency consequences of concentration of risk for some hazards.

Greater transparency to disclose the nature of this regulatory supervision would serve to further build consumer and political confidence in the industry's capacity to pay claims. This could include pooling company regulatory filings of stress testing into public reports. This could be done by regulators or independent agencies like the Property and Casualty Insurance Compensation Corporation or the Institute for Catastrophic Loss Reduction. The expectation is that disclosure of industry practices would demonstrate to policyholders and policymakers that insurers have the financial capacity to respond to a wide range of extreme events. Increased disclosure would also provide information to the industry that may be developed into benchmarks to identify lagging companies that need to address weaknesses.

No solvency concerns arose in 1998, when the industry was confronted with the significant and unexpected costs associated with a massive ice storm. Much of the industry cost was recovered through reinsurance. Moreover, the storm struck at a point in the insurance cycle when most companies were in good financial health. The ice storm put a spotlight on the role of reinsurance in the industry's management of extreme events.

Since that time, the Office of the Superintendent of Financial Institutions, Autorité des marchés financiers, Property and Casualty Insurance Compensation Corporation, and others have continued to probe to understand how insurance companies manage their use of reinsurance. This discussion is expected to continue with the growing importance of severe climate and seismic risk. It is in the best interests of consumers, reinsurers, and insurers that an open conversation about the role of reinsurance is sustained, as the majority of the funds used to pay consumer claims following an extreme event in Canada is typically provided by reinsurance.

Market conduct regulation

Each major loss event in Canada resulted in some issues for insurance consumers. The majority of policyholders with claims report a positive experience, but the media and others tend to speak with those who are not happy. Many customers do not read their insurance policy until a loss is experienced. Coverage for extreme events is not well understood by policyholders and includes complex elements. Climate-related coverage often differs for each insurer, and this introduces challenges when neighbours compare responses. Considerable learning takes place following an event for consumers, insurers, the media, and other stakeholders. Some events reveal policy terms, limits, and gaps that should be revised to better align consumer expectations and the intention of insurers.



Members of the Canadian Council of Insurance Regulators are responsible for market conduct supervision. They work to serve the public interest. This requires understanding insurance practices and, when required, advising insurers and intermediaries about how to address consumer concerns, like the importance of fair treatment and clear disclosure of coverage terms and limits at the point of sale. The council members have adopted a risk-based approach to market conduct regulation. As the industry's coverage of severe weather risks grows over time, market conduct regulators will pay greater attention to how the industry manages climate-related risks.

The council's 2017 findings report and position paper entitled "Natural Catastrophes and Personal Property Insurance" sets out more than two dozen recommendations.⁹⁵ The council's recommendations are found in Appendix IV of this report. Regulatory action to ensure the fair treatment of insurance consumers across Canada should be supported by insurance companies, brokers, and others in the industry. The council report commits member support for government incentives for the prevention and mitigation of the impacts of natural catastrophes; action by other government organizations to increase consumer awareness and understanding of insurance with a focus on protecting property from natural catastrophes; development and use of risk modelling tools and aggregated risk data; creation of innovative risk-sharing practices that ensure new product development; and risk-sharing practices that allow for adequate and suitable coverage for consumers in high-risk areas.

Canada's market conduct regulators expect timely and efficient handling of claims and allow access and entry to industry participants from other jurisdictions to assist with the claims and recovery process. They expect insurers to provide timely reporting of major loss events, products that will provide adequate coverage for the identified risk, and that consumers are able to understand the contract. Members recommend the use of plain language and support enhanced transparency and disclosure at point of sale.

The industry benefits from working with market conduct regulators to build consumer confidence and understanding of coverage. This is important because coverage terms and conditions are likely to continue to evolve and change, so the industry will need to effectively communicate new information to policyholders.

Moreover, company-to-company differences in coverage for flood and other hazards benefits consumers with coverage for differing needs but creates issues for brokers and consumers seeking to understand the coverage offered. Regulators are sometimes asked to explain and perhaps defend insurance industry practices to other government departments and elected officials. Consumers and the insurance industry benefit from engaged and informed regulation.

⁹⁵ Canadian Council of Insurance Regulators, "Natural Catastrophes and Personal Property Insurance." See Appendix IV of this report for a summary of CCIR positions and recommendations.

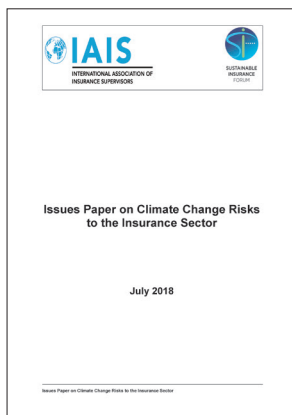
Consumer misunderstanding about coverage is a recurring issue. Companies want consumers to be aware of what coverage they have in place, exclusions, and limits. The products were designed to best serve the insurer's understanding of the needs of consumers. Deductibles and limits are needed to ensure affordability. The industry regularly seeks to better inform consumers about coverage through the Insurance Bureau of Canada, the Insurance Brokers Association of Canada, the Canadian Association of Direct Relationship Insurers, the Canadian Association of Mutual Insurance Companies, and other national and provincial organizations. Public outreach efforts present opportunities to directly engage regulators.

The expectation of increasing consumer demand for climate-related coverage and the likelihood of sustained differences in coverage between providers suggests that market conduct regulators will more frequently become involved to understand, challenge, and perhaps explain industry practices to consumers and policymakers.

The insurance industry could establish a forum where consumer issues are discussed in collaboration with market conduct regulators. The industry could anticipate consumer and regulatory interest in the development of plain language coverage for severe weather coverage. Insurers and brokers should press to retain the capacity for innovation and embrace differences in coverage, while seeking to best inform policyholders. Companies and their competitors should welcome greater clarity about differences in coverage offered, confident in their capacity to justify alternatives designed to meet the differing needs of consumers.

Members of the Canadian Council of Insurance Regulators set out an ambitious agenda as they work to protect insurance consumers. The council recommendations related to natural catastrophes should be welcomed by brokers, agents, and insurers.

Internal practices



In 2018, the International Association of Insurance Supervisors published the “Issues Paper on Climate Change Risks to the Insurance Sector.”⁹⁶ The paper includes several case studies of regulatory practices around the world supervising the management of climate-related risks by insurance companies.

In the United States, the National Association of Insurance Commissioners issued a white paper, “The Potential Impact of Climate Change on Insurance Regulation.”⁹⁷ The paper was released in 2008, more than 10 years ago. Some commissioners have collected and disclosed climate risk filing data for insurers for 2009 and each year since. The association states “The white paper is the beginning of a process rather than the end. One might view it as the first step of many in assessing where the insurance industry is with regard to measuring the impact of climate change and global warming on its business operations.”⁹⁸ Ceres, a sustainability advocate, publishes an annual assessment of the regulatory filings.⁹⁹ The most recent study assesses the filings for 148 large insurers accounting for more than 70 percent of the market in the United States. Half (52 percent)

of the property and casualty insurers and one-quarter (24 percent) of the major life and health insurers in the United States earned a medium- or high-quality score for their climate disclosure. Ceres observes that climate risk disclosure practices by large insurers have been improving.

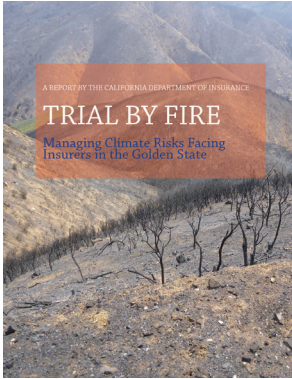
96 International Association of Insurance Supervisors, “Issues Paper on Climate Change Risks to the Insurance Sector.”

97 National Association of Insurance Commissioners, “The Potential Impact of Climate Change on Insurance Regulation.”

98 Ibid., 14.

99 Messervy, “Insurer Climate Risk Disclosure Survey Report and Scorecard.”

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Trial by Fire: Managing Climate Risks Facing Insurers in the Golden State is a 2018 report by the California Department of Insurance.¹⁰⁰ The report provides a comprehensive assessment of insurance practices in the management of climate-related risks. The report also describes the activities of the California regulator, including a description of the regulator's actions to promote climate risk disclosure and an analysis of investment risk.

The case study provided by the regulator in the United Kingdom described work underway since 2012. The regulator reported that it will “focus on promoting resilience to climate change and supporting an orderly transition to a lower carbon society.”¹⁰¹ This activist approach to supervision includes stress testing of extreme weather risks facing insurance companies. The regulator also conducted an independent evaluation of the investment portfolios of insurers. The analysis measured alignment of investments against “a 2 degrees benchmark” to measure investment risk resulting from the transition to a low-carbon future

as set out in the Paris Agreement. The regulator supports the Task Force on Climate-Related Financial Disclosure initiative to disclose physical and transitional risks.

The case study offered by the French regulator focused on climate risk disclosure requirements for banks and insurance companies.¹⁰² One insurer disclosed that its expected claims paid will double by 2050 (20 percent due to climate change and 80 percent due to an increase in vulnerabilities). Another insurer reported its “responsibility risk” and subsequent reputational risk if it fails to achieve its carbon footprint goals. The regulator notes that the expected disclosure of physical and transitional climate risks by insurers and banks will increase with time to include an assessment of bond portfolios, with the regulator committed to “playing an active role in climate risk mitigation.”

