Cat tales

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ICLR releases major report

Sewer backup: The risk perceptions and behaviours of homeowners in Edmonton and Toronto

By Dan Sandink, Research Coordinator

Damages caused by sewer backup is a major concern for many, if not most, urban municipalities in Canada. Increasing heavy rainfall events caused by climate change, rapid urbanization, and deteriorating or obsolete infrastructure will increase the risk of sewer backup. In January of this year, the Institute for Catastrophic Loss Reduction surveyed more than 800 homeowners in Edmonton and Toronto to learn their views on damages caused by sewer backup.

Sewer backup is caused by excess water entering sanitary systems (infiltration and inflow), which causes increased pressure that can push sewage into lower levels of buildings through sanitary sewer connections (toilets, sinks, floor drains, etc.). The existence of combined sewer systems, which convey both storm and sanitary sewage, exacerbates sewage backup risk in older parts of cities. Although this is generally perceived as strictly an infrastructure problem, effective management of basement flooding requires actions at both the municipal level and at the individual or homeowner level. For example, many homeowners' eavestrough downspouts and foundation drains contribute a significant amount of unwanted water into sanitary sewer systems. Municipalities should continue to work to upgrade existing sewer systems, and adhere to improved standards when building new systems. However, upgrading infrastructure is an expensive and long term process. In areas where upgrading is not feasible or may take several years to complete, homeowners should be encouraged to take appropriate actions to reduce their damage risk. Homeowners should also be informed of their role in contributing to sewer backup, and should be encouraged to reduce their contributions of unwanted water into sanitary sewer systems.

Table 1 provides a summary of mitigation options that survey respondents adopted. The study revealed that the majority of homeowners had not taken some of the most effective actions to reduce their damages, including installing backwater valves and sump pumps. The majority of homeowners who had previously sustained sewer backup damages had insurance coverage for this peril, however, a considerable proportion of homeowners did not know whether or not their insurance policy included coverage for sewer backup damages. The study also revealed that homeowners who had sustained damages attributed the majority of the responsibility for their damages to their municipal government.

Many homeowners indicated that they did not report their damages to authorities, including insurance companies, ►

Sewer backup cont...

for their most recent sewer backup damages. This suggests that municipal governments may be unaware of areas of their jurisdiction which may have been subject to sewer backup damages.

The majority of homeowners, both those who had never sustained sewer backup damages and those who had, were unaware that their municipal governments were taking actions to reduce the occurrence of sewer backup. Of those who were aware that the government was taking actions, the majority felt that the actions were at least somewhat effective, and were less likely to perceive themselves at risk of sustaining future damages.

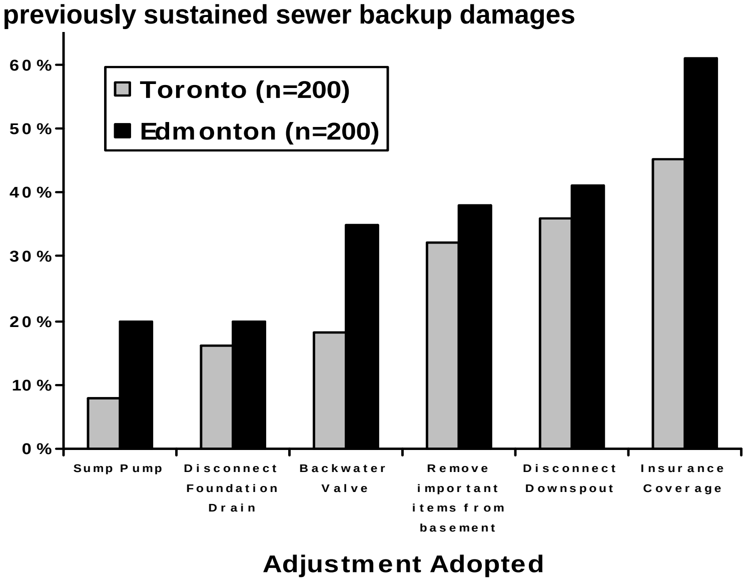
Homeowners should be better informed about their roles and responsibilities for the mitigation of sewer backup damage. Improving their understanding about the risks of basement flooding, the reason it happens, the chance that it will happen to them, their responsibilities for mitigation, and how they can reduce their own risks will help to reduce basement flood damages.

Effective hazards education is a complex process. Previous research has revealed that education programs which are formalized, provide ongoing and long-term information from a variety of sources and through a variety of channels, and provide information in a timely fashion following hazard events can increase individual awareness of hazards and increase private risk reducing actions. Edmonton's program has followed a number of these tenets, and as the results of this study suggest, its program has been relatively effective. In May 2007, Toronto's City Council approved expanding the City's basement flood information and incentive program, and has increased its comprehensiveness.

