SIRP – Secure - Home Adaptation Strategies and Programs

Recommendation:

Utility Committee receives this report as information.

SIRP Background:

This report has been prepared in response to a February 14th 2020 Utility committee request:

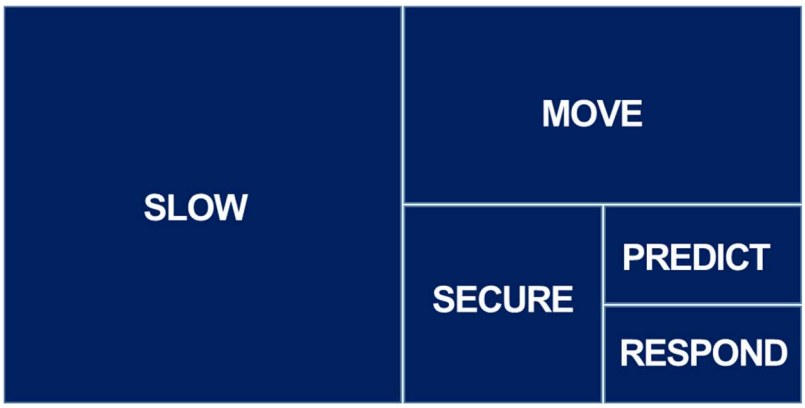
> *That Administration work with EPCOR to provide a more detailed update to Utility Committee on Home Adaptation Strategies and programs as part of the SECURE theme in the Stormwater Integrated Resource Plan, along with some analysis that these strategies and programs may have on insurance rates for Edmonton homeowners*

This report is structured into two major sections

- First providing details on the SIRP SECURE components and current status of the efforts underway from EPCOR.
- Second an update on the ongoing discussions and collaboration with the insurance sector.

SIRP SECURE Strategy:

The SIRP strategy has been classified into five themes as described below



Slow: We slow the entry of stormwater into the drainage network by absorbing it in green infrastructure and holding it in ponds, creating space in the collection system during storm events.

Move: We move excess water away from areas at risk, quickly and efficiently.

Secure: We help secure individual properties in higher risk areas against sewer backups, inflow infiltration and overland flooding and river flooding.

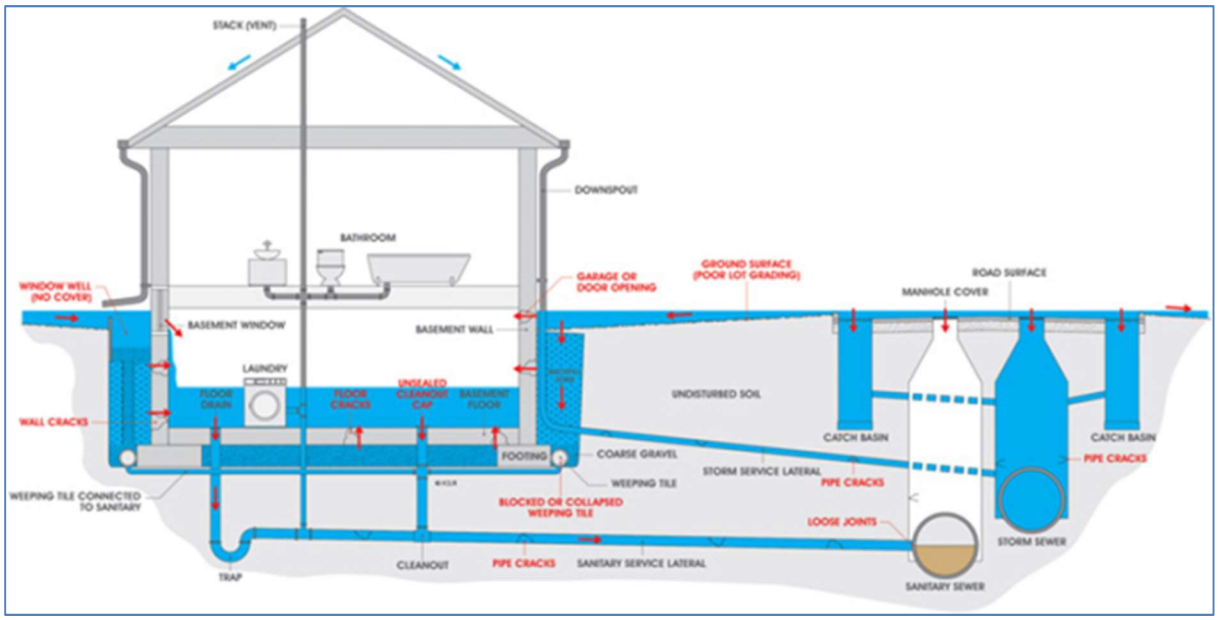
Predict: We predict and manage the movement of stormwater through smart sensors and technologies that integrate into the collection system.