The case study offered by the insurance regulator in Brazil focused on the United Nations' Principles for Sustainable Insurance.¹⁰³ The regulator conducted a survey of 127 insurance companies representing 75 percent of the market. The supervisor found that most companies were signatories to the agreement, but a majority had just begun to incorporate environmental, social, and governance risks, including climate risk, into their business practices. The regulator reported that investors and consumers were the driving force for this integration, not regulation or government policy. The regulator in Brazil will monitor insurer awareness of climate issues, disclosure of investment policies, and development of green insurance products.

Some insurance regulators around the world are considering climate risk as they supervise insurance companies. Regulatory practices continue to evolve and are expected to become more active with time. A common focus is the use of stress tests to assess insurers' financial preparedness for extreme climate events. Insurance companies are generally more advanced than banks and other financial institutions because of their experience responding to large loss events and investments in loss models over the past 30 years. Insurance regulators also seek greater disclosure about climate risk management, including a focus on investment risk associated with the transition to a low-carbon future.

Over the next 10 years, insurance supervisors in Canada are expected to more actively regulate the climate risk management efforts of the insurance industry. International experience suggests that this will include a focus on solvency and market conduct issues. Compliance will require effort by insurance companies but should be embraced by the industry as a means of building consumer and public confidence.

¹⁰⁰ Mills et al., “Trial by Fire.”

¹⁰¹ International Association of Insurance Supervisors, “Issues Paper,” 60–63.

¹⁰² Autorité des marchés financiers, “Report on Socially Responsible Investments in Collective Investment Schemes.”

¹⁰³ International Association of Insurance Supervisors, “Issues Paper,” 47–48.

Rate and product regulation

Canadian insurance consumers presently benefit from a competitive and innovative market covering climate-related risks for homeowners and businesses. Policymakers have not disrupted industry efforts to design and bring to market products that serve the changing needs of consumers. Companies set pricing based on an actuarial assessment of expected costs and an understanding of consumers' willingness to pay. Coverage is affordable and effective, and consumers appear satisfied that their risks are covered. In addition, these products generate moderate earnings for insurers. The absence of regulation of the products and pricing is working well for consumers and the industry.

Interference in price regulation and product design has disrupted auto insurance markets across Canada to the detriment of consumers and the insurance industry. Insurers must be alert to the risk of interference in residential and commercial insurance markets and actively work to champion the benefits of markets with no regulation of products or rates. Increased solvency and market conduct supervision is expected and will be helpful, but interference in product innovation and pricing would not be good for consumers or the industry.



Rate regulation is present in the United States. Some markets, like Florida, have been in turmoil for decades.¹⁰⁴ Rate and product regulation disrupts the capacity of insurance markets to recover from a major shock and increases the cost of coverage for consumers. Alabama, Georgia, Mississippi, and North Carolina have legislation mandating intervention in ratemaking.¹⁰⁵ Insurers must submit a rate plan with actuarial justification and demonstrate compliance with mandated discounts. Florida, Louisiana, Maryland, New York, Rhode Island, and South Carolina require discounts but do not mandate specific rates.



The financial services regulator in the United Kingdom announced in 2011 a “new and more intrusive” approach to market conduct regulation.¹⁰⁶ Consumer protection based on fair sales processes and clear product disclosure failed to protect consumers, particularly bank customers, during the financial crisis. The regulator is now intervening in the design of products by financial institutions to ensure that they “truly do serve the needs of the customers to whom they are marketed.”¹⁰⁷ They may, for example, prohibit the sale of some products to specific customer segments.

Preventing regulatory interference in markets that results in harm for consumers and the insurance industry requires that Canada's brokers, agents, and insurers continue to work to serve the needs of consumers. This includes the design and affordability of coverage. Moreover, the industry must ensure awareness of its efforts. There is considerable scope and need to make insurance processes more transparent so that they can be readily understood by consumers.

Implications for the insurance industry

Supervisors work to protect insurance consumers. They provide an independent, objective assessment of insurance practices. Insurance regulators are expected to increasingly press the insurance industry for more information and greater disclosure about management of climate risks. This is a good thing—it is good for insurance consumers and for the insurance industry. More large severe weather events will result in consumers, the media, and others questioning the financial capacity of the insurance industry. Informed solvency regulators will know if they can support industry assurances. Moreover, the industry response to some extreme events have identified market conduct issues. Consumers and the industry will benefit from increased regulatory attention to anticipate and resolve these issues.

104 Navarro, “Florida Facing Crisis in Insurance.”

105 United Policyholders, “State-by-State Mitigation Insurance Discount Statutes Summaries.”

106 Financial Services Authority, “Product Intervention,” 3.

107 Ibid., 3.

CLIMATE RISKS: IMPLICATIONS FOR THE INSURANCE INDUSTRY IN CANADA

The insurance industry in Canada should welcome and encourage increased regulatory scrutiny of their management of climate-related risks. Scenario testing is expected to confirm that insurance companies are financially prepared for plausible, extreme weather events. Some companies may initially be challenged to fully document their efforts. Nevertheless, industry practices appear sound, and regulators are expected to press companies to prove this.

Companies are financially prepared to respond to multibillion dollar severe weather events. Insurance companies should develop mechanisms to share information about their financial preparedness with consumers, regulators, brokers, agents, investors, and employees. Consumers and the insurance industry benefit when regulators are able to respond to emerging extreme events and confirm the industry's financial preparedness.

Beyond scenario testing, insurance regulators in countries that include the United States, United Kingdom, and France require insurance companies to assess and report climate risk in their investments. Since 2009, climate risk disclosure filings have been released by the regulator in California for external analysis. Regulatory leadership encouraging insurance companies to evaluate risks in their investment portfolios has resulted in more comprehensive public disclosure.

Most insurance companies in Canada do not disclose climate risks in their investment portfolios. However, insurance regulators and investors in Canada are expected to require this information over the next 10 years. Insurance companies should understand climate risk in their investments and should welcome regulatory interest.



The Task Force on Climate-Related Financial Disclosure sets out more than 30 questions to assess the management of climate-related risks by insurance companies. This process seeks to inform shareholders and regulators. Guidance developed specially for insurance companies encourages disclosure about governance, strategy, risk management, and metrics/targets. All insurance companies in Canada should prepare for increased financial disclosure about climate-related risks.

The insurance industry must be alert to the risk of political interference in the design and pricing of coverage. The current market is competitive and responsive, with a good record of serving consumers. Political interference could limit the industry's ability to adapt coverage to best reflect the evolving needs of consumers and interfere with efforts to ensure adequate pricing. This risk appears low at this time but could build quickly following an extreme event with a poor industry response. Discussion about government support for insurers who provide flood insurance coverage to homeowners where actuarial pricing appears "unaffordable" is an example of an uncomfortable conversation for an industry where market forces have served consumers and insurers very well.



How have insurers adapted to more extreme weather?

"We delight in the beauty of the butterfly, but rarely admit the changes it has gone through to achieve that beauty."

Maya Angelou

The sustained increase in severe weather claims paid over the past 30 to 40 years resulted in significant and wide-ranging changes in traditional industry practices. Premiums increased as part of multiple responses by the industry to growing evidence of the increasing risk of loss and damage to property. In recent years, overall industry revenues and reinsurance coverage were sufficient to cover claims paid, including the surge in disaster claims. It is important to understand and acknowledge many other adaptations by the industry because they provide important insights into further actions required over the next 10 years.

Severe weather damage claims emerged as a priority for the Canadian insurance industry with the 1998 ice storm. In the 1960s and 1970s, loss and damage from extreme weather events in Canada were so low that the insurance industry did not measure or actively manage this peril. In the 1980s, the industry paid less than \$0.1 billion a year (all figures are adjusted for inflation), on average, in severe weather damage claims.¹⁰⁸ Industry attention at that time was focused on auto insurance reform, the liability crisis, and other challenges.

108 Insurance Bureau of Canada, "2018 Facts of the Property and Casualty Insurance Industry in Canada," 17.

CLIMATE RISKS: IMPLICATIONS FOR THE INSURANCE INDUSTRY IN CANADA

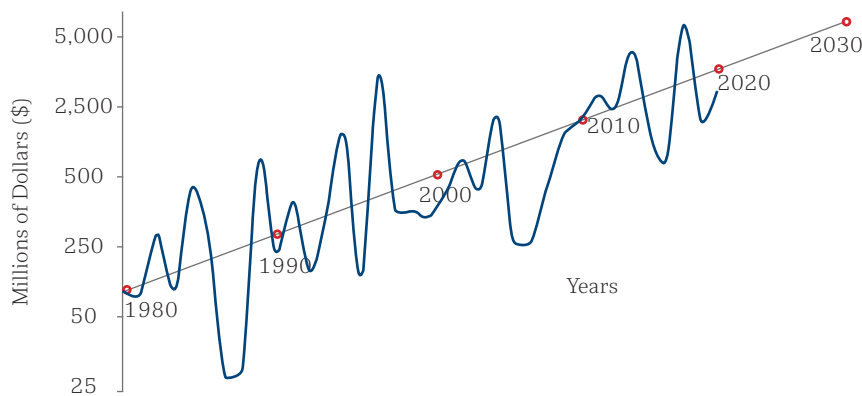
The more than \$2 billion paid in damage claims after the 1998 ice storm was a shock for Canadians in southern Quebec, eastern Ontario, and New Brunswick. The severity and remarkable volume of damage claims were an unprecedented challenge for Canada's insurance industry. At the time, it would typically take more than 20 years to accumulate \$2 billion in severe weather claims from across the country.