Effective education programs should also target homeowners that have sustained sewer backup damages, but may not have reported these damages to their municipality. Heavy rainfall events are expected to increase in both intensity and frequency as result of climate change, and as many municipalities lack the capacity to adequately maintain sewer infrastructure, it will continue to deteriorate. Thus, homeowners who have sustained only minor damages in the past, or live in areas with aging or obsolete infrastructure, may be prone to more serious damages in the future. These homeowners should be targeted with information in order to increase their awareness and damage reducing actions related to basement flooding.

Dan Sandink, M.A., is Research Coordinator at the Institute for Catastrophic Loss Reduction, and has authored numerous reports and articles on urban flood risk perceptions, and risk management for climate change adaptation.

Figure 1: Mitigative adjustments taken by homeowners who had previously sustained sewer backup damages



For a free copy of *Sewer Backup: Homeowner perception and mitigative behaviour in Edmonton and Toronto*, contact Dan Sandink at dsandink@iclr.org

The Ice Storm ten years on

By Ronald Stewart, NSERC Chair in Extreme Weather
McGill University

Perspective

The 1998 Ice Storm over Quebec, Ontario and the northeastern United States is considered to be one of the greatest natural disasters in Canadian history. Freezing precipitation fell between January 4 and January 10, 1998 and brought hardship to eastern Canada and the northeastern United States with the Montreal area being particularly impacted. The storm affected the electricity supply to 3.5 million people, shut down transportation, restricted emergency services, damaged farms, trees, and personal property. There were an estimated 28 deaths in Canada and 19 in the United States.

The Ice Storm accounted for 20% of the net insurance premiums written in Canada in 1998. In the United States, Hurricane Katrina represented not quite 40% of the net premiums. Using this measure, the Ice Storm is the second largest catastrophe/man-made disaster to strike in North America, exceeding even Hurricane Andrew and September 11.

With its 10th anniversary almost upon us, it is an opportune time to review some of the critical meteorological conditions leading to this event.

The Storm

The Ice Storm was linked with a persistent large scale atmospheric circulation pattern. This produced a strong frontal zone that extended from the southern United Sates all the way to eastern Canada and the northeastern United States. Temperatures in the centre of this zone were near 0ºC. Bursts of moisture from the Gulf of Mexico travelled northward along the frontal zone and brought snow, rain, freezing rain and ice pellets over a several day period to a large portion of eastern North America.

Where cold, dense air undercut the warm, light air from the Gulf of Mexico, hazardous winter precipitation was produced. This formed because snow produced high in the atmosphere fell into a layer above the surface that was above freezing and so it fully or partially melted before falling close to the surface where temperatures were below freezing. If the melting of snow aloft was complete, the ensuing liquid drops fell to the surface as freezing rain. If the melting aloft was only partial so that some ice was still present in the particles as they fell close to the surface in the subfreezing region, they would refreeze and fall as ice pellets. Since a wide variety of particle sizes occur in the atmosphere, it is also possible that a mixture of freezing rain and ice pellets can occur simultaneously. For the same temperature distribution in the atmosphere, small snowflakes may melt completely to form freezing rain, whereas large snowflakes may melt partially to form ice pellets.

In the Montreal area, there was a distinct pattern in the type of precipitation associated with the storm. To the east and south, freezing rain dominated. Near Montreal, the precipitation was often a mixture of freezing rain and ice pellets. To the north, the precipitation in general was often in the form of snow and/or ice pellets.

There were two main periods of the Ice Storm that produced much of the icing at the surface. In the Montreal region, these periods were approximately 14 hours on January 5-6 and a longer approximate 48 hour period from January 7-9. Of the cities affected by the storm, St. Hubert, south and east of Montreal, received the most freezing accumulation (80 mm), with some areas nearby receiving at least 100 mm.

The precipitation in the first icing period was mainly characterized by freezing rain and fog, whereas the second icing period was characterized by freezing rain, some ice pellets, and fog. Both periods showed the classic temperature profile of warm above freezing air aloft with a subfreezing region below. However, in the first period, temperatures aloft were quite high so that the snow all melted and only freezing rain fell. In the second period, temperatures were not as high so some ice pellets were formed in addition to the freezing rain.

