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Bureau d'assurance du Canada

A Primer on Severe Weather and Overland Flood Insurance in Canada

About Insurance Bureau of Canada (IBC)

IBC represents Canada's private property and casualty insurers. Insurers in Canada write over \$59.6 billion in direct premiums for private auto, home and commercial insurance. IBC's members account for approximately 86% of this premium volume. In 2017, the insurance industry contributed over \$9.4 billion in taxes and levies in Canada.



Introduction

Every day in every community, Canadians face risk of harm from climate change; some face more risk than others. Every uptick in insurance claims costs or government disaster assistance payouts represents hundreds or thousands of lives disrupted, precious possessions lost and human suffering. Insurers see themselves as partners with governments and individual Canadians in a whole-of-society approach to managing risk, including those risks brought on by our changing climate. We all have a role to play in ensuring that everyone is prepared and protected.

Scientific Data and Insurance Data Tell Us the Weather is Changing

- Insurance Bureau of Canada (IBC), which represents Canada's home, auto and business insurers, is a key national voice on the economic costs of climate change and is leading the national conversation on the many ways that Canadians can adapt to climate change to reduce their risk.
- Climate change is costing Canadian taxpayers, governments and businesses billions of dollars each and every year.
- Costs are rising because of the increase in the severity and frequency of extreme weather events as well as the increased number of Canadians living in harm's way.
- Insurers rely on their own data on insured losses as well as scientific data to understand how a warming climate is affecting their customers.
- Climate scientists tell us that a warming climate will increase precipitation. Although precipitation trends are harder to observe and measure than temperature trends, there is strong evidence of increased annual precipitation in Canada.¹ Increased winter precipitation can lead to larger snowpacks which, when combined with spring rainfall and rapidly warming spring temperatures, has led to widespread flooding in eastern Canada in recent years.
- Insured-loss data shows an increase in water-related damage as a result of precipitation over the last four decades. Factors such as increasing population and changes in how we use homes (e.g., finished basements) also cause increases in insured losses – but it is clear that our changing climate is having an impact as well.

What we know about severe weather

1. Severe weather is on the rise

The Government of Canada has reported that “Canada has become wetter in recent decades.”²

This increase fits with the projections of climate scientists worldwide who have predicted that a warming planet will result in more extreme weather events. David Phillips, Senior Climatologist at Environment and Climate Change Canada (ECCC), puts it this way: “Canada is a more dangerous place to live nowadays than it was even 25 years ago.”³

Trends in Canada are similar to trends observed in the United States. The 2018 National Climate Assessment Report written by the U.S. Global Change Research Program states that:

“Since 1980, the number of extreme weather-related events per year costing the American people more than one billion dollars per event has increased significantly (accounting for inflation), and the total cost of these extreme events for the United States has exceeded \$1.1 trillion. Improved understanding of the frequency and severity of these events in the context of a changing climate is critical.”⁴

Insurers in Canada have also reported larger catastrophic weather events per year across the country since 1983, including a big jump in the number of events since 2011. A catastrophic weather event is defined as an event that results in \$25 million or more in insured losses (see Chart 1).

Property and casualty insurance payouts from extreme weather have more than doubled every five to ten years since the 1980s. Costs have been rising because of the increase in the severity and frequency of extreme weather events as well as the increase in the number of Canadians living in harm’s way and the increasing number of homes that have finished basements.

Chart 1 – Large Catastrophic Weather Events in Canada



Source: 1983 to 2007: IBC, PCS Canada, Swiss Re and Deloitte
Source: 2008 to 2018: CatIQ
Events included when 2008 \$ 25 million limit adjusted by GDP, Population
Perils: Flood, Water, Rain, Storm, Snow, Ice, Hail, Wind, Tornado, Hurricane

2. Rates of precipitation are increasing

There is compelling data to show an increase in annual precipitation over time in Canada.⁵ One credible dataset that indicates an increase in extreme precipitation is the Actuaries' Climate Index, which is a monitoring tool and objective indicator of the frequency of extreme weather. It captures temperature and precipitation across North America, including Canada, and shows an increase in extreme precipitation events since the fall of 2013.⁶ (See Chart 2.)

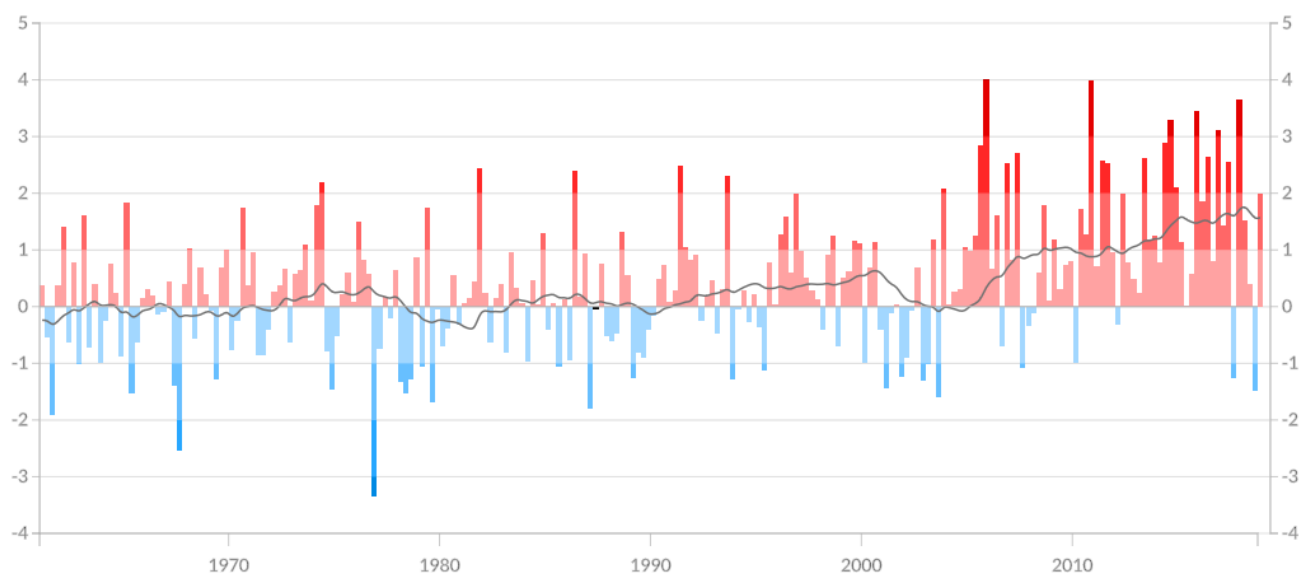
Recent observational evidence indicates that extreme rainfall events are occurring repetitively in locations across Canada. These events are identified through insurance claims data aggregated by an independent third party, Catastrophe Indices and Quantification Inc. (Cat IQ), which insurers use to determine overall insurance trends related to catastrophic losses in Canada.

Cat IQ records extreme rainfall events based on significant losses totaling \$10 million to \$25 million and catastrophic claims losses above \$25 million. These numbers do not reflect losses to public infrastructure and under-represent residential overland flood losses because these were largely uninsurable until 2016 and are still not widely insured.

These extreme rainfall events are also reflected in trends in federal disaster financial assistance payments, which have registered a remarkable increase in payouts due largely to public infrastructure losses resulting from flooding events over the past decade. In Ontario alone, significant or catastrophic extreme rainfall events have occurred multiple times in the following municipalities:

London	<ul style="list-style-type: none">• August 2011• September 2014• June 2015• July 2016• June 2018
Windsor	<ul style="list-style-type: none">• July 2014• September 2014• August 2016• August 2017
Cornwall	<ul style="list-style-type: none">• September 2010• August 2016• October 2017
Peterborough	<ul style="list-style-type: none">• April 2014• May 2017• June 2018
Vaughan	<ul style="list-style-type: none">• August 2011• June 2013
Richmond Hill	<ul style="list-style-type: none">• May 2013• July 2013
Adjala-Tosorontio	<ul style="list-style-type: none">• June 2017• June 2018

Chart 2 – Extreme Precipitation Index for Canada



(Source: Actuaries Climate Index – <http://actuariesclimateindex.org/explore/regional-graphs/>)

Canada has seen a shift in precipitation and the trend has been upward. Some of the largest changes have taken place in British Columbia and Atlantic Canada.

In addition to looking at general precipitation trends, it also matters whether the precipitation is rain or snow. Severe weather events can take place year-round in Canada, but the type of precipitation involved will differ from season to season. In parts of Canada, winter precipitation has been increasing, leading to more flood hazards come springtime. Winter precipitation can lead to larger snowpacks which, when combined with spring rainfall and rapidly warming spring temperatures, lead to widespread flooding.

Equally, geography is a factor, with different parts of Canada being affected by different types of extreme events more frequently.

Increasing trends in precipitation intensity have been observed in over two-thirds of the Northern Hemisphere. Due to its location, Canada is also experiencing more frequent extreme heat events, which can lead to higher precipitation.⁷

3. Challenges posed by rainfall data

Climate scientists and others rely on rainfall gauge data from ECCC as observational data about precipitation trends. Rainfall gauge data in Canada shows an annual increase of overall precipitation, but there is difficulty in capturing extreme events unless they occur in the precise location where the measuring instrument (a rain bucket) is located. Given that there are fewer than 200 of these instruments to cover a country of 9.9 million square kilometres, it is not surprising that for Canada

as a whole, observational evidence of changes in extreme precipitation is lacking.⁸ Famously, one of the most severe rainstorms on record occurred on August 19, 2005, and caused widespread flooding over the northern portions of the City of Toronto. However, the ECCC rain gauge at Pearson airport registered little rain relative to the municipal gauges across the city. That was because the bulk of the storm simply bypassed the airport.

Unfortunately, the ECCC rainfall gauge program was a victim of budget cuts in the 1990s, which affected the consistency of its data. Currently, ECCC is updating how it collects precipitation data, but the challenge of tracking intense localized events will likely remain.

Because rain gauge data has limitations, other data sources, such as radar signatures of past storm events, are being considered as alternatives. However, radar data has also been shown to have limitations when used to track rainfall. For example, radar underestimated the amount of rainfall during the Toronto Flood on July 8, 2013.⁹

It may be useful to look to U.S. observational data of heavy/intense rainfall events because the dense observation network in the U.S. is statistically more likely to capture extreme events. For example, observations in the 2014 U.S. National Climate Assessment report indicate an increase in the trend of heavy rainfall over the past 30 to 50 years.¹⁰ Several scientific studies that include both the United States and Canada have noted that precipitation levels change at the U.S.-Canada border, which would indicate a difference in measuring rather than in precipitation levels.¹¹

Finally, insurer loss data can also help to complete the picture – particularly since insurer data tends to be more recent than other data sources.

4. Changing precipitation trends can be attributed to climate change

Canada's 2014 science assessment report is clear that changing precipitation trends can be attributed to climate change.

“Warming of the global climate over the past century is unequivocal. It is evident in global atmospheric and oceanic temperature data, and from changes in a variety of other physical indicators, including declines in snow and ice cover.”¹²

These declines in snow and ice cover are already being experienced in Canada, as indicated in the Canada in a Changing Climate report (2014) and in chapter 5 of Canada's Changing Climate Report (2019).

A number of studies state that calculating and attributing large-scale regional precipitation trends to climate change is often difficult.

In the future, event attribution science may provide a more concrete connection between single large-scale extreme weather events and climate change. Both the southern Alberta floods of 2013 and the Fort McMurray wildfire of 2016 were observed to have been more severe than they would have been without climate change as a factor.¹³

5. Flooding is the dominant climate peril facing Canada today

Federal Environment Minister Catherine McKenna recently stated that “the one-in-100-year flood” is happening much more frequently.¹⁴ According to the 2017 study *Climate Change, Floods, and Municipal Risk Sharing in Canada*:

“Flooding is currently the most costly hazard for urban properties. Water related losses have become the principal source of property claims, surpassing both fire and theft.”

According to the Canada in a Changing Climate report, wildfire and drought risk will increase due to the increase in severity of heatwaves. Climate change will also cause more intense rainfalls that will increase the risks faced by urban areas.¹⁵

6. Common definitions of water damage (sewer backup, overland flooding and seepage)

The following are common ways that water can enter a home or business. Insurers may offer optional coverage for these perils.

Sewer BackUp

Sewer backup (SBU) occurs when, for example, the water table rises or when urban sewer pipes become pressurized during a storm. The buildup of pressure causes water to reverse back up through the main outflow pipe in the house to emerge through drains in showers, sinks or toilets. This type of damage can be prevented through installation of a backflow prevention valve on the main outflow drain in a house.

Overland Flooding

Overland flooding usually occurs when bodies of fresh water, such as rivers and other watercourses, overflow onto dry land and cause damage. It can also happen when there is an intense rain storm and water accumulates rapidly, exceeding the ability of local stormwater drainage systems to divert it. In either case, water runs over the surface of the ground and through doors and basement windows into homes. Overland flooding events can last weeks and the prolonged exposure to water can cause structural damage to buildings. Contaminants from local landfills, oil tanks and septic fields can enter homes and render homes unlivable. Fungus and mold can seed behind drywall during a flood event, flourish later and cause health issues if not removed. Reconstruction can take over a year and often requires homeowners to find alternative living arrangements for a lengthy period of time.

Seepage

Water seeping through foundations or seams in the building, intended to be watertight. It is typically not a sudden event, whereas overland water or flooding is water that suddenly enters through doors and windows.

Water and Sewer Lines

Some insurers are providing protection for the water and sewer lines connected to homes, in the event that they leak, break, tear, rupture or collapse.

7. Different types of overland floods - fluvial, pluvial, coastal and tsunami - and their causes

FLUVIAL FLOODING can occur when water levels rise in lakes and rivers due to rain or extensive volumes of melted snow, and/or overflow of dams and channels. Fluvial risk is often predictable and can be modelled and mapped based on flood return intervals across discrete geographies; for example, floodplains. Insurance for homeowners in areas at risk of fluvial floods may be unaffordable or unavailable and will likely remain so in the absence of mitigating measures that can bring the risk down to insurable levels. (Bringing these properties to insurable levels may involve physically moving homes and businesses to safer settings through the government purchase of properties – a practice known internationally as “strategic retreat.”)

PLUVIAL OR SURFACE WATER FLOODING occurs when heavy rainfall creates a flood event independent of an overflowing body of water. There are two common causes of pluvial flooding.

- 1) Intense rain saturates and overwhelms an urban drainage system so that the water flows out into streets and nearby structures (often through the sewage system, causing sewer backup)
- 2) Rainfalls on hillsides that are unable to absorb the water, causing run-off or flowing water.

Hillsides where there have been recent forest fires are common sources of pluvial floods, as are communities on hillsides. Pluvial flooding can happen in any urban area – even in higher-elevation areas that lie above coastal and river floodplains. As a consequence, pluvial risk is less predictable and can affect anyone. Flood coverage is available in many areas for pluvial flooding.

COASTAL OR SURGE FLOODING is produced when high winds from hurricanes and other storms push water onshore. This is the leading cause of coastal flooding and often the greatest threat associated with a tropical storm. In this type of flood, water overwhelms low-lying land and often causes devastating loss of life and property. Coastal risk can be generally modelled and predicted. Insurance for this peril is in its infancy and still very limited. Canadians living along coastal areas may be eligible for this type of coverage.

TSUNAMIS result in water damage and coverage has historically been available to commercial property policyholders under optional flood coverage. To date, as insurers start offering optional residential overland flood coverage, we are not aware of any personal property insurers who have developed optional flood coverage that includes tsunami.

8. How insurers use flood maps to accurately assess risk

Governments across Canada rely on insurers to increase the availability and affordability of overland flood insurance to reduce taxpayer-funded disaster assistance payouts. But until 2015, insurers lacked access to reliable flood maps to price overland risk across the country.

Maps can effectively communicate flood hazard. For urban planning and infrastructure deployment purposes, municipalities often rely on **flood hazard maps**. These maps show flooding extents and depths for given return periods, such as the annual probability of occurrence. In Canada, flood hazard maps are usually based on detailed engineering studies for 1- to 2-kilometre sections of rivers. They typically show fluvial (riverine) flooding only; they do not consider pluvial (rainfall), coastal, ice jam and

other types of flooding. As a result, they are also often referred to as “floodplain maps.” In many areas of Canada, flood hazard maps are either unavailable or outdated.

To underwrite risk, insurers require access to maps that show all potential sources of overland flooding (fluvial, pluvial and coastal). For this reason, Insurance Bureau of Canada (IBC) invested heavily to develop comprehensive flood hazard and vulnerability maps covering all scenarios. After a global search, IBC selected a leading private-sector flood modeller from the U.K.

Today, Canadian insurers purchase licences to access such maps from competing private-sector companies in the U.K., United States and Czech Republic. Insurers then combine these maps with other data – such as the replacement value of a structure, the likely basement contents of a home and other property-specific details – to determine the flood exposure of a particular property. The availability and pricing of insurance for a particular location is based on this analysis and may vary from insurer to insurer depending on their internal analysis and appetite for risk.

IBC is working with Natural Resources Canada to improve input data on terrain modelling to increase the accuracy of flood maps. It is also working with the Canadian Water Network and municipalities across the country to ensure that private-sector flood maps reflect investments made in flood defences, including the protection or restoration of natural infrastructure.

9. Making flood mapping information available to home and business owners

At their annual meeting in May 2018 and again in January 2019, the Federal/Provincial/Territorial Ministers of Emergency Management discussed ongoing work, led by Natural Resources Canada on the development of an accessible, public information tool that would help Canadians inform themselves of their personal flood risk.

Such a tool or mechanism is foundational in any effort to reduce flood risk in Canada. International experience demonstrates that citizens are not motivated to take the necessary steps to protect themselves from flooding until they are aware of their personal risk. Furthermore, international research conducted at the University of Waterloo in Ontario found that consumers must be contacted repeatedly to become informed about their flood risk.

Canadians will not normally seek out flood risk information if they are not aware of its relevance. For this reason, a single authoritative source detailing flood risk must be designed to also feed the same information to realtors, mortgage lenders and mortgage insurers. In this way, consumers will be presented with the same risk details over and over again, prompting them to make risk-informed decisions. IBC is working with Public Safety Canada and Natural Resources Canada to design and launch such a flood risk portal in 2020.

Index

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- ² Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation, authored by the Government of Canada
- ³ CatIQ Connect Conference: February 4, 2019
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- ⁵ Canada's Changing Climate Report (Section 4.3), authored by the Government of Canada
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- ⁷ Simonovic, S. P., Schardong, A., & Sandink, D. (2016). Mapping extreme rainfall statistics for Canada under climate change using updated intensity-duration-frequency curves. *Journal of Water Resources Planning and Management*, 143(3), 04016078
- ⁸ Simonovic, S. P., Schardong, A., & Sandink, D. (2016). Mapping extreme rainfall statistics for Canada under climate change using updated intensity-duration-frequency curves. *Journal of Water Resources Planning and Management*, 143(3), 04016078 & <https://www.tandfonline.com/doi/pdf/10.1080/07055900.2018.1514579?needAccess=true>
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