The 1998 ice storm resulted in 700,000 claims in Canada and 140,000 claims in the United States over a period of four or five weeks, one of the largest insurance response events in the world in terms of the number of claims paid.¹⁰⁹ A \$2 billion severe weather loss event with 700,000 claims in Canada was unimaginable before 1998.

Recently there have been many large loss events. This includes Canada's most destructive hail storm (2010), urban flooding (2013), wildfire (2016), tornado (2018), severe wind (2018), and residential overland flooding (2019).¹¹⁰ Since 2013, industry severe weather damage claims averaged \$2.1 billion a year.¹¹¹ Since the 1980s, severe weather claims paid by the Canadian insurance industry doubled every 5 to 10 years, after adjustment for inflation.¹¹² Recent losses are 20 times that of the early 1980s.

Graph 8: Climate-related insurance payments

Insurance claims paid, 1983-2018, millions of dollars adjusted for inflation



Source: Institute for Catastrophic Loss Reduction

Canada's property and casualty insurance industry recorded an overall underwriting loss each year between 1980 and 2002, with severe weather claims of \$0.3 billion a year, on average. In 1998, the industry experienced its largest underwriting loss up to that point, in part due to the ice storm.¹¹³ The industry, however, adapted its underwriting practices in response to lower interest rates and sustained high severe weather damage claims, and now consistently reports a modest overall underwriting profit. The industry also adapted to the sustained increase in the volume of severe weather claims by building its response capacity. Since 1998, the insurance industry in Canada made great strides in its financial and operational capacity to manage claims resulting from floods, wildfire, and other extreme weather risks.

109 Lecompte et al., "Ice Storm '98," 19.

110 Insurance Bureau of Canada, "2018 Facts of the Property and Casualty Insurance Industry in Canada," 17.

111 Based on data provided by Catastrophe Indices and Quantification Inc. (CatIQ); see <https://www.catiq.com>.

112 Insurance Bureau of Canada, "2018 Facts of the Property and Casualty Insurance Industry in Canada," 17–25.

113 Ibid., 8, 15.

Understanding the loss

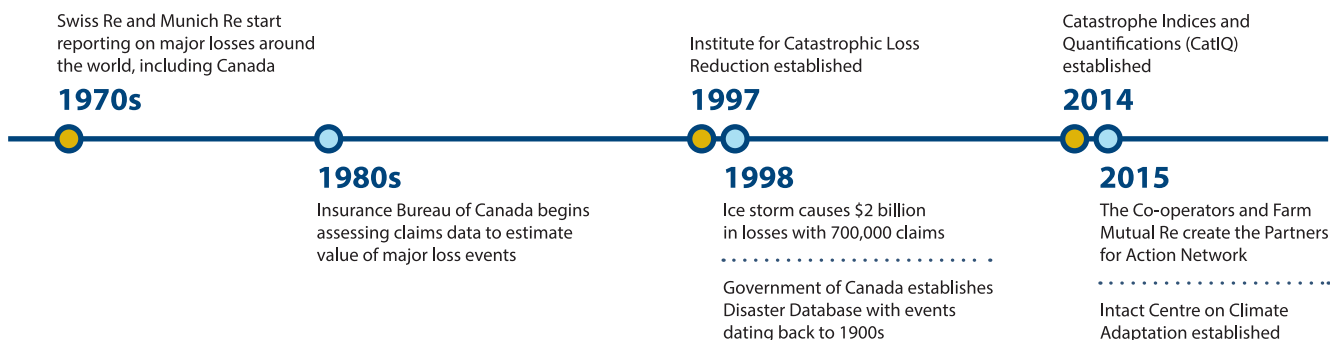
Better industry management of increased severe weather claims began with efforts to understand the risk. Over several decades, the Canadian insurance industry made investments to understand the risk of loss to property and public infrastructure from extreme climate events and the best practices for loss reduction.

Insurers in Canada identified management of catastrophic events as an industry priority in 1992, when the insurance industry in the United States was found to be unprepared for Hurricane Andrew.

Some insurers involved in the Florida insurance market became insolvent, rates were inadequate, and many consumers were disappointed with the industry’s response to the storm.¹¹⁴ The industry in Canada focused initially on preparedness for a large earthquake in Vancouver or Montreal. The Insurance Bureau of Canada collaborated with federal and provincial regulators to establish international best industry and regulatory practices for managing the solvency risk from extreme events.

Industry efforts to prepare for a severe earthquake identified the absence of industry links to the academic research community, disaster management agencies, and officials responsible for building codes and land-use planning. In 1997, the industry established the Institute for Catastrophic Loss Reduction to build critical partnerships for the industry.¹¹⁵ The institute provides a forum for 120 member insurers and partners to better understand the risk of loss from earthquakes, flooding, wildfires, and severe wind. The institute was directed to identify loss reduction best practices that insurers can share with homeowners, builders, governments, and others. The institute grew into Canada’s leading disaster research institute, with extensive experience collaborating with hazard researchers and decision makers in the public and private sector. Importantly, the institute provide a forum for the insurance industry to collaborate in its understanding of climate risks and risk reduction best practices.

Graph 9: Timeline of catastrophic loss management in Canada



The 1998 ice storm established management of climate risks as a priority for the insurance industry in Canada. The industry was able to demonstrate to policyholders, policymakers, and the media its capacity to pay claims. The challenge responding to the storm involved managing the remarkable volume of claims. Innovative leadership resulted in widespread praise for the industry’s response. The insurers, brokers, and others in the industry discovered that preparedness for extreme events requires financial and operational preparedness.

114 Kelly and Stodolak, “Why Insurers Fail,” 6.

115 Institute for Catastrophic Loss Reduction, “The ICLR Strategic Plan 2017–2021,” 1–4.

CLIMATE RISKS: IMPLICATIONS FOR THE INSURANCE INDUSTRY IN CANADA

In 1998, the Government of Canada established the Canadian Disaster Database, which includes information about more than 1,000 natural and technological events since 1900, with a focus on significant disaster events that have directly affected Canadians.¹¹⁶ Since the 1970s, Swiss Re and Munich Re report on major loss events in Canada and around the world, providing estimates of the value of claims paid by the industry and direct damage not covered by insurance.^{117,118} In 1983, the Insurance Bureau of Canada began assessing claims data from member insurers to estimate the value of claims paid following major loss events. After the ice storm in 1998, this information became a prominent part of the bureau's annual publication *Facts of the Property and Casualty Insurance Industry*. The findings are frequently included in industry communication with the media and government. In 2014, Catastrophe Indices and Quantification (CatIQ) was created to provide the industry with analytical and meteorological information about natural hazards and to develop industry loss and exposure data.

In 2015, Intact Financial Corporation established the Intact Centre on Climate Adaptation. The centre focuses on research and building awareness of solutions to climate change risks facing homeowners, communities, industries, and governments.¹¹⁹ In 2015, The Co-operators Group Ltd. and Farm Mutual Re created the Partners for Action network at the University of Waterloo.¹²⁰ This applied research network works to advance flood resiliency.

Over the past 25 years, Canada's insurers supported the development of loss models. The initial focus was on severe earthquakes to better inform insurer decisions about reinsurance coverage. Over time, this expanded to support the analysis of concentration of risk, ratemaking, and risk management.¹²¹

Canadian models address a variety of hazards, including earthquake, severe thunderstorm or winter storm, and tropical cyclones. A recent focus on the development of pluvial, fluvial, and coastal food models was critical to supporting the introduction of residential flood insurance and better management of commercial flood exposure.¹²² The 2013 flooding in southern Alberta resulted in significant commercial loss claims.¹²³ Importantly, model findings are now used to support ratemaking and ensure adequate pricing of risks. Reinsurance brokers, including Aon and Guy Carpenter, support insurance companies and clients through their use of available loss models and development of models for the Canadian market.

Avoid or accept

Rising claims led to a review of coverage and pricing. Several events, like the flooding in Calgary in 2013, identified differences between consumer and insurer understandings of the coverage in place.¹²⁴ Some events, like wildfires in Slave Lake and Fort McMurray, Alberta, exposed the high cost of resolving claims in remote locations and the risk of post-event inflation. Repeated significant losses resulted in concern about coverage terms and conditions to ensure that premium income was sufficient to cover the changing understanding about the frequency and severity of losses.

116 Tudor, "EPC Electronic Disaster Database and Its Characteristics."

117 Swiss Re Institute, "Natural Catastrophes and Man-Made Disasters in 2018."

118 Munich Re, "NatCatSERVICE Methodology."

119 University of Waterloo, "Helping Canadians Adapt to Extreme Weather."

120 University of Waterloo, "Partners for Action."

121 Kovacs, "Hope for the Best and Prepare for the Worst."

122 Sandink et al., "Making Flood Insurable for Canadian Homeowners."

123 Kovacs and Sandink, "Best Practices for Reducing the Risk of Future Damage."

124 Harris, "The Problem with Property."

Insurance companies reassessed current coverage terms and conditions. Model policies developed by the Insurance Bureau of Canada were revised several times, particularly those dealing with personal property. Brokers and companies actively engaged consumers to improve awareness and understanding about the coverage in force and optional endorsements.

