

# LESSONS LEARNED

Local actions to address extreme  
weather

*By Paul Kovacs*

Every week or two there is another example in Canada of local governments confronted by extreme weather that is damaging property and disrupting their community. This includes a flood, wildfire or other natural hazard. It is exciting to observe the growing number of local leaders that are working to build climate resilient communities – communities that have taken action to reduce the risk to loss and damage from future hazards. In particular, many communities have begun to anticipate a future that is wetter, warmer, and stormier as a result of climate change. This includes communities responding to a disaster and choosing to build back better, and those investing in resilience in anticipation of future extreme weather events.

In 2015, the United Nations established an international strategy for managing disaster risk – the Sendai Framework for Disaster Risk Reduction. This strategy has been endorsed by the Government of Canada, several provinces, and many municipalities. The case studies and the lessons learned that are presented in this report demonstrate action underway in Canada to implement each of the four priorities for action set out in the Sendai Framework:

- Build back better in recovery
- Better understand disaster risk
- Strengthen disaster risk governance
- Invest in disaster risk reduction

### **Build back better in recovery**

Severe flooding resulted in loss of life and unprecedented damage across southern Alberta in 2013. Planning completed in advance of the flood empowered local leaders in High River to execute bold action during the recovery to reduce the future risk of flooding. Homes were removed, dikes were built, and a road was elevated. Mayor Snodgrass believes that High River is now “the most well protected community in Canada for flood risk” – a remarkable change in five years.

Perth-Andover, New Brunswick, experienced unprecedented flood damage in 2012. The village moved quickly in partnership with the province to prepare a strategy to eliminate flood risk. Most homes experiencing flood damage were relocated or flood-proofed. Some road sections have been elevated to ensure access to the hospital. Extensive renovations were made to the hospital and high school. There is, however, no commitment yet to relocate or protect businesses and other non-residential buildings at risk.

Kangiqsualujjuaq is a small Inuit community in Quebec. During a 1999 New Years' Eve celebration more than 400 residents were in the school gymnasium when it was struck by one of Canada's most deadly avalanches. Local leaders worked with provincial officials to rebuild the community to be resilient to avalanche risk. New construction is now prohibited within 100 metres of the bottom of a hill or mountain. All homes in the exclusion zone were relocated or demolished. Provincial funds were provided to repair damaged infrastructure and support the relocation of local businesses.



**Figure 2:** Damage following a severe storm in 2016 in the Town of Percé.  
(Source: Town of Percé)

A severe storm in late 2016 resulted in the destruction of the concrete wall protecting the boardwalk, motels, restaurants and shops in Percé, Quebec. The town had experienced prior losses and disruption due to coastal erosion and flooding. The town supported research before the collapse to assess possible actions to protect the community. The community was able to act quickly in response to the 2016 event because of its collaboration with the research community in establishing a detailed recovery plan.

Metro Vancouver is vulnerable to a number of hazards, including catastrophic earthquake, coastal flooding, and riverine flooding. Research warnings about the potential for extensive loss of life and tens of billions of dollars of damage encouraged the community to develop a regional resilience recovery framework, including a resilience vision and strategy to build back better in recovery. The three-year project, which involves local emergency managers, academics, and critical infrastructure partners, will be completed in 2019.

Recovery from disaster presents an opportunity for bold and science-based action to improve the climate resilience of a community. Communities should establish a resilience vision for recovery from any disasters that may occur. The funding and public support required for transformational improvement in disaster resilience are often only available for a brief period, immediately following a loss. These can be accessed if the community is prepared to act.

## **Better understand disaster risk**

All local governments in Canada have prepared an assessment of local hazards. Provincial legislation requires that these assessments be regularly updated and filed with the province. However, these reports typically focus exclusively on community preparedness to respond to disasters and seldom include the rigorous analysis required to support action to address risk reduction. In all of the case studies in this report, the communities have included actions to better understand the risks they face, a detailed understanding that supports disaster risk reduction and adaptation to extreme weather. External consultants and academic advisors, like the Institute for Catastrophic Loss Reduction, are now widely available to support local officials in completing this analysis.

The District of North Vancouver has won international awards for its innovative leadership in reducing the risk of loss and damage from landslides, wildfire, earthquake, and other natural hazards. A particular element of the District's efforts celebrated in this report is the development of risk tolerance, or acceptable risk criteria. Most risks can be reduced but not eliminated. At some point, the residual risk may become acceptable to the community relative to the high cost of further risk reduction. This approach of defining acceptable risk is widely used in private industry, but is only emerging in the public sector, with the District of North Vancouver acting as a pioneer.

Fort Nelson First Nations is surrounded by forests and is at risk of loss from wildfire. The community participated in a pilot program with a variety of partners that resulted in preparation of FireSmart risk reduction plans for 170 structures in the community. The use of drones and the application of the FireSmart program has greatly increased understanding of fire risk in the community. Specific risk reduction actions have been identified that can be used to champion action to build a fire resilient community. Resilience begins with a deep understanding of risk.

Surrey has experienced nuisance flooding, especially during king tide events, and sought to develop a detailed understanding of the coastal flood risks associated with rising sea level and climate change. They implemented a multi-year program with engineering and climate studies, but also participatory, community-driven planning. A diverse set of options – protect, accommodate, retreat – were discussed with community groups, business associations, farmers and neighbouring communities. The goal for Surrey is to get ahead of the risks associated with sea level rise by building a shared, long-term vision for the community.