Respond: We respond through fast rollout of flood barriers, traffic diversions, and public communications to protect life, safety and property.

This report is focused specifically on the SECURE theme and provides more details on the work completed since the SIRP strategy was approved and the on-going collaborations that EPCOR has been involved with the insurance sector around flood mitigation and protection of private property.

Property Flood Risk Pathways:

The flood risk to individual properties is illustrated in the figure below from the CSA Standard Z800-18 – Guideline on Basement Flood Protection and Risk Reduction. The figure shows the multiple paths where storm water can enter a property during a flooding event resulting in damage to the property. Stormwater can enter a home either via a backup through the sanitary sewer, risk mitigated by installation of a backwater valve and via foundation drains and/or window wells, risk mitigated by proper lot grading and repairs to service lines pipes to reduce risk from infiltration of water ponding on the surface and installation of a sump pump to direct foundation drain high water levels away from the property.



The longer the duration that the water pools on the ground surface after a storm event the higher the risk that the water will access the sanitary pipes and/or foundation drains of properties without adequate flood proofing and enter the building. The SIRP Secure theme was developed to address each of these pathways through three focus areas for intervention:

- Theme 1 - Flood proofing of private property through backwater valves, foundation flooding risks and sealing of access points for overland water during extreme storm events
- Theme 2 - Inflow/Infiltration reduction of excess water into to the sanitary pipes through manhole and pipe sealing and identification and removal of roof leaders and foundation drain connections to the sanitary pipe system to reduce surcharging risk
- Theme 3 – River flooding risk – mitigated with outfall gates to limit the potential of water backing up the pipes during a high river level event.

Over the last year EPCOR has also identified that within the areas of the City without a piped storm network the SECURE theme should also include a fourth aspect the maintenance and upgrading of the ditches and swale systems particularly in the industrial areas to reduce the risks of overland flooding to these property owners as this is an additional pathway for flooding of private property in the City.

EPCOR SIRP-SECURE Investment Themes:

The following sections provide more details on the investment themes that support the SIRP-SECURE strategy component. This includes how the four themes within SIRP-SECURE allowed EPCOR to adapt to constraints of COVID-19 while continuing to deliver on the overall 20 year SIRP strategy.

<u>SIRP-SECURE – Theme 1 - Flood Proofing of Private Property</u>

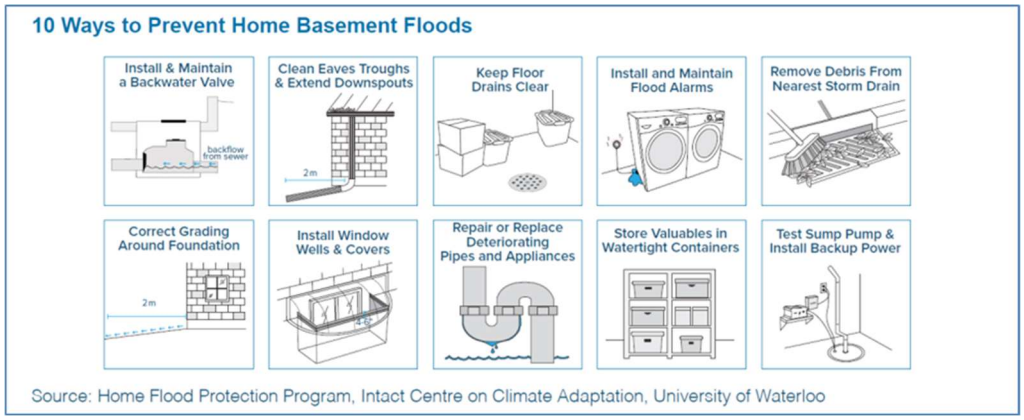
The SIRP analysis completed in 2019 identified approximately 6000 properties (including 2500 in the river valley neighbourhoods) that have a higher flooding risk due to being adjacent to areas where the water in the road could pool at depths above the 1 meter depth during an extreme storm or high river water level event. There are an additional 40,000 properties with a mid-high exposure risk where ponding in the road network could be between 0.35 and 1 meter depth during these extreme events.