Industry awareness of increasing future claims costs resulted in the need to raise rates. A priority for insurance companies was to ensure adequate pricing so coverage could be sustained. Insurance companies sought clear evidence of need before committing to high rates. For example, the 1998 ice storm was a major loss event, but the science did not find that there would be a marked increase in similar storms in the future, so there was no need to adjust pricing. The wildfire in Slave Lake, Alberta, in 2011, by contrast, provided a warning to the industry of the growing risk of wildfire damage and previously unanticipated industry costs involved in debris removal and inflated expenses associated with rebuilding in poorly serviced locations. This finding was reinforced with the Fort McMurray fire in 2016. Several urban flooding events resulted in claims larger than anticipated and required that companies reassess coverage terms and pricing.

Accept climate risks

Basic insurance policies include coverage against the risk of loss resulting from many climate-related hazards—wildfire, hurricane, tornado, hail, lightning, and winter storms. There are important differences in coverage terms and limits between insurers, but basic coverage includes many climate hazards. Some additional hazards can be covered through endorsements, including water damage from sewer backup and overland flood. Insurance companies are willing to cover many severe weather and other climate-related risks for a fair premium.

Most homeowners buy insurance. Most businesses that own buildings buy insurance. Most lenders require proof of insurance. Insurance is available for individuals and small businesses that rent, and the cost is typically low. However, many tenants choose not to buy coverage. Over many decades, insurers have demonstrated their willingness to accept financial responsibility for sudden and accidental climate-related risks in Canada. However, slow onset risks, like thawing permafrost and drought, are typically uninsurable. They do not meet the insurability requirement that losses are triggered by sudden and accidental events.

Consumers want replacement cost insurance. They seek the peace of mind that insurance will support a full recovery if they experience a total loss. Very few property owners want coverage for the depreciated cash value of their home or business. Canada's insurers understand consumer needs and therefore provide replacement cost coverage. Guaranteed replacement cost coverage brings uncertainty for insurers and higher cost for consumers, but it is the preferred coverage for most property owners. Provision of new for old means that insurance contributes to rebuilding structures that are newer and more resilient than those they replace. Fort McMurray, for example, is more resilient to future loss from wildfire because the homes destroyed in the 2016 wildfire were older and less resilient. They were replaced by similar homes that are more resistant to damage from wildfire and other climate risks.¹²⁵

In 2015, several insurers introduced residential overland flood insurance coverage. In 2019, half of homeowners with moderate or low risk in Ontario, Quebec, and British Columbia had flood cover, and coverage was growing elsewhere across the country. The Insurance Bureau of Canada is in discussion with the federal and provincial governments to champion the idea that private insurance could be offered to Canadian homeowners in high-risk areas if public supports are provided.¹²⁶ Presently, few homeowners at high risk of flooding purchase insurance.

¹²⁵ Kovacs et al., "Fort McMurray."

¹²⁶ Insurance Bureau of Canada, "Options for Managing Flood Costs of Canada's Highest Risk Residential Properties."

Risk transfer

Reinsurance is an essential tool that insurers use to manage the risk of loss from extreme events. Following large disasters like the 1998 ice storm, the 2013 Calgary flood, and the 2016 Fort McMurray wildfire, most insurance companies in Canada recovered a large share of the costs they incurred in the payment of consumer claims through the coverage in place with their reinsurers. Large loss events did not become a threat to the solvency of insurers because they had engaged in financial planning for extreme events, including the use of reinsurance. Very large loss events for Canada become manageable when they are spread globally through the effective use of reinsurance.

Beyond financial support, reinsurers and reinsurance brokers provide loss management advice. They share knowledge about good industry practice based on their dealings with insurance companies across Canada and around the world. Reinsurers and reinsurance brokers are familiar with loss models, maps, and other tools to help insurers manage the risk of loss from severe weather events. These services are helpful for large insurance companies, providing an expert second opinion about critical company decisions. This support is also important for smaller insurers that may otherwise not have access to expert advice about low-probability, high-consequence hazards.

The insurance industry is in discussion with the Government of Canada about the transfer of systemic risk from catastrophic events. Analysis by the Property and Casualty Insurance Compensation Corporation affirms the financial capacity of Canada's insurance industry to successfully respond to large events resulting in a few tens of billions of dollars in losses. However, there is a risk—a very low probability risk—that an extreme loss event could result in the systemic failure of Canada's insurance industry.¹²⁷ The industry is proposing a collaboration with the federal government to support industry management of a catastrophic event, like a major earthquake in Vancouver or Montreal. A mechanism like this would also support industry management of extraordinary severe weather hazards.

Promote loss reduction

The Insurance Brokers Association of Canada, Institute for Catastrophic Loss Reduction, Intact Centre on Climate Adaptation, Partners for Action, Insurance Bureau of Canada, and other industry groups are supporting efforts by the insurance industry to inform and champion risk reduction. The frequency and severity of climate-related hazards is increasing, but the risk of loss and damage can be managed if protective action is taken by property owners and public agencies. With homeowners better informed about the risk, knowledge about best loss reduction practices, and given effective financial incentives it is possible to prevent most large hazards from becoming disasters.



127 Kelly, "Why Insurers Fail—2016 Update."

Since 1997, the Institute for Catastrophic Loss Reduction has provided a forum for leaders from the insurance industry to work with policymakers and researchers to better understand the factors driving losses higher.¹²⁸ Insurers worked to ensure this information is available to private- and public-sector decision makers to support risk reduction actions. This includes information to improve building codes, local land-use planning decisions, and protective investments. The industry goal is to provide a scientific foundation to support the building of disaster-resilient communities.

The industry is building collaborations with other stakeholders, too. The Insurance Bureau of Canada established a partnership with the Red Cross following the 2016 wildfire in Fort McMurray. The bureau also partnered with Public Safety Canada to press for better flood maps and develop a mechanism to protect properties at high risk of flooding.

Some insurers have begun providing financial incentives to policyholders to reward them for risk reduction efforts. This includes discounts for homeowners with a backwater valve and sump pump, those located in zones with lower risk of overland flooding, or those following the FireSmart recommendations. Effective motivation by insurers and governments may significantly increase property owner participation in loss reduction.

Public awareness is a powerful tool to drive loss reduction. Increasingly, the insurance industry is embracing the opportunity to educate and share its knowledge about climate-related risks.

Implications for the insurance industry

It is now widely accepted that severe weather and other climate-related claims will dominate property insurance coverage in Canada for the next 10 years and beyond. Large loss events should not present a surprise to the insurance industry like the ice storm did 20 years ago or flooding in Calgary and Toronto in 2013. Today, the insurance industry must regularly demonstrate it is financially and operationally prepared for claims resulting from water, wildfire, wind, and hail damage. The industry exists to help society recover from the worst climate-related events and will do so when the industry is financially and operationally prepared.

Preparedness involves pricing that ensures confidence that funds are available to pay claims, to support the operational capacity needed to serve consumers that experience a loss, and more. Climate risks will account for most of the value and volume of property claims. Importantly, management of climate risks will increasingly define the relationship between the insurance industry and consumers.

Brokers, agents, and insurers must work to develop an understanding of climate risks that permeates through the business, including integration of climate risk management into training and educational programs provided by the Insurance Institute of Canada. The insurance industry is deservedly proud of its efforts over many decades of promoting fire prevention and road safety. Society is much safer because of the leadership evident across the insurance industry. A similar commitment is emerging for climate risks.

Insurance is the business of managing risk. Physical and transitional climate-related risks are emerging as the top risks facing society. The industry has begun the journey toward establishing leadership, but more is needed. In the 1800s, the industry sold fire insurance. In the 1900s, the industry sold auto and property insurance. In the 2000s, the industry will increasingly be known for providing climate and auto coverage.

¹²⁸ Kovacs, "Hope for the Best and Prepare for the Worst"

Recommendations for the Canadian insurance industry

"Risk comes from not knowing what you're doing."

Warren Buffett

The Canadian and global policy conversation about climate change mitigation and adaptation is struggling. Global warming will likely exceed the targets established in the Paris Agreement. The risk of severe weather damage continues to increase.

A new business discussion has emerged that focuses on managing climate risks. For the insurance industry in Canada this includes physical, liability, and transitional risks. For the next 10 years, this presents an opportunity for the insurance industry. The opportunity to serve Canadians is expected to exceed the risks over the near term.

The insurance industry in Canada successfully adapted to the remarkable increase in severe weather damage claims over the last 30 to 40 years. The industry consistently demonstrated its financial and operational capacity to serve the needs of policyholders. Climate risks have replaced fire as the coverage that defines the relationship between property owners and the insurance industry.

Severe weather damage claims are expected to increase. This will be driven by natural variability in the climate, more people and values at risk, an aging infrastructure, and change in the climate. Significant risks for the industry may or may not emerge over the next 50 to 100 years. Over the next 10 years, however, the opportunities for the insurance industry to serve consumers are expected to greatly exceed the risks.

Management of climate-related risks for the insurance industry begins with financial and operational capacity, but is wider reaching and more complex. Some companies have begun to consider investment, solvency, regulatory, and reputational risks. Over time, this will be reflected in financial and regulatory disclosure. Several companies are also choosing to endorse emerging best practices, like the Principles for Sustainable Insurance, Principles for Responsible Investment, and the Task Force for Climate-Related Financial Disclosure.