Both periods were characterized by low level air flow that descended down the Appalachians, crossed the St. Lawrence Valley, and ascended up the Laurentians. This led to substantial differences in atmospheric temperatures across the St. Lawrence Valley. Descending air in the atmosphere is compressed and this leads to heating, whereas ascending air expands and cools. The air descending down the Appalachians therefore warmed and this increased the temperature aloft. This in turn would mean that more of the snow falling into this layer would melt and therefore eventually fall as freezing rain. The air ascending up the Laurentians cooled, reducing the temperature aloft, leading to more ice pellets and snow and less freezing rain. This valley-scale circulation was a major contributor to the pattern of precipitation types found across the region. ►

The Ice Storm ten years on cont...

In addition, both significant icing periods were associated with precipitation steadily increasing in intensity all the way down to the surface. This is evidenced in part because of the common occurrence of fog at the surface. Moisture was available right down to the surface to maximize the amount of hazardous precipitation. Many other storms have sub-saturated conditions above the surface so some of the precipitation evaporates or sublimates before reaching the surface and this acts to reduce impacts.

The types of precipitation found at locations such as Montreal suggest that the atmosphere was often close to producing non-hazardous precipitation. That is, if precipitation had been dominated by ice pellets alone instead of by freezing rain alone or dominated by ice pellets with some freezing rain, the resultant icing would have been minimal. Since the combination of freezing rain and ice pellets was common during the second icing period, this implies that the atmospheric conditions were very close to mainly forming ice pellets. The atmosphere only needed a small change to have done this. Numerical calculations suggest that a decrease in the temperature of the warm air aloft of only 0.5ºC was all that would have been needed at critical times during the second major icing period to change the dominance of freezing rain into dominance by ice pellets.

Major ice storms have affected Montreal in the past. Examples over the last few decades include February 23-25, 1961; March 22-23, 1972; and December 12-14, 1983. All these icing events illustrated pressure fields, precipitation type distributions, and fog that were also evident in the Ice Storm. Large scale and local factors appear to conspire to create such events in a consistent manner.

Summary

The Ice Storm was a catastrophic event by any measure. It was associated with a persistent large scale pattern that brought bursts of sustained heavy precipitation to regions of eastern Canada and the United States. Freezing precipitation was produced where cold air undercut warm air aloft although this was influenced by local factors such as terrain. These large scale and local factors led to two major icing periods in areas such as Montreal although the atmosphere was sometimes very close to producing non-hazardous precipitation. Storms of similar intensity to the Ice Storm have happened and will happen again.

Dr. Ronald Stewart.

Canada’s first Safer Living home scores direct hit from Noel

Canada’s first Safer Living home, constructed on West Point, PEI in Nov. 2006, performed just as it was designed after taking a direct hit from tropical storm Noel the weekend of Nov. 3. According to homeowners, the wind was so intense – with gusts of 120 to 140 km/h - they couldn’t hear each other talk when they were upstairs. Yet the homeowners reported to ICLR that absolutely no damage was caused by Noel.

Located on Prince Edward Island and designed and constructed to withstand winds of 200 km/h, the house is the first to be completed under ICLR’s Designed...for safer living program. The construction was funded by The Co-operators. The Safer Living program is available to ICLR member insurers, home builders and others seeking to build homes resilient to historic and future severe weather risks.

"The increasing frequency and severity of weather-related catastrophes such as Noel and Hurricane Juan are growing dangers to people around the world," said ICLR executive director, Paul Kovacs. "Canadians have a tradition of building strong homes, yet we have the knowledge to build homes that are even more resilient to extreme weather events that are increasing in frequency and severity - we need to harness that knowledge to build safer homes for this and future generations of Canadians.”

The house, located in West Point on the western shore of PEI, had to be rebuilt after a fire destroyed the home, which was insured by The Co-operators. The new house is designed to withstand the most hazardous weather conditions in the area - wind storms and extreme winter weather. In the months and years to come, additional safer living homes will be built in various regions of Canada. The homes will be designed to be resilient to the weather perils in that area, which may include earthquakes, prairie wildfire, tornadoes and hail storms.

An open letter to Institute members

By Paul Kovacs, Executive Director
Institute for Catastrophic Loss Reduction

Dear Members

Thank you for your ongoing support of the Institute for Catastrophic Loss Reduction. The year was another strong one for the Institute as we promote disaster resilience based on science.

I invite you to nominate a staff member to participate on the Insurance Advisory Committee. The Committee has been established to enhance communication of our research findings, and more actively involve members in the selection and direction of our programs.

We are working to build disaster resilient communities through our safety research and education, with a focus on better design and construction of homes, risk management tools for municipal decision makers, and continuity planning tools for small business. Increasingly it is our intention to address water damage to homes, proactive management of the risk of a catastrophic wildland fire, and climate change.