Since the approval of the SIRP strategy the flood proofing resources have been expanded at EPCOR to include a manager and three additional flood proofing inspectors to complement the

three inspectors and backwater valve subsidy program that has been in place since 2004. The team has also completed the certified flood inspectors training program as developed by the Intact Center on Climate Adaption (ICCA) in conjunction with Fleming College.

The EPCOR flood inspection report provided to all homeowners after an inspection has also been updated to align with the recommended content from ICCA and we are in the process of developing a software application to reduce the level of effort and duration to complete the inspection in the field with the home owner and produce the final report for the homeowner. This software tool will also be integrated with our work management and GIS systems to improve tracking of these completed inspections and follow up activities with each homeowner.

The primary focus areas of the home flood inspection are illustrated in the figure below.



EPCOR has continued to fund the backwater valve subsidy of $800 per property as part of the SIRP strategy and in the last year completed a public opinion survey review of customers that had completed an inspection but had not followed up on requesting the backwater valve installation subsidy. Appendix 1 for this report includes the results of this customer engagement activity.

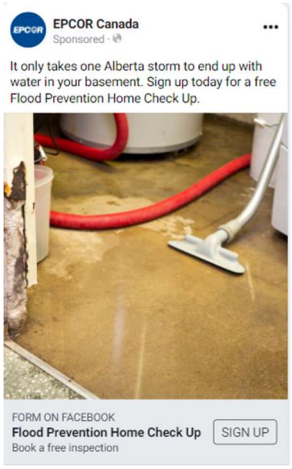
In general there is positive perception of the backwater valve subsidy program with opportunities for improvement identified including providing more time to apply for the subsidy after inspection and for EPCOR to provide a recommended list of contractors to complete the installations. Overall there is still a perception of low flooding risk from the individuals that choose not to follow up on the installation of a backwater valve due to the cost impact as the subsidy does not cover the full installation cost. EPCOR will continue to promote the program and increase awareness on this important action that all homeowners should take.

It is important to note that backwater valves are a requirement for all new home installations as per the design and construction standards, so this gap primarily impacts older properties constructed prior to the 1990's. For homeowners with backwater valves, flood inspections are also still a focus for EPCOR due to the other flow paths for water to enter a property and to ensure the homeowner is aware of the annual maintenance requirements for their backwater valve.

The following table shows the historical numbers of home flood proofing inspections completed by the utility and backwater valve subsidies claimed.

Full Flood Inspections completed	2017	2018	2019	2020	Up to May 2021
Flood Prevention Inspections in homes (single family, duplex)	540	271	565	530	42
Total number of Backwater Valve Subsidies paid	414	171	335	358	161

Prior to 2019, the inspections were primarily based on an individual homeowner contacting EPCOR for interest in an inspection, annual numbers of inspections varied each year based on calls received into the program.



The SIRP-SECURE strategy provides additional focus where EPCOR will be reaching out specifically to high risk customers in a coordinated neighbourhood approach to systematically target high risk properties.

This proactive approach was started in 2020, but had to be pulled back due to changing health restrictions and comfort of home owners to interact with our inspectors over the last year. High risk properties adjacent to our other planned construction work where we are already engaged with the community did continue as planned. Despite these constraints we have

continued to promote the EPCOR flood inspection programs during the last year and have provided inspections throughout this period with homeowners that are comfortable with the process. One innovation has been the incorporation of tools such as Facetime and WhatsApp to allow the homeowner to complete the inspection within their property with the inspector remaining outside and providing input on what they were seeing through the screen.

In addition to the social media campaigns to encourage signing up for a flood proofing inspection, the SIRP team has presented at the Edmonton Federation of Community leagues as part of the Green Leagues workshop series and at a lunch learn session hosted by the Climate Change Adaptation team. Flood risk mitigation was also presented in a session with IDEA as part of a session of overall water and drainage utility considerations for infill success.