Three recommendations for the insurance industry in Canada to address climate-related risks over the next 10 years are to:

1. Embrace the opportunity and manage the risks presented.
2. Be proactive in disclosing how the industry is handling the risks.
3. Share industry knowledge to motivate action in others.

1. Embrace the opportunity and manage the risks presented by severe weather and climate change.

Through industry collaboration and individual company action, the insurance industry must address underwriting and operational risks resulting from the impact of climate change on the frequency and severity of extreme events. Consumers and insurers must be confident that pricing, terms, and coverage limits are sustainable and adequately cover expected costs, supported by exposure knowledge, risk reduction information, and loss models. Companies must assess and develop products that meet the evolving severe weather risk management needs of consumers. The insurance industry must continue to demonstrate its capacity to serve consumers following extreme events by investing in an emergency electrical power supply, the capacity of employees to work from home or remote locations, and the availability of teams trained to respond to an occasional surge in claims. Increasing risk of severe weather damage represents an opportunity for the insurance industry over the next 10 years.

The United Nations' Principles for Sustainable Insurance provides industry-specific guidance. Brokers and insurers should endorse and implement the principles to help them integrate climate risks into decision making. The industry should continue to support development of risk reduction best practices for policyholders, loss data, and models that inform industry management of flood, wildfire, and climate-related risks.

2. Proactively disclose how the industry is handling climate risks.

The insurance industry must address investment and solvency risks. Many consumers, investors, and regulators want companies, including insurance companies, to provide greater disclosure about how they are managing climate-related risks. Legal challenges may affect the value of investments in major emitters. Valuations may change as a result of shifts in regulation, rising carbon taxes, and new technologies to support society's transition to a low-carbon future. Insurers and brokers should measure and disclose their greenhouse gas emissions and targets to reduce their environmental footprint. Low insolvency risk must be rigorously affirmed through stress testing of low-probability, high-consequence extreme weather scenarios and ongoing evaluation of reinsurance coverage and concentration of risk. Solvency regulators provide an independent, objective assessment of the ability of insurers to pay severe weather claims.

The Task Force on Climate-Related Financial Disclosure is working to develop industry-specific advice on disclosure to inform investors and regulators for eight industries, including insurance. Insurance companies should monitor and embrace these emerging tools to demonstrate their preparedness. Investment risk management can be informed by tools provided to investors that endorse the United Nations' Principles for Responsible Investment. Increased regulatory attention and scrutiny assessing the management of the industry's capacity to pay claims should be welcome and encouraged by the industry.

3. Share industry knowledge and provide incentives to motivate action by others

Action by property owners and governments can significantly reduce the risk of loss from severe weather events, like installing a backwater valve or a sump pump with a battery-powered backup. The insurance industry is working to develop effective loss reduction solutions based on scientific study and industry knowledge. Brokers and companies should proactively share this information with property owners, governments, and other decision makers. Awareness building is most effective when accompanied by financial incentives. Insurers that align pricing and risk will reward actions that reduce the risk of loss claims. The Institute for Catastrophic Loss Reduction and the Intact Centre on Climate Adaptation are working to identify specific loss reduction actions that can be championed by the insurance industry.

Appendix I – Principles for Sustainable Insurance

The United Nations Environment Programme Finance Initiative's Principles for Sustainable Insurance (PSI) serve as a global framework for the insurance industry to address environmental, social, and governance (ESG) risks and opportunities. The vision of the PSI initiative is of a risk-aware world where the insurance industry is trusted and plays its full role in enabling a healthy, safe, resilient, and sustainable society. The purpose of the PSI initiative is to better understand, prevent, and reduce ESG risks, and better manage opportunities to provide quality and reliable risk protection.

Principle 1

We will embed in our decision making environmental, social, and governance issues relevant to our insurance business.

Possible actions:

Company strategy

- Establish a company strategy at the Board and executive management levels to identify, assess, manage and monitor ESG issues in business operations.
- Dialogue with company owners on the relevance of ESG issues to company strategy.
- Integrate ESG issues into recruitment, training and employee engagement programmes.

Risk management and underwriting

- Establish processes to identify and assess ESG issues inherent in the portfolio and be aware of potential ESG-related consequences of the company's transactions.
- Integrate ESG issues into risk management, underwriting and capital adequacy decision-making processes, including research, models, analytics, tools and metrics.

Product and service development

- Develop products and services which reduce risk, have a positive impact on ESG issues and encourage better risk management.
- Develop or support literacy programmes on risk, insurance and ESG issues.

Claims management

- Respond to clients quickly, fairly, sensitively and transparently at all times and make sure claims processes are clearly explained and understood.
- Integrate ESG issues into repairs, replacements and other claims services.

Sales and marketing

- Educate sales and marketing staff on ESG issues relevant to products and services and integrate key messages responsibly into strategies and campaigns.
- Make sure product and service coverage, benefits and costs are relevant and clearly explained and understood.

Investment management

- Integrate ESG issues into investment decision-making and ownership practices (e.g. by implementing the Principles for Responsible Investment).

Principle 2

We will work together with our clients and business partners to raise awareness of environmental, social and governance issues, manage risk and develop solutions.

Possible actions:

Clients and suppliers

- Dialogue with clients and suppliers on the benefits of managing ESG issues and the company's expectations and requirements on ESG issues.
- Provide clients and suppliers with information and tools that may help them manage ESG issues.
- Encourage clients and suppliers to disclose ESG issues and use relevant disclosure or reporting frameworks.

Insurers, reinsurers and intermediaries

- Promote adoption of the Principles.
- Support inclusion of ESG issues in professional education and ethical standards in the insurance industry.

Principle 3

We will work together with governments, regulators and other key stakeholders to promote widespread action across society on environmental, social and governance issues.

Possible actions:

Governments, regulators and other policymakers

- Support prudential policy, regulatory and legal frameworks that enable risk reduction, innovation and better management of ESG issues.
- Dialogue with governments and regulators to develop integrated risk management approaches and risk transfer solutions.

Other key stakeholders

- Dialogue with intergovernmental and non-governmental organisations to support sustainable development by providing risk management and risk transfer expertise.
- Dialogue with business and industry associations to better understand and manage ESG issues across industries and geographies.
- Dialogue with academia and the scientific community to foster research and educational programmes on ESG issues in the context of the insurance business.
- Dialogue with media to promote public awareness of ESG issues and good risk management.

Principle 4

We will demonstrate accountability and transparency in regularly disclosing publicly our progress in implementing the Principles.

Possible actions:

- Assess, measure and monitor the company's progress in managing ESG issues and proactively and regularly disclose this information publicly.
- Participate in relevant disclosure and reporting frameworks.
- Dialogue with clients, regulators, rating agencies and other stakeholders to gain mutual understanding on the value of disclosure through the Principles.

Additional information is available at: www.unepfi.org/psi

Appendix II – Principles for Responsible Investment

The mission of the United Nations' Principles for Responsible Investment (PRI): We believe that an economically efficient, sustainable global financial system is a necessity for long-term value creation. Such a system will reward long-term, responsible investment and benefit the environment and society as a whole.

The PRI will work to achieve this sustainable global financial system by encouraging adoption of the Principles and collaboration on their implementation; by fostering good governance, integrity and accountability; and by addressing obstacles to a sustainable financial system that lie within market practices, structures and regulation

Principle 1

We will incorporate ESG issues into investment analysis and decision-making processes.

Principle 2

We will be active owners and incorporate ESG issues into our ownership policies and practices.

Principle 3

We will seek appropriate disclosure on ESG issues by the entities in which we invest.

Principle 4

We will promote acceptance and implementation of the Principles with the investment industry.

Principle 5

We will work together to enhance our effectiveness in implementing the Principles.

Principle 6

We will each report on our activities and progress towards implementing the Principles.

Additional information is available at: www.unpri.org

Appendix III – ShareAction TCFD question list and scoring

ShareAction used the framework provided by the Task Force on Climate-Related Financial Disclosure to assess the disclosure by the 80 largest global insurance companies. They assessed responses to the following questions to judge disclosure about governance, strategy, risk management, and metrics. Four insurers were awarded an overall score of AAA or AA: AXA, Aviva, Allianz, and Legal & General. No Canadian insurers were included in this study.

Governance (16 percent)

- Which of the following best describes the board's oversight of climate-related issues?
- How climate related issues are integrated into board discussions?
- Has the board identified climate change as a material risk?
- How your organization has assigned climate-related responsibilities to investment and underwriting?
- Have you publicly supported the adoption of the final TCFD recommendations? By when do you intend to fully implement these recommendations for your business?
- Has the organization introduced structured education/awareness programmes for key internal decision makers on the potential impact of climate-related risks within the business?
- Summarize the steps the company has taken to educate clients on mitigating climate liability risks and encourage policyholders to reduce the losses caused by climate change-influenced events.

Strategy (32 percent)

- Have climate-related risks and opportunities that could have material financial impact been identified?
- As an asset owner, how have you factored climate-related risks and opportunities into the group level investment strategy or policy?
- For any of the following, do you have climate-related incentives, which are forward-looking and based on long-term investment horizons?
- As an asset owner, how is the management of climate-related risks embedded into your contractual agreements with professional service providers (asset managers, proxy voting advisors, investment consultants, etc.)? How do you ensure the requests are being met?
- How are climate-related issues factored into asset manager selection process by your investment consultant or internal investment executive?
- Do you publish (internally or externally) information on the potential impacts of climate-related risks and opportunities on your core business, products and services?
- Are and specific climate-related products or services being offered or are under development?
- As an asset owner, have you assessed the resilience and alignment of the organisation's strategy, taking into consideration different climate-related scenarios?
- As an insurer, have you assessed the resilience and alignment of the organization's strategy, taking into consideration different climate-related scenarios?

