BASEMENT FLOODING:

Lessons from Edmonton and Toronto

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Basement flooding is a major concern for many, if not most, urban municipalities in Canada. Increases in the frequency and intensity of heavy rainfall events caused by climate change, rising urbanization and deteriorating infrastructure will increase basement flood risk in the future. Effective management of flood risks requires improving sewer infrastructure, and also the cooperation of more informed homeowners.

Earlier this year, the Institute for Catastrophic Loss Reduction (ICLR) surveyed more than 800 homeowners in Edmonton and Toronto to learn their views about basement flooding, particularly sewer backup.[1] The study revealed that almost twice as many homeowners with recent basement flood damage in Edmonton had taken action to reduce the risk of future damage than in Toronto. A possible explanation is the nature of Edmonton's thorough basement flood information program.

Sewer Backup: Damages and Causes

Sewer backup is caused by ground and storm water infiltration and inflow in sanitary storm systems, which can increase pressure and push sewage into lower levels of buildings through sanitary sewer connections (toilets, sinks, floor drains). The existence of combined sewer systems, which convey both storm and sanitary sewage, exacerbates sewage backup risk in older parts of cities. Damages from this hazard can be extensive. In August 2005, a severe rainfall event in the Greater Toronto Area (GTA) caused extensive overland flood and sewer backup damages, resulting in over 13,000 sewer backup insurance claims at a value of $247 million. In 2004, the City of Edmonton was hit with two severe rainfall events, resulting in 9,500 sewer backup insurance claims valued at $143 million. Similar loss events have also been experienced in many other communities across Canada.

Although sewer backup is generally perceived as strictly an infrastructure problem, effective management of basement flooding requires actions at both the municipal and homeowner levels. Indeed, many homeowners' eavestrough downspouts and foundation drains contribute a significant amount of unwanted water into sanitary sewer systems. Municipalities should continue 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 of municipal infrastructure may take several years to complete, actions by homeowners can immediately 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.

Actions at Homeowner Level

The City of Edmonton has employed a formalized basement flood education program over the past several years, which has included ongoing public meetings, information mailings, professionally designed and printed information brochures, websites and handbooks, and has provided public basement flood prevention workshops to increase knowl-

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1 For a full copy of the survey report, contact the author at <dsandink@iclr.org>.

edge of basement flood mitigation tools. Edmonton has also provided a long-term and formalized preventative plumbing incentive program, which provides financial assistance for the installation of preventative measures, such as backwater valves.

The City of Toronto employs a basement flooding education and incentive program, which includes several components similar to Edmonton's program. However, at the time the survey was administered, Toronto's program lacked the long-term nature and formality of Edmonton's program.

Do Homeowners Take Action To Reduce Risk?

Generally, they do not. A substantial body of research on hazard behaviour has found that hazard prone individuals are more likely to deny their exposure, rather than take damage reducing actions. Homeowners are also likely to blame local governments for damages. This is especially true in the case of sewer backup, where homeowners place the majority of responsibility for damages to their home on municipal governments, citing failing infrastructure as the cause of their loss.

Half of the homeowners in the study sample had previously sustained sewer backup damages, and were asked what they had done to reduce the risk of future damages (Figure 1).

Some of the most effective damage risk reducing actions, including installing backwater valves and sump-pumps, were rarely taken. Interestingly, Edmonton homeowners took these actions almost twice as often as Toronto homeowners. Disconnecting downspouts was one of the more popular actions taken by homeowners; however, few homeowners had removed foundation drain connections.

The most popular adjustment adopted by homeowners in both Edmonton and Toronto was having insurance coverage for sewer backup damages. This finding reflects previous research revealing that private property owners are far more likely to take easy-to-use, yet less effective, adjustments to address their hazard risk. While insurance may be an effective tool to help a homeowner to recover from damages, it does not reduce their risk of sustaining damages in the future, as backwater valves and sump pumps will.