EPCOR has also provided information on flooding risks to the City of Edmonton Insurance and Risk group for all 1400+ City owned facilities and is in the process of preparing similar information packages for the Edmonton Public School board (example below) to allow them to incorporate flood proofing into their facility planning and school educational programs.

EPCOR

DOVERCOURT SCHOOL INFORMATION SHEET

INTRODUCTION

The goal of this document is to help provide information on the potential flooding risks and share water consumption usage for each institution maintained/operated by the Edmonton Public School Board. The document leverages the analysis completed by EPCOR in the development of the Stormwater Integrated Resource Plan (SIRP) and the water consumption information collected in the development of the Water Integrated Resource Plan (WatIRP). The information will allow EPCOR and the EPSB to identify locations where there is a potential to align our efforts for climate change adaptation and improving efficient use of resources in the community.

FLOODING RISK

As part of the SIRP analysis Dovercourt School is located in catchment area 140 which has a current overall ranking of D (Moderate). After reviewing the insurance flood risk maps and considering institutions at risk, this school is considered to be at moderate risk of flooding. The images indicate the areas of the institution that could be exposed to flooding damages during different storm intensity events. Maps shown were developed by JBA Risk Management and are provided to the insurance industry with information on the depth of overland flooding predicted for different storm intensities, assuming that the piped storm network was not functioning.

MITIGATE FLOOD RISK

The Dovercourt neighbourhood has been recommended for installation of a future dry pond. EPCOR and the City of Edmonton are reviewing green spaces within the catchment area to determine the optimum configuration for the dry pond as part of the City of Edmonton Open Spaces Repurposing Strategy. It is recommended that LID efforts/features on site would help provide an additional layer of protection from flooding. EPCOR is available to discuss options for LID installation and funding partnerships since the Dovercourt School has been identified as being in topographical sag area. ECPOR also is available to help complete a Flood Proofing Inspection of the building/site to help identify problem areas and provide direction on possible solutions

Storm Scenario	Likelihood over 1 Year	Likelihood over 30 Years	Likelihood over 100 Years
1:20 Year Event	5.00%	78.54%	99.41%
1:100 Year Event	1.00%	26.03%	63.40%
1:1500 Year Event	0.07%	1.98%	6.45%

Legend

- 0.35 to 1 meter
- 1 to 3 meters
- 3 – 6 meters
- 6 – 9 meters
- Greater than 9 meters

Sub Basin: Ranking D
Sub Basin #: 140

Figure 1 Insurance Risk Maps 1:20 Year*

Figure 2 Insurance Risk Maps 1:100 Year*

Figure 3 Insurance Risk Maps 1:1500 Year*

Similar information packages are being planned for the other school boards and health sector entities and the University of Alberta facilities team. We are also working closely with the City Planning groups to include the flooding risk components as part of the development strategies for Nodes and Corridors and District planning. EPCOR is preparing maps showing locations of topographical sags, which indicate higher flooding risks to adjacent properties to support these initiatives.

Our priority focus area for the remainder of 2021 and into 2022 will be outreach specific to the properties in the river valley neighbourhoods. These are the highest risk locations identified in the SIRP strategy as some of the properties have risks from both high river levels and intense rain storms. More details on the river valley focused initiatives are included in the Theme 3 section below.