Risk Management (28 percent)

- Have you incorporated climate-related issues into your engagement with investee companies, key service providers and external parties?
- Do you encourage any of the following during your engagement with investee companies and corporate borrowers?
- Do you publish annual voting records on proxy votes?

- Please select the collaborative engagement initiatives and industry associations you participate in?
- As an asset owner, has the business undertaken a portfolio-wide assessment of potential systemic risks associated with the transition to a low-carbon economy?
- As an asset owner, has the business developed tools to help identify and assess climate-related risks and opportunities in portfolio construction, stock selection or asset allocation?
- As an insurer, does the business have a process for identifying and assessing climate-related risks on insurance or reinsurance contracts or agreements?
- Are there geographic locations, perils or coverages for which the company has increased rates, limited sales, or limited or eliminated coverages because of catastrophic events?

Metrics and Targets (23 percent)

- As an asset owner, has the business developed metrics used to assess climate-related risks and opportunities in investment decisions?
- As an insurer, has the business developed metrics used to assess climate-related risks and opportunities in underwriting decisions?
- As an asset owner, have you measured low-carbon assets in your portfolio?
- As an asset owner, have you measured high-carbon assets in your portfolio?
- As an asset owner, have you calculated your aggregate or specified portfolio emissions intensity?
- As an asset owner, has the business developed climate-related targets?
- As an insurer, has the business developed climate-related targets?
- As an asset owner, have you introduced an asset allocation policy on low-carbon assets? Has this commitment resulted in modifications of asset allocation or stock selection or weighting?

Additional information is available at: www.shareaction.org

Appendix IV – CCIR position and recommendations

The Findings Report and Position Paper published by the Canadian Council of Insurance Regulators (CCIR) in 2017 includes the following recommendations concerning natural catastrophes and personal property insurance:

CCIR supports the continued development and improvement of risk modelling tools and probabilistic data to help insurers: a) better understand and rate risk and b) offer a diverse and appropriate selection of products and coverages.

CCIR supports the use of risk modelling tools and probabilistic data by all stakeholders in better understanding, preparing for and mitigating the impact of natural catastrophes.

CCIR encourages stakeholders to better collaborate so that aggregated risk data is made more readily available to support the conditions necessary to enhance preparedness, as well as the affordability and availability of natural catastrophe insurance.

CCIR encourages the creation of innovative risk-sharing practices that ensure new product development and the availability and affordability of coverage for natural catastrophes in Canada.

CCIR supports risk-sharing practices that allow for adequate and suitable coverages for consumers in high-risk areas.

CCIR recommends that insurers have policies and procedures in place to ensure timely and efficient handling of consumer inquiries before, during and after a natural catastrophe.

CCIR recommends that insurers have policies and procedures in place to ensure timely and efficient handling of claims, particularly those related to natural catastrophe events, including contingencies for the potential of multiple events across more than one jurisdiction.

CCIR recognizes that innovative solutions from regulatory authorities may be necessary to support timely and efficient handling of claims following a natural catastrophe. In the past, this has included allowing immediate access and entry to industry participants from other jurisdictions to assist with the insurance claims and recovery process.

CCIR supports government initiatives for the prevention and mitigation of the impacts of natural catastrophes and/or relief funding programs.

CCIR members should work with other government organizations and other stakeholders to increase consumer awareness and understanding of insurance, with a focus on protecting property from natural catastrophes.

CCIR members need to convey these positions and recommendations to their respective ministries to ensure governments are aware of our general concerns and the role both governments and regulators have to play.

CCIR members expect insurers to provide timely reporting to the appropriate regulatory authority following a natural catastrophe (i.e., the regulatory authority from the area in which the natural catastrophe occurred). Where appropriate that regulatory authority will share the information with the other CCIR members.

CCIR recommends that insurers incorporate the following principles into the development of natural catastrophe products:

- Ensure products provide adequate coverage for the identified risk.
- Develop products and services that are complementary to the risk transfer function of insurance and incent the prevention and mitigation of the risks consumers face from natural catastrophes.

Ensure consumers are better able to understand their insurance contract.

CCIR supports the continued development and innovation of products for natural catastrophes to ensure consumers across Canada have access to affordable coverage.

CCIR expects that insurers continue to incorporate the CCIR Principles for Managing Conflicts of interest into the distribution of their natural catastrophe products:

- Priority of Client's Interest
- Disclosure of Conflicts or Potential Conflicts of Interest
- Product Suitability

CCIR recommends the use of plain language in insurance policies and information / materials on natural catastrophe coverages.

CCIR supports enhanced transparency and disclosure requirements at the point of sale to increase consumer understanding and awareness of coverage related to natural catastrophes.

CCIR members need to convey these observations to their respective ministries to ensure governments are aware of our general concerns and the role both governments and regulators have to play.

CCIR expects that insurers and intermediaries promote products and services in a manner that is clear, fair and not misleading. CCIR supports industry outreach and the development of incentives and mitigation measures for consumers.

- Outreach and communications to consumers should include various formats (i.e., online, mailers...) and align with principles of plain language so that the information is clear and easily understandable.
- Outreach measures should equip consumers with sufficient information to enable informed decisions and make product choices that suit the consumer's needs.

CCIR expects that industry efforts on education and awareness will include the provision of ongoing information to policyholders, including details on the product, limitations, exemptions and deductibles, to ensure consumers can make informed decisions and choices that best suit their needs.

CCIR has a strong interest in ensuring that the timing, delivery, and content of information provided to customers at the point of sale and that policy service is appropriate through to the point at which all obligations under the policy have been satisfied (i.e., throughout the life cycle of the product).

CCIR encourages the industry to consider educational efforts and campaigns that seek to increase the consumer's understanding of insurance in general.

The CCIR expects insurers to have sufficient human capital to handle natural catastrophe claims in a timely and efficient manner.

The CCIR supports risk-sharing and risk management practices so that insurers are financially prepared for a major natural catastrophe.

The CCIR supports continued adaptation as a result of lessons learned from previous events.

The CCIR expects that all insurers and intermediaries adopt policies that support the fair treatment of customers.

The CCIR will continue to monitor the effects of climate change and any potential implications for the insurance industry in Canada.

The CCIR supports industry and government efforts to improve financial literacy.

Appendix V – Bibliography

- Autorité des marchés financiers. “Report on Socially Responsible Investments in Collective Investment Schemes.” 2017. https://www.amf-france.org/en_US/Publications/Rapports-etudes-et-analyses/Epargne-et-prestataires?docId=workspace%3A%2F%2FSpacesStore%2F2e257eee-d2e0-4a99-9264-4b3311073060#.
- AXA Group. “2019 Climate Report.” 2019. <https://group.axa.com/en/newsroom/publications/2019-climate-report>.
- Barbero, R., H.J. Fowler, G. Lenderink, and S. Blenkinsop (2017): “Is the Intensification of Precipitation Extremes with Global Warming Better Detected at Hourly than Daily Resolutions?” *Geophysical Research Letters* 44, no. 2 (2017). <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2016GL071917>.
- Broom, Douglas. “The Cost of Generating Renewable Energy Has Fallen—A Lot.” *World Economic Forum*, May 7, 2019. <https://www.weforum.org/agenda/2019/05/this-is-how-much-renewable-energy-prices-have-fallen/>.
- Burck, Jan, Ursula Hagen, Franziska Marten, Niklas Höhne, and Christoph Bals. “Climate Change Performance Index—Results 2019.” *Germanwatch*, 2019. <https://newclimate.org/wp-content/uploads/2018/12/CCPI-2019-Results.pdf>.
- Burger, Michael, and Justin Gundlach. “The Status of Climate Change Litigation—A Global Review.” *United Nations Environment Programme*. 2017. <http://columbiaclimatelaw.com/files/2017/05/Burger-Gundlach-2017-05-UN-Envt-CC-Litigation.pdf>.
- Bush, E., and D.S. Lemmen, eds., “Canada’s Changing Climate Report.” *Government of Canada*, 2019. <https://changingclimate.ca/CCCR2019/>.
- Canada. “Canada’s Mid-Century Long-Term Low-Greenhouse Gas Development Strategy.” *Government of Canada*. 2016. <http://publications.gc.ca/pub?id=9.825953&sl=0>.
- Canada. “Expert Panel on Sustainable Finance—Final Report: Mobilizing Finance for Sustainable Growth.” *Government of Canada*. 2019. http://publications.gc.ca/collections/collection_2019/eccc/En4-350-2-2019-eng.pdf.
- Canada. “Expert Panel on Sustainable Finance—Interim Report.” *Government of Canada*. 2018. <http://publications.gc.ca/site/eng/9.863536/publication.html>.
- Canada. “Pan-Canadian Framework on Clean Growth and Climate Change: Canada’s Plan to Address Climate Change and Grow the Economy.” *Government of Canada*. 2016. <https://www.canada.ca/content/dam/themes/environment/documents/weather1/20170125-en.pdf>.
- Canadian Council of Insurance Regulators. “Natural Catastrophes and Personal Property Insurance.” 2017. <https://www.ccir-ccra.org/Documents/View/2838>.
- Canadian Mortgage and Housing Corporation. “Canadian Housing Observer 2014.” <https://chbanl.ca/wp-content/uploads/Canadian-Housing-Observer-2014.pdf>.
- Canadian Securities Administrators. “CSA Notice 51-354: Reporting of Climate Change-Related Disclosure Project.” 2018. https://www.osc.gov.on.ca/documents/en/Securities-Category5/csa_20180405_climate-change-related-disclosure-project.pdf.
- Canadian Securities Administrators. “CSA Notice 51-358: Reporting of Climate Change-Related Risks.” 2019. https://www.osc.gov.on.ca/en/SecuritiesLaw_csa_20190801_51-358_reporting-of-climate-change-related-risks.htm.
- Carney, Mark. “Breaking the Tragedy of the Horizon: Climate Change and Financial Stability.” *Speech delivered at Lloyd’s of London*, London, UK, September 29, 2015. <https://www.bis.org/review/r151009a.pdf>.

- Cook, John, et al. "Consensus on Consensus: A Synthesis of Consensus Estimates of Human-Caused Climate Warming." *Environmental Research Letters* 11, no. 4 (2016). https://www.researchgate.net/publication/301247690_Consensus_on_Consensus_A_Synthesis_of_Consensus_Estimates_on_Human-Caused_Global_Warming.
- Co-operators, The. "The Co-operators Integrated Annual Report 2017." 2018. <https://www.cooperators.ca/en/en/-/media/Cooperators-Media/Section-Media/AboutUs/corporate-overview/Annual-reports/archive2017/The2017IntegratedAnnualReportpdf.pdf?newtab=1&la=en>.
- CPA Canada. "State of Play: Study of Climate-Related Disclosures by Canadian Public Companies." 2017. <https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/energy-resources/State-of-Play-Study-Climate-Related-Disclosures-Report-June-2017.pdf>.
- Dowd, Allan. "Lawsuit against Canada over Kyoto accord dismissed." *Reuters*, October 21, 2008. <https://ca.reuters.com/article/domesticNews/idCATRE49K6VM20081021>.
- Environment and Climate Change Canada. "Canada's Coal Power Phase-Out Reaches Another Milestone." News release, Government of Canada, December 12, 2018. <https://www.canada.ca/en/environment-climate-change/news/2018/12/canadas-coal-power-phase-out-reaches-another-milestone.html>.
- Environment and Climate Change Canada. "Canadian Environmental Sustainability Indicators: Global Greenhouse Gas Emissions." Government of Canada. 2019. <https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/global-greenhouse-gas-emissions.html>.
- Financial Services Authority. "Product Intervention." Discussion Paper DP11/1, 2011. https://www.fca.org.uk/publication/discussion/dp11_01.pdf.
- Griffin, Paul. "The Carbon Majors Database—CDP Carbon Majors Report 2017." CDP Worldwide. 2017. <https://b8f65cb373b1b7b15feb-c70d8ead6ced550b4d987d7c03fcd1d.ssl.cf3.rackcdn.com/cms/reports/documents/000/002/327/original/Carbon-Majors-Report-2017.pdf>.
- Harris, Craig, "The Problem with Property." *Canadian Underwriter*, May 31, 2014. <https://www.canadianunderwriter.ca/features/cc-the-problem-with-property/>.
- Harvey, Chelsea and Nathaniel Gronewold. "CO2 Emissions Will Break Another Record in 2019." *Scientific American*, December 4, 2019. <https://www.scientificamerican.com/article/co2-emissions-will-break-another-record-in-2019/>.
- Institute for Catastrophic Loss Reduction. "The ICLR Strategic Plan 2017–2021." 2016. https://www.iclr.org/wp-content/uploads/PDFS/ICLR_Five_year_report_2016.pdf.
- Insurance Bureau of Canada. "2018 Facts of the Property and Casualty Insurance Industry in Canada." 2019. http://assets.abc.ca/Documents/Facts%20Book/Facts_Book/2018/IBC-Fact-Book-2018.pdf.
- Insurance Bureau of Canada. "Options for Managing Flood Costs of Canada's Highest Risk Residential Properties: A Report of the National Working Group on Financial Risk of Flooding." 2019. <http://www.abc.ca/on/resources/studies/options-for-managing-flood-costs-of-canada%E2%80%99s-highest-risk-residential-properties>.
- Insurance Institute of Canada. "Automated Vehicles: Implications for the Insurance Industry in Canada." 2016. <https://www.insuranceinstitute.ca/en/resources/insights-research/changing-workforce/automated-vehicles>.
- Intact Financial Corporation. "2018 Social Impact Report." 2019. https://s1.q4cdn.com/321139868/files/doc_downloads/pas/2018/Intact_2018_Social_Impact_Report.pdf.

CLIMATE RISKS: IMPLICATIONS FOR THE INSURANCE INDUSTRY IN CANADA

- Intergovernmental Panel on Climate Change. "Climate Change 2014: Synthesis Report." Contribution of Working Groups I, II, and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. Geneva, Switzerland: IPCC, 2015. https://www.ipcc.ch/site/assets/uploads/2018/05/SYR_AR5_FINAL_full_wcover.pdf.
- Intergovernmental Panel on Climate Change. "Global Warming of 1.5°C—Summary for Policymakers." 2018. https://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf.
- International Association of Insurance Supervisors. "Issues Paper on Climate Change Risks to the Insurance Sector." 2018. https://www.insurancejournal.com/research/app/uploads/2018/08/IAIS_and_SIF_Issues_Paper_on_Climate_Change_Risks_to_the_Insurance_Sector_-1.pdf.
- Kelly, Grant, and Peter Stodolak. "Why Insurers Fail: Natural Disasters and Catastrophes." PACICC, 2013. <http://www.pacicc.com/publications/pages/publications/WIF%20Natural%20Disasters.pdf>.
- Kelly, Grant. "Why Insurers Fail: Natural Disasters and Catastrophes—2016 Update." PACICC, 2016. <http://www.pacicc.org/publications/pages/publications/WIF%20Natural%20Disasters%202016%20Update.pdf>.
- Kossin, James, Timothy Hall, Thomas Knutson, Kenneth Kunkel, Robert Trapp, Duane Waliser, and Michael Wehner, "Extreme Storms." Climate Science Special Report. Fourth National Climate Assessment 1 (2017): 257–276. <https://science2017.globalchange.gov/chapter/9/>.
- Kovacs, Paul. "Development Permits: An Emerging Policy Instrument for Local Governments to Manage Interface Fire Risk in a Changing Climate." ICLR Research Paper Series 61. Toronto, ON: Institute for Catastrophic Loss Reduction, 2018. https://www.iclr.org/wp-content/uploads/2018/05/Development-Permits_2018.pdf.
- Kovacs, Paul. "Hope for the Best and Prepare for the Worst: How Canada's Insurers Stay a Step Ahead of Climate Change." Policy Options, December 1, 2005. <https://policyoptions.irpp.org/fr/magazines/global-warming-a-perfect-storm/hope-for-the-best-and-prepare-for-the-worst-how-canadas-insurers-stay-a-step-ahead-of-climate-change/>.
- Kovacs, Paul, and Dan Sandink. "Best Practices for Reducing the Risk of Future Damage to Homes from River and Urban Flooding: A Report on Recovery and Rebuilding in Southern Alberta." ICLR Research Paper, no. 532 (2013). <https://www.iclr.org/wp-content/uploads/PDFS/best-practices-for-reducing-the-risk-of-future-damage-to-homes-from-riverine-and-urban-flooding.pdf>.
- Kovacs, Paul, et al. "Fort McMurray: Learning from Canada's Costliest Disaster." Zurich Insurance Company Ltd. 2019. https://www.osc.gov.on.ca/en/SecuritiesLaw_csa_20190801_51-358_reporting-of-climate-change-related-risks.htm.
- LeComte, Eugene L., et al. "Ice Storm '98." ICLR Research Paper, no. 1. (1998). https://www.iclr.org/wp-content/uploads/PDFS/1998_ice_storm_english.pdf.
- Levin, Kelly, Benjamin Cashore, Steven Bernstein, Graeme Auld, et al. "Overcoming the Tragedy of Super Wicked Problems: Constraining Our Future Selves to Ameliorate Global Climate Change." Policy Sciences 45, no. 2 (2012). <https://link.springer.com/article/10.1007/s11077-012-9151-0>.
- Lüthi, D., M. Le Floch, B. Bereiter, T. Blunier, J.-M. Barnola, U. Siegenthaler, D. Raynaud, J. Jouzel, H. Fischer, K. Kawamura, and T.F. Stocker. "High-resolution carbon dioxide concentration record 650,000–800,000 years before present." Nature, Vol. 453, pp. 379–382 (2008). doi:10.1038/nature06949.
- McCue, Duncan. "Why Environmentalists Are Taking Their Climate Fight to Canadian Courtrooms." CBC News, June 21, 2019. <https://www.cbc.ca/news/the-national-climate-change-courts-1.5182876>.