Work at the Insurance Research Lab for Better Homes (IRLBH) provides the foundation for advancing our disaster resilient home design and construction program, ***Designed… for safer living***.

Cooperators General Insurance partnered with ICLR this year to build Ontario's first disaster resilient home, while the home built last year recently survived a direct hit from the remnants of Hurricane Noel and suffered no damage (see page 2). Also under our showcase homes program, ICLR will provide a safety retrofit to a home in Montreal in 2008, the ten year anniversary of the 1998 Ice Storm (see page 3). Also we will approach you and our other member insurers next year to participate in an exciting study with Swiss Re about managing the risk of flood damage to homes.

The Vancouver Board of Trade has agreed to partner this summer with ICLR to launch the ***Open for business*** program to promote disaster recovery for small business. This will include tools specifically designed to support continuity planning, risk assessment and loss reduction.

Our ***Resilient, sustainable, vibrant and prosperous (RSVP) cities*** program was recently launched in Kelowna. We are working with senior city staff to document the processes used to manage the 2003 wildland fire, risk management tools available and the barriers encountered as the community works to build resilience to future hazards.

Further, I am a member of the advisory committee developing a climate change adaptation strategy for the city of Toronto, and the Institute recently partnered with the Clean Air Partnership to secure David Miller, the Mayor of Toronto, to champion the launch of the Mayors' Alliance for Resilient Cities.

Our efforts continue to secure praise nationally and internationally. In particular, the Paris-based International Council for Science has accepted the ICLR proposal to host and manage its Integrated Research on Disaster Risk program. With generous support from Lloyd's, ICLR looks to work with the Council to drive international hazard research efforts towards a focus on loss prevention and risk management.

Also, in May ICLR will host the world conference on flood defense, while several members of our team are leading hazard research programs for United Nations organizations including the Intergovernmental Panel on Climate Change, UNESCO, the World Meteorological Organisation, and the Committee on the Peaceful Uses of Outer Space.

Extreme events do not need to become disasters. We are working to turn research into action to build disaster resilient communities.

Thank you for your continuing support.

Paul Kovacs, Executive Director of ICLR.

ICLR's Kovacs and McBean part of IPCC team recognized with Nobel Peace Prize.

ICLR Executive Director Paul Kovacs and Director of Policy Dr. Gordon McBean of the University of Western Ontario, were part of the Intergovernmental Panel on Climate Change (IPCC) research team that was awarded the Nobel Peace Prize October 12. The Norwegian Nobel Committee decided that the prize be "shared, in two equal parts" between the IPCC and Al Gore "for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change."

According to Kovacs, the award "is further recognition of the international leadership demonstrated by ICLR researchers and the Canadian property and casualty insurance industry, and acknowledgement of the importance of climate change for society."

In a letter to lead authors of the Fourth Assessment Report (AR 4) as well as Co-Chairs and Heads of Technical Support Units, IPCC Chairman Dr. Rajendra K. Pachauri commented "I have been stunned in a pleasant way with the news of the award of the Nobel Peace Prize for the IPCC...I, on my part, will not only continue but intensify the effort that I have been making to project the work of the Panel to the outside world."

The Intergovernmental Panel on Climate Change (IPCC) was established by the World Meteorological Organisation and UNEP to assess scientific, technical and socio-economic information relevant for the understanding of climate change, its potential impacts and options for adaptation and mitigation. It is open to all Members of the UN and of WMO.

Friday Forum schedule for 2008

Each month ICLR hosts an informal discussion of current research and industry issues related to natural hazards. The cost is $75 for members, $150 for non-members for each forum. Business casual dress.

January 18
Toronto seismic microzonation project
(Hesham Naggar)

February 15
Wildfire
(Judith Kulig)

March 28
The GEOIDE Network
(Nicholas Chrisman)

April 18
Mould
(Eric Savory)

May 16
Edmonton/Toronto sewer backup
(Dan Sandink)

June 20
Managing the threat of asteroid impacts
(Paul Kovacs)

September 19
Tornado/wind damage
(Greg Kopp)

October 17
Earthquake
(Kristy Tiampo)

November 14
Insurance Research Lab
(Mike Bartlett)

For more information, contact Tracy Waddington at (416) 364-8677 or twaddington@iclr.org

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Mission
To reduce the loss of life and property caused by severe weather and earthquakes through the identification and support of sustained actions that improve society's capacity to adapt to, anticipate, mitigate, withstand and recover from natural disasters.

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