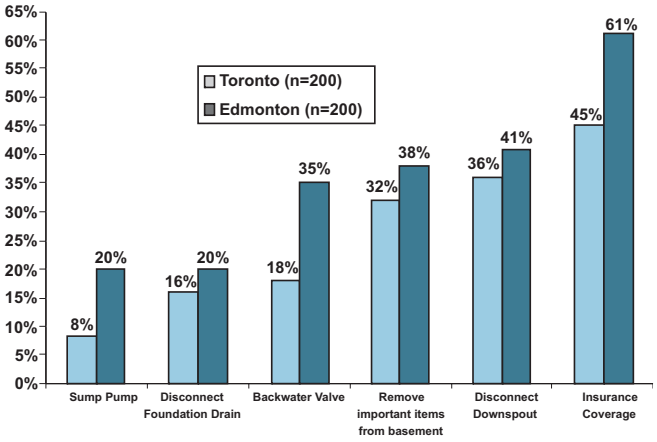
The majority of homeowners surveyed in this study did not know that their municipal governments were taking actions to reduce sewer backup damages. Of the few homeowners that did know that their governments were taking action, the majority believed that these actions were either somewhat or very effective for reducing sewer backup damages.

Effective Education and Information Programs

Effective hazards education is a complex process. Previous research has revealed that education programs that are formalized, provide ongoing and long-term information from a variety of sources and through a variety of

Figure 1

Adjustment Adopted to Reduce Risk of Future Damage



channels, and provide information in a timely fashion following hazard events can increase individual awareness of hazards and increase private risk reducing action.

Edmonton's program has followed a number of these tenants. As the results of this study suggest, their program has been relatively effective. Historically, Toronto's basement flood education program has been less comprehensive and, as the results of this study shown in Figure 1 suggest, their program has been less successful in encouraging mitigative behaviour in homeowners. Since the summer of 2007, the City of Toronto has been working to improve their basement flooding information program.

Improving the Message

More and more, homeowners are choosing to locate expensive items in their basements, including televisions, home theatre systems and furniture. A few years ago, average insurance claims for sewer backup were about $3,000 to $5,000. The 2005 GTA storm, however, resulted in an average insurance claim of $19,000 and the 2004 storms in Edmonton saw an average of over $15,000. This suggests that the property that people are placing in their basements may be increasing in both quantity and value. As indicated in Figure 1, few homeowners who had sustained sewer backup damages in the past had chosen to remove expensive items from their basement. Homeowners have a right to use their basement in any way they see fit. However, they should also be made to understand that placing expensive property in basements that are prone to flooding is risky. If they choose to locate their property in their basement, they should be made aware that they should take steps to protect it.

Homeowner knowledge of insurance coverage should be improved. Though insurance was the most popular action taken, there were numerous homeowners who did not know whether or not their insurance policy covered

Some Elements of Effective Hazard Information Programs

- Use several credible sources to produce and present information – city engineers, scientists, plumbers, contractors, insurance professionals.
- Use as many channels as possible – professionally produced brochures, mass media, print, information mailings, Internet.
- Make sure that information provided by various sources is consistent – conflicting information will reduce effectiveness of information programs.
- Timing is of the essence – have information ready for the public and the media so they can access it immediately after or during flood events.
- Information should describe who is at risk, the type of loss they face, and how they can reduce or prevent damages.
- Information should be easily accessible – and reflect the target population. Which language are they most comfortable reading? Do they use computers?
- Information should be presented over the long term.
- Information programs should be periodically evaluated and improved.

sewer backup damage, and several who did not have sewer backup coverage cited an increase in insurance premiums as their reason. Homeowners should be encouraged to check if their policies cover this type of damage, and should be made aware that sewer backup coverage is optional, and typically adds no more than $30 to $40 per year to the average homeowner's annual insurance premiums.

Targeting the Right Homeowners

Naturally, municipalities seek to target information programs at areas in their cities that have experienced damages caused by flooding. These areas are often identified based on homeowner calls made to the city reporting damages and requesting assistance. This study revealed that many homeowners who sustained minor damages may not have reported their damages to authorities. Homeowners who have sustained only minor damages in the past may be at risk of sustaining more serious damages in the future, as a result of climate change and continued deterioration of infrastructure. These homeowners should be identified and targeted with basement flood information.

As infrastructure ages and as intense heavy rainfall events become more common as a result of climate change, areas of cities that have never had sewer backup may become prone to damages. Areas that are serviced by combined sewers and older separated sewers that may develop infiltration and inflow issues are of particular concern. Municipalities should work to identify areas that may be at risk of sustaining future damages, and target basement flood information to these areas as well.

Ongoing Work

ICLR is working to increase the resilience, sustainability, vibrancy and prosperity of municipalities through its RSVP… for cities program. The goal of the program is to increase natural hazard resilience and reduce deaths, injuries and damages caused by natural hazards in Canadian municipalities. As part of the program, ICLR is working to increase knowledge of urban flood risks, and is working to develop a practical how-to manual to assist Canadian municipalities in the development of effective urban flooding education and mitigation programs. *MW*

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