- Messervy, Max. "Insurer Climate Risk Disclosure Survey Report and Scorecard: 2016 Findings and Recommendations." Ceres, October 2016. <https://www.ceres.org/sites/default/files/reports/2017-03/Ceres%20Insurer%20Climate%20Risk%20Disclosure%20Survey.pdf>.
- Mills, Evan, Ted Lamm, Sadaf Sukhia, Ethan Elkind, and Aaron Ezroj. "Trial by Fire: Managing Climate Risks Facing Insurers in the Golden State." California Department of Insurance, September 2018. <http://www.insurance.ca.gov/0400-news/0100-press-releases/2018/upload/nr106TrialbyFire090618.pdf>.
- Montreal Pledge. "How-to: Five Steps to Measure your Portfolio's Carbon Footprint." PRI. 2014. <https://montrealpledge.org>.
- Mucke, Peter. "World Risk Report 2018." Bündnis Entwicklung Hilft. 2018. <https://reliefweb.int/sites/reliefweb.int/files/resources/WorldRiskReport-2018.pdf>.
- Multihazard Mitigation Council. "Natural Hazard Mitigation Saves: 2017 Interim Report: An Independent Study—Summary of Findings." Washington, DC: National Institute of Building Sciences, 2017. https://www.fema.gov/media-library-data/1516812817859-9f866330bd6a1a93f54cdc61088f310a/MS2_2017InterimReport.pdf.
- Munich Re. "NatCatSERVICE Methodology." March 2018. https://natcatservice.munichre.com/assets/pdf/180220_NCS_Methodology_en.pdf.
- National Association of Insurance Commissioners. "The Potential Impact of Climate Change on Insurance Regulation." 2008. https://www.naic.org/documents/cipr_potential_impact_climate_change.pdf.
- Navarro, Mireya. "Florida Facing Crisis in Insurance." New York Times, April 25, 1996. <https://www.nytimes.com/1996/04/25/us/florida-facing-crisis-in-insurance.html>.
- Office of the Superintendent of Financial Institutions. "Guideline—Stress Testing." 2009. <http://www.osfi-bsif.gc.ca/Eng/Docs/e18.pdf>.
- Poggio, Marco. "Next Climate Liability Suits vs. Big Oil Could Come from Western Canada." Climate Liability News, January 22, 2019. <https://www.climateliabilitynews.org/2019/01/22/climate-liability-western-canada-vancouver-victoria/>.
- PRI. "Launch of First Online and Free Climate Scenario-Based Analysis Tool." Principles for Responsible Investment. 2018. <https://www.unpri.org/news-and-press/launch-of-first-online-and-free-climate-scenario-based-analysis-tool/3571.article>.
- PRI. "Principles for Responsible Investment: An Investor Initiative in Partnership with UN Finance Initiative and the UN Global Compact." 2018. <https://www.unpri.org/download?ac=6303>.
- PRI. "PRI Signatory Directory." Downloaded September 1, 2019. <https://www.unpri.org/signatories/signatory-directory>.
- PRI. "The Inevitable Policy Response." 2018. <https://www.unpri.org/inevitable-policy-response/what-is-the-inevitable-policy-response/4787.article>.
- Sandink, Dan, Paul Kovacs, Greg Oulahen, and Glenn McGillivray. "Making Flood Insurable for Canadian Homeowners: A Discussion Paper." Institute for Catastrophic Loss Reduction and Swiss Re. 2010. <https://www.iclr.org/wp-content/uploads/PDFS/making-flood-insurable-for-canadian-homeowners.pdf>.
- Schiermeier, Quirin. "Droughts, heatwaves and floods: How to tell when climate change is to blame." Nature, Vol. 560 (2018). <https://www.nature.com/articles/d41586-018-05849-9>.
- Senate of Canada. "Reducing Greenhouse Gas Emissions from Canada's Built Environment." Report of the Standing Senate Committee on Energy, the Environment and Natural Resources. 2018. https://sencanada.ca/content/sen/committee/421/ENEV/reports/ENEV_Buildings_FINAL_e.pdf.

CLIMATE RISKS: IMPLICATIONS FOR THE INSURANCE INDUSTRY IN CANADA

- ShareAction. "Got It Covered? Insurance in a Changing Climate." 2018. <https://aodproject.net/wp-content/uploads/2018/05/AODP-Got-It-Covered-Insurance-Report-2018.pdf>.
- Statistics Canada. "Canada Goes Urban." Government of Canada. 2017. <https://www.unpri.org/inevitable-policy-response/what-is-the-inevitable-policy-response/4787.article>.
- Statistics Canada. "Canada's Population Estimates: Subprovincial Areas, July 1, 2018." Government of Canada. Released February 8, 2019. <https://www150.statcan.gc.ca/n1/daily-quotidien/190328/dq190328b-eng.htm>.
- Swiss Re Institute. "Natural Catastrophes and Man-Made Disasters in 2016: A Year of Widespread Damages." Sigma 2 (2017). <https://www.unpri.org/inevitable-policy-response/what-is-the-inevitable-policy-response/4787.article>.
- Swiss Re Institute. "Natural Catastrophes and Man-Made Disasters in 2018: 'Secondary' Perils on the Frontline." Sigma, no. 2 (2019). https://www.swissre.com/dam/jcr:c37eb0e4-c0b9-4a9f-9954-3d0bb4339bfd/sigma2_2019_en.pdf.
- Task Force on Climate-Related Financial Disclosure. "Final Report." 2017. <https://www.fsb-tcfd.org/wp-content/uploads/2017/06/FINAL-TCFD-Report-062817.pdf>.
- Task Force on Climate-Related Financial Disclosure. "2019 Status Report." 2019. <https://www.fsb.org/wp-content/uploads/P050619.pdf>.
- Tudor, Carol. "EPC Electronic Disaster Database and Its Characteristics. Project Report 97-1." Government of Canada. 1997. <http://www.publications.gc.ca/collections/Collection/D83-5-97-1E.pdf>.
- United Nations. "United Nations Framework Convention on Climate Change." 1992. <https://unfccc.int/resource/docs/convkp/conveng.pdf>.
- United Nations. "Principles for Sustainable Insurance." UNEP Finance Initiative. 2012. https://www.unepfi.org/fileadmin/documents/PSI_document-en.pdf.
- United Nations. "Paris Agreement on Climate Change." 2015. https://unfccc.int/sites/default/files/english_paris_agreement.pdf.
- United Nations. "UNEP FI Working with 16 Global Insurers to Better Understand Risk & Implement TCFD Recommendations." UNEP Finance Initiative. 2018. <https://www.unepfi.org/news/industries/insurance/unep-fi-working-with-16-global-insurers-to-better-understand-risk-implement-tcfd-recommendations/>.
- United Nations. "Principles for Sustainable Insurance Signatory Companies." September 2019. <https://www.unepfi.org/psi/signatory-companies/>.
- United Policyholders. "State-by-State Mitigation Insurance Discount Statutes Summaries." 2017. http://uphelp.org/sites/default/files/guides/2017.08.03_naic_mitigation_discount_handout.pdf.
- United States Congress. "S. 3481. To Amend the Securities Exchange Act of 1934 to Require Issuers to Disclose Certain Activities Relating to Climate Change, and for Other Purposes." Enacted September 24, 2018. <https://www.govinfo.gov/content/pkg/BILLS-115s3481is/pdf/BILLS-115s3481is.pdf>.
- University of Waterloo. "Helping Canadians Adapt to Extreme Weather." 2018. <https://www.intactcentreclimateadaptation.ca/wp-content/uploads/2015/11/Intact-Centre-Brochure-2018.pdf>.
- University of Waterloo. "Partners for Action." https://uwaterloo.ca/partners-for-action/sites/ca.partners-for-action/files/uploads/files/c013708_env_fmnp_stewardship_report_v2_lowres_final-s_0.pdf.

- World Economic Forum. "The Global Risks Report 2019," 14th ed., 2019. http://www3.weforum.org/docs/WEF_Global_Risks_Report_2019.pdf.
- Zizzo, Laura, Travis Allan, and Alexandra Kocherga. "Stormwater Management in Ontario: Legal Issues in a Changing Climate. A Report for the Credit Valley Conservation Authority." Zizzo Allan Professional Corporation. 2014. https://cvc.ca/wp-content/uploads/2014/05/Stormwater-Management-in-Ontario_Legal-Issues-in-a-Changing-Climate_2014.04.29.pdf.

“We did not come to fear the future. We came here to shape it.”

Barack Obama

Increased risk of physical damage from extreme weather has been identified by the World Economic Forum as the top issue facing society over the next 10 years. The insurance industry is at the forefront of managing this risk.

What are the primary factors expected to drive the increase in physical damage?



EXPOSURE

The number of people who live, work and play in zones of high and rising risk is expected to grow. There are more buildings at risk of damage from flooding, and more people and businesses located in the wildland-urban interface at risk of damage from wildfire. Moreover, there is a growing concentration of values in major urban centres at risk of damage from intense rainfall, severe wind and winter storms.



VULNERABILITY

Recent extreme events have overwhelmed Canada’s critical infrastructure. These systems were designed to anticipate historic, moderate weather events. Most systems were not designed to support populations that have grown over time. Additionally, homes and other buildings are aging. Research finds that older structures are more like to experience damage form extreme events, like the fire loss in Fort McMurray.



EXTREME WEATHER

Intense rainfall events that overwhelm storm and sanitary sewer systems are expected to increase in frequency and severity. The area burned by wildfire is expected to increase due to climate change bringing drought, as well as more lightning strikes and conditions that support infestations and erode the health of forests.

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