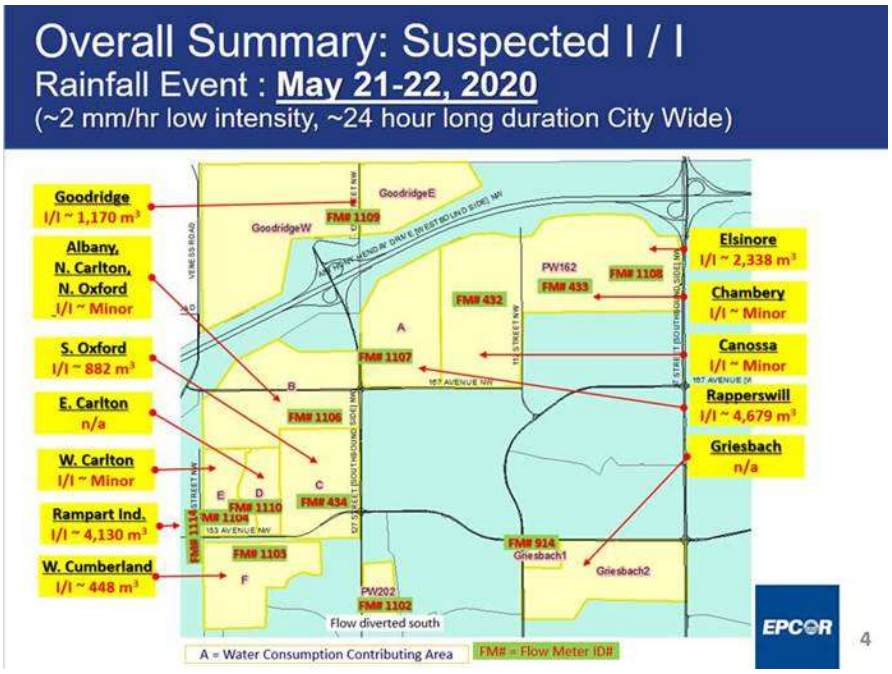
SIRP – SECURE – Theme 2 - Inflow/Infiltration Reduction

Inflow/Infiltration describes excess water that enters the piped sanitary sewer system and increases the risk of flooding to adjacent properties during storm events.

- Infiltration is water that seeps into the sewer pipes through holes, cracks, joint failures and faulty connections
- Inflow is water that rapidly flows into the sewer pipes through roof drain spouts, foundation drains, storm drain cross connections and through manhole covers.

As part of the SIRP-SECURE strategy EPCOR has implemented a capital program focused on identification and reduction of inflow/infiltration sources to the sanitary sewer network. Approximately 9000 manholes and their connecting pipes have been identified as being situated in a topographical sag location. These locations are being targeted as part of two capital programs – manhole lining and pipe lining to reduce the paths for water to enter the sewer network through cracks, joint failures and manhole covers. Approximately 1000 manholes per year are planned for lining each year. The figure to the right shows the manhole condition before and after lining.

In addition, EPCOR has been systematically testing for storm water cross connections and connections of roof leaders and foundation drains to the sanitary network through smoke and dye testing. In 2020 the focus was testing the neighbourhoods in the northeast of the City to determine the sources of excess storm water entering the NEST sanitary trunk network. Through this analysis we have determined that the neighbourhoods of Rapperswill, Rampart Industrial, Elsinore and Goodridge have higher levels of I/I than their adjacent communities. See figure to the right.



Additional investigations are continuing to identify the specific locations where storm water is entering the sanitary pipes to allow for targeted reduction of these flows. Community outreach is also in development to work with homeowners whose downspouts or foundation drains are connected to the sanitary network to reconfigure these to reduce flooding risks. EPCOR will be assessing the potential to implement an additional subsidy program to support these disconnects aligned with similar programs offered in other communities and will recommend this as part of the 2024 PBR renewal and there is a better understanding of the number of properties requiring reconfiguration.

SIRP-SECURE – Theme 3 - River Flooding risk mitigation

River flooding risk mitigation is a joint effort between the City of Edmonton and EPCOR to manage the impacts to the properties located within the river valley locations and in particular for properties located within the Provincially designated floodway and flood fringe areas as this has an impact on Provincial Disaster Relief Funding eligibility (see section at end of this report for more details on this item).

EPCOR's focus is on reducing the risk of river water accessing the piped sewer network and reaching customer basements through these flow paths. The City of Edmonton is responsible for the emergency response efforts to protect from overland flood paths, however EPCOR is also supporting this effort through our SIRP –RESPOND theme in assisting the City and property owners to develop emergency response plans and through the acquisition of barricades and sand bags for deployment to assist during a flooding event.

There are 31 river valley outfalls whose elevation and proximity to customer service connections can result in river water backing up into the pipes and increasing risk to private property. A multiyear capital project (2021 to 2029) will have each of these outfall locations reconfigured with an automatic gate to allow the utility to close the outfalls during a high river event and rapidly open them again after the event to reduce risk of flooding if a storm occurs in the network upstream of the closed gate. The project is being completed in three phases. Phase 1 consists of the conversion of 4 existing manual gates within the Cloverdale neighbourhood and the additional of 2 new gates (one in Riverdale and one in River Valley Fort Edmonