

SPECIAL REPORT

TD Economics



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NATURAL CATASTROPHES: A CANADIAN ECONOMIC PERSPECTIVE

Highlights

- Over the past three decades, there has been an increase in natural catastrophes and their associated damages, both at home and abroad. There's more to this spike than weather conditions, as socioeconomic factors have also played a significant role.
- Natural catastrophes have major impacts on people, property, and prosperity all across Canada. The economic and financial impacts of natural catastrophes tend to be masked by the way that economic indicators, such as GDP, are calculated.
- The long term financial impact of natural catastrophes is estimated to cost Canadians \$5 billion per year in 2020, and \$21-\$43 billion by 2050.
- With no sign that things are going to be getting any better, it's prudent for businesses and policy-makers to start thinking of the long-term implications of inaction, and place a larger emphasis on natural catastrophes when making investment decisions.

There is evidence from around the world that natural catastrophes are on the rise. This is a serious issue for society, as these catastrophes can destroy homes, disrupt businesses, and take lives. Natural catastrophes are an especially pertinent issue in Canada, as demonstrated by last summer's floods in Alberta and Ontario, which caused unprecedented levels of damage, economic disruptions, and human tragedy. In this special report, we discuss how socioeconomic factors have contributed, at least in part, to the increased incidence of natural catastrophes over the past three decades. We round out our analysis by shedding some light on the financial and economic implications of these catastrophes for Canadians.

A spike in natural catastrophes

Any natural force that has major human, economic, or social impacts can be classified as a natural catastrophe (see Table 1 for a description of the types). For instance, severe weather becomes "catastrophic" when it displaces people from their homes, causes injuries, deaths, property damage, or economic disruptions (see Table 2 for the criteria underpinning the definition). Globally, there has been an increase in the number of natural catastrophes since the 1980's, which has been driven primarily by weather related events (see Chart 1). We're seeing much of the same story in Canada, where the average number of natural catastrophes has doubled over the past three decades, to about 20 per-year (see Chart 2). However, there is still a great deal of variation in the number of Canadian natural catastrophes from year-to-year, with nearly 40 events occurring in 2008.

Since 2000, the majority of Canadian natural catastrophes

Table 1 - Natural catastrophe categories

Category	Examples
Meteorological (Weather related)	Hurricane, typhoon, cyclone, winter storm, blizzard/snowstorm, severe storm, thunder storm, lightning, hailstorm, tornado
Hydrological (Weather related)	General flood, flash flood, storm surge, glacial lake outburst, flood subsidence, avalanche, landslide
Climatological (Weather related)	Heat wave, drought, cold (frost), extreme winter, forest fire, bush fire, brush fire, grassland fire
Geophysical (Not directly weather related)	Earthquake, tsunami, volcanic eruption, rockfall, landslide

Source: Munich Re, TD Economics.

Table 2 - Criteria for natural catastrophe classification

	Canadian Disaster Database	Munich Re	UN ISDR
Type of impact	One + of the following	One + of the following	One + of the following
Human	10+ deaths; 100+ affected	2,000+ deaths; 200,000+ homeless	10+ deaths; 100+ affected
Social	Cannot recover without aid	-	State of emergency declared
Economic	International assistance required	Dependent on international aid	International assistance required
Damages	-	> US\$60 Million	-

Source: Canadian Disaster Database; Munich Re; United Nations International Strategy for Disaster Reduction Database.

have taken place in the western provinces (see Chart 3), yet the most costly catastrophes have been concentrated in Alberta and Ontario (see Table 3). Similar to the global trend, Canadian natural catastrophes are driven by weather related phenomena, like heavy rains, winds, ice storms, and floods. There is some evidence that severe weather is becoming more common in Canada, with storms that used to occur once every forty years now occurring once every six, in some regions of the country¹. Changes in weather patterns are not fully responsible for the increased incidence of natural catastrophes in Canada, as socioeconomic factors have also played a significant role.

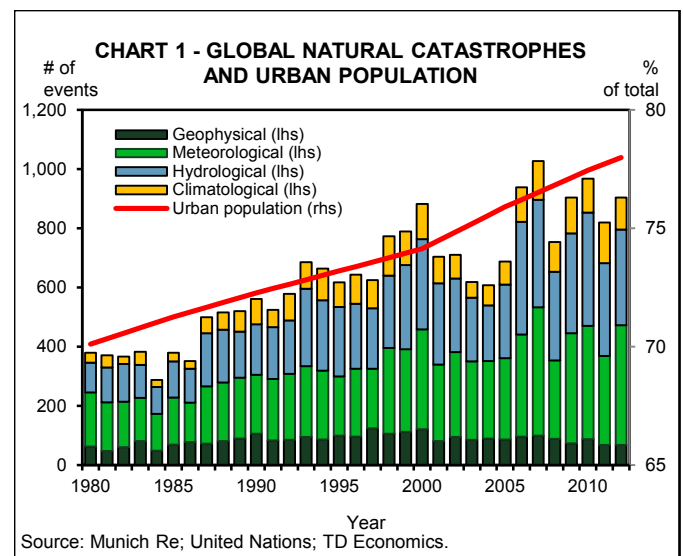
Population growth and urbanization have increased the density of cities. Relative to the 1980's, the number of people living in urban settings has increased drastically – about 215 million in the world's more developed regions, and about 10 million in Canada (see Chart 1 and Chart 4). Consequently, weather need not be more severe to impact a larger number of people. Moreover, a large portion of major urban cities are located in areas which are prone to certain types of catastrophes. In Canada, for example, cities near river mouths or coasts like Vancouver, Montréal, and 80% of the Nova Scotia, New Brunswick, and Prince Edward Island coastlines, are particularly susceptible to storms and flooding. Inland locations are prone to a different set of natural catastrophes that can be equally as dangerous. For instance, dryness has made the Prairie region particularly susceptible to wildfires and droughts, especially in the summer months. It's only natural that these events would affect a greater number of people as these cities become more densely populated, and thus cause the number of recorded natural catastrophes to increase – even if our weather patterns remained unchanged.

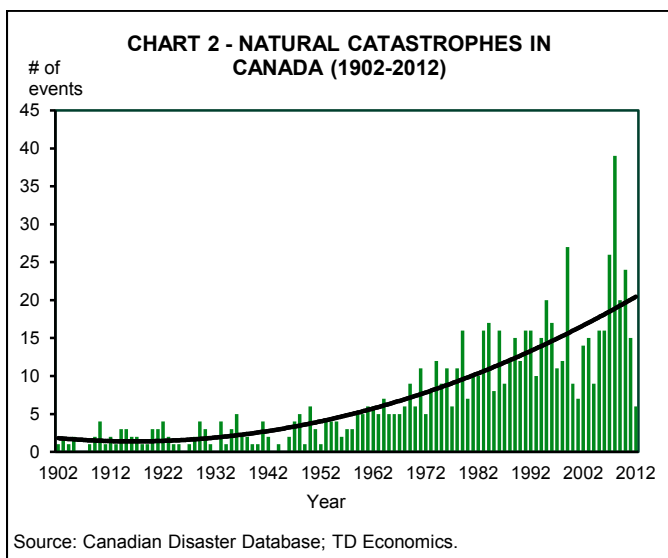
Industrial make-up may have also contributed to the increase of natural catastrophes in developed countries. As an economy matures, it typically relies upon the service sector for a greater portion of productivity. Service-based industries tend to require less space per-person, and are

usually concentrated within offices in major cities. As a result, events that hit major cities have a greater chance of causing large economic distortions – think of the economic ramifications of the severe cold snap that hit Toronto last December. The freeze caused large scale power outages, shut down businesses, and delayed air travel in and out of the city. Since Toronto's Pearson airport acts as a hub for many domestic and international flights, the economic impacts of this storm were also felt by other provinces and industries.

In the short-term, these disruptions can create an additional drag on national metrics (like GDP), and exacerbate the overall economic impacts, potentially leading to more events being classified as catastrophic.