Moncton developed a climate change adaptation and flood management strategy. Better understanding of future rainfall intensity allowed the City to replace a major culvert with a 20 percent increase in capacity to accommodate a 100-year storm in 2100.



**Figure 3:** *Damage following the December 2013 ice storm in Brampton.*  
(Source: City of Brampton)

In 2013, Ontario experienced a severe ice storm. Brampton suffered extensive loss and damage, including 20,000 homes without power and 50,000 trees destroyed. The community developed a 10-year plan to re-establish the forest canopy. The plan focused on the planting native species resilient to ice damage and the importance of a variety of trees. Brampton is creating a climate-resilient urban forest.

Understanding the risk is an essential foundation to support effective investments in risk reduction, ideally taking into account the expected impact of change in the climate. We can build disaster resilient communities, but this is best done through a rigorous assessment of the risk of loss and damage, and a thorough evaluation of the alternative risk reduction options.

### **Strengthen disaster risk governance**

Local officials have a leading role in the management of the risk of loss and damage from extreme weather, but responsibility is shared with other stakeholders. There is considerable scope to reduce loss and damage by improving governance of the issue and expanding the number of stakeholders participating in the management of severe weather risk. The Institute for Catastrophic Loss Reduction consistently finds, for example, that most property owners fail to fully participate in managing the risk of damage to their home or business.

A variety of non-governmental and private sector organizations participate in disaster response efforts in Canada. Many have the potential to move beyond simply responding to events and could also contribute to disaster risk reduction efforts. This

includes the Canadian Red Cross, the Salvation Army, Mennonite Disaster Service, St. John Ambulance, the United Way, the local Humane Society, and local food banks. Insurance companies, major local employers, and other business leaders also have considerable self-interest in taking actions to enhance the capacity of the community to more effectively cope with extreme weather hazards.

Montreal is the first community in Canada to establish a resilience office, a Chief Resilience Officer, and a Resilient City Strategy. The 2018 strategy sets out a five-year plan for the city to collaborate with a variety of partners in building a community better able to anticipate and recover from severe weather and other shocks.

Prince Albert is located near the Nisbet Provincial Forest and is at risk of wildfire. The Crutwell fire threatened the community in 2012, numerous fires occurred in the area in 2015, and the tragic impact of the fire that destroyed parts of Fort McMurray contributed to the creation of the Nisbet Forest Protective Strategies Working Group. The Group brings together a broad range of public and private sector collaborators to plan and promote fire risk reduction efforts.

The most costly disaster in Canada's history included the destruction of more than 2,000 homes in Fort McMurray. The extent of the loss brought together new collaborations that are now working to anticipate future events. For example, the insurance industry, with support from the Canadian Red Cross, picked up and disposed of 12,000 refrigerators and freezers. The community, province and the Canadian Red Cross are promoting FireSmart.

Wildfires burned across British Columbia in 2017 and 2018. Kamloops established new collaborations to provide unprecedented support for evacuees. This included pre-identification of reception centres, training of volunteers and establishment of new communications protocols.

Extreme weather events can result in tremendous strain on emergency medical systems. Kingston, Frontenac, Lennox, and Addington Public Health pioneered the development of systems to monitor and anticipate emergency department volume, hospital admissions and surge capacity from threats that now include extreme heat, air quality during wildfires, and tornado. As these tools are installed across Ontario a number of partnerships and collaborations are emerging.

All of the cases in this report involve local leadership acting in partnership with other stakeholders to jointly champion disaster resilience and adaptation. Working with the public, other levels of government, private industry, and non-governmental organizations is a critical element for communities seeking to move beyond responding when disaster strikes to a strategy of proactively managing the risk of loss and damage from extreme weather:

## **Invest in disaster risk reduction**

The Institute is aware of dozens of examples across the country of local action to reduce the risk of disasters and adapt to extreme weather. We are proud that we have supported several of these efforts. Each year more communities have begun implementing disaster risk reduction.

Many tornadoes are experienced in Ontario each year. Dufferin County's Chief Building Official, Mike Giles, is aware of research supported by the Institute for Catastrophic Loss Reduction that demonstrates how inexpensive measures, like hurricane clips, can significantly reduce the risk of damage from tornadoes. The County introduced a \$4.50 rebate for each \$1.00 clip installed in new homes. More than 2,000 were installed during the first 18 months of the program. Dufferin County provides an example of local leadership to advance community resilience.

Victoriaville has introduced financial incentives for homeowners and builders to promote sustainability and reduce the carbon footprint in buildings. The program includes incentives for a number of adaptation measures like hurricane clips and window shutters to reduce the risk of severe wind damage, and actions to cope with extreme heat, like reflective roofing, high performance windows, and shading devices for windows. This innovative program has extended to eight other communities across Quebec.

Perth County earned an award of excellence from the Canadian Association of Chiefs of Police for partnering with a private company to develop a tool to better anticipate road conditions in an emergency. Municipal 511 was developed by Transnomis Solutions to provide emergency response personnel with the best information about how to travel to their destination quickly in an emergency.

Richmond is vulnerable to flooding from storm surge, high tides, rising sea level, and overflow from the Fraser River. The community has made significant investments in flood protection. The community's new flood management strategy acknowledges that climate change and seismic risk will require extensive further investment. Richmond seeks to integrate its flood management strategy into the Fraser Basin plan.

Tofino's Tsunami Warning System was tested in 2012 when a 7.7 magnitude earthquake struck north of the community. In 2016 and 2017, the community hosted more than a dozen community engagement events to support tsunami education. This investment in preparedness will reduce the risk of fatalities and injuries when a major tsunami strikes.