The effect per-capita income has on the incidence of natural catastrophes is ambiguous. Wealthier populations have more resources available for managing and preventing damage, which usually means lower mortality rates and less damage to property. However, it is incorrect to assume that higher per-capita income protects against losses. Wealthier populations also tend to have more valuable possessions, so the damages that do occur come with a higher price tag. Moreover, studies have shown that the mortality rates





for some natural catastrophes (landslides, windstorms and floods) rise with per-capita income up to a point, and then fall with further increases. The logic is that as individuals become wealthier they move toward more attractive areas, such as coastal regions and river mouths, which are prone to more natural catastrophes. This makes sense, given that those natural catastrophes which are not correlated with human migration, such as earthquakes and heat waves, do not follow the same pattern.

The economic and financial impacts of natural catastrophes

Natural catastrophes have major impacts on people, property, and prosperity all across Canada. The economic disruptions caused by these events often create a ripple effect, indirectly impacting other industries and provinces. No Canadian city or industry is immune to these impacts and it is, therefore, important to be aware of the immediate and long-run economic and financial implications of these events.

Economic impacts

In the short-term, natural catastrophes tend to follow a similar pattern of economic disruption. The immediate damages create a drag on output, spending, and labour hours. Immediately following the event, reconstruction efforts offset these losses and, often somewhat paradoxically, provide a net boost to economic growth². We witnessed this pattern following the Alberta floods this past summer. Although the floods caused an approximate \$500 million loss³ in labour hours, the reconstruction efforts that followed likely had a net increase on Alberta’s forecasted growth (+0.2% to GDP

in 2013 and +0.4% to GDP in 2014)⁴.

The immediate increases registered in gross domestic product following a natural catastrophe partially reflect the way GDP is calculated, and do not imply that catastrophes are “good for the economy.” GDP is a measure of economic output in a given location over a period of time – it is not a measure of well-being, nor does it account for the destruction of infrastructure, or more importantly, human tragedy. Increases in GDP following a catastrophe need to be taken in context: they are short-term, and as time passes, the economy reverts back to “business as usual.”

In the long-term, economic indicators tend to mask the impact natural catastrophes have on the economy. Returning to the example of Alberta this past summer, flooding caused approximately \$2 billion worth of damage to infrastructure, four deaths, and 100,000 people to be displaced from their homes and workplaces within the region – the impact of which is not fully apparent in GDP figures. Short-term increases in GDP following the reconstruction efforts are partially offset with matching long-term costs to treasury and private sector balance sheets. That is to say, nobody is “better off” as a result of the floods, in terms of personal wellness or long-term economic well-being. In short, the immense infrastructure damages and human tragedies caused by natural catastrophes have a devastating impact that popular economic accounts tend to overlook.

Financial impacts

Focusing in on the short-term financial implications, most natural catastrophes impact individual businesses, but do not appear to adversely impact financial markets⁵. The likely explanation for this is that investors feel impacts will

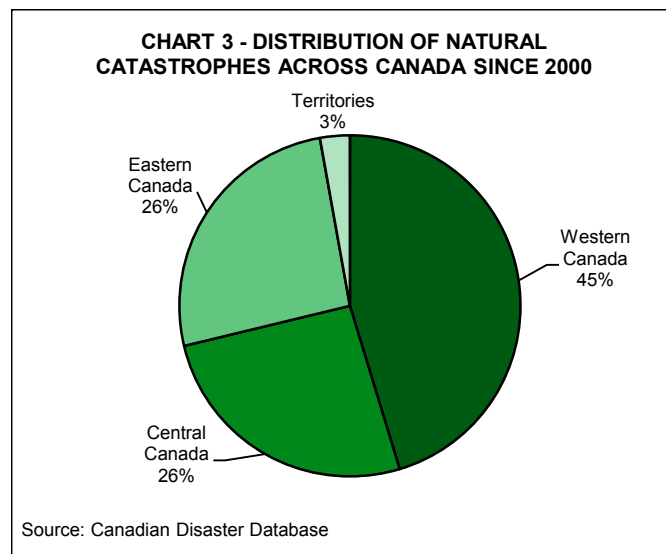


Table 3 - Top 10 largest Canadian natural catastrophes since 2000

Year	Date	Location	Type of catastrophe	Infrastructure damage (\$ mil)
2013	June 19-24	Southern Alberta	Flooding	\$1,743
2013	July 8-9	Toronto, Ontario	Flooding	\$944
2011	May 14 - 17	Slave Lake, Alberta	Wild fire	\$742
2005	August 19	Southern Ontario	Wind/rainstorm	\$625
2010	July 12-13	Southern Alberta	Wind/thunderstorm	\$530
2012	August 12	Alberta	Flooding, hail, winds	\$530
2009	July 24-28	Ontario	Heavy rains	\$376
2005	June 6-8 & 17-19	Alberta	Flooding	\$300
2009	July 11-13	Ontario and Quebec	Heavy rains	\$228
2003	Summer months	British Columbia	Wild fire	\$200

Source: Canadian Disaster Database; Insurance Bureau of Canada; TD Economics.

be short-lived, and government disaster assistance, along with injections of insurance capital, will dampen the impact on businesses. Only in the most extreme catastrophes - ones where major amounts of infrastructure are destroyed - have financial markets exhibited a significant and lasting adverse reaction. The 2011 earthquake and tsunami in Japan is an example of this. The catastrophe had such a devastating impact on Japan's population and infrastructure that financial markets tumbled sharply during the event. However, catastrophes of this magnitude tend to be rare.

Over the long-term, natural catastrophes have significant financial implications. As events occur more frequently, infrastructure damages will put a major strain on the pocketbooks and productivity of governments, firms, and households alike. If no efforts are made to upgrade infrastructure to withstand harsh conditions, natural catastrophes could cost Canadians dearly – an estimated \$5 billion per-year in 2020 and \$21-\$43 billion by 2050⁶, in infrastructure damages, healthcare costs, reduced performance of Canadian industry, and lost labour hours. However, some of these

costs can be mitigated by upgrading infrastructure to be prepared for these events. Some estimates claim that every dollar invested in adaptation now, will yield anywhere from \$9-\$38 worth of avoided damages in the future⁶.

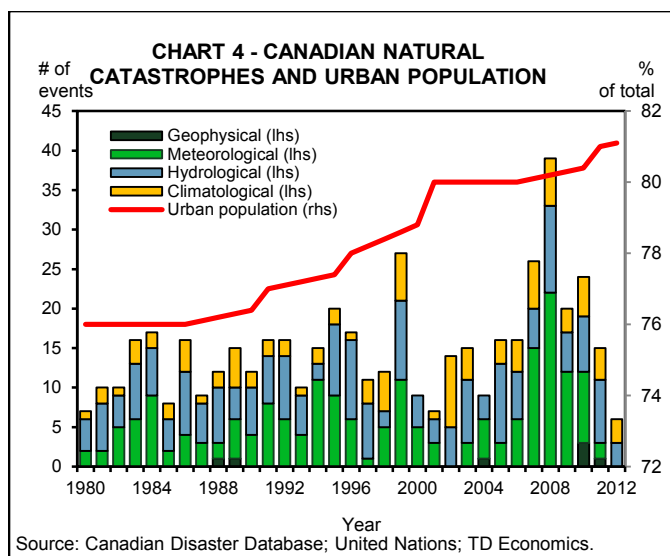
Bottom line

Globally, there has been an increase in the number of natural catastrophes over the past three decades. We're seeing a similar trend in Canada, where severe weather that used to occur once every forty years is now occurring once every six, in some regions of the country. This has serious ramifications for Canadians that popular economic indicators, like GDP, do not capture.

Regardless of the cause, it's clear that natural catastrophes are a major issue for Canada. With no sign that things are going to be getting any better, it's prudent for businesses and policy-makers to start thinking of the long term-implications, and place a larger emphasis on catastrophes when making investment decisions. Businesses need to identify how these events impact their bottom line and adjust long-term financial plans accordingly. Governments need to take a close look at their inventory of infrastructure to identify vulnerabilities and areas where proactive adaptation can prevent future damages, loss of life, or economic disruptions. Awareness and preparation is the first step toward ensuring the safety of people, property, and prosperity for Canada's future.

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End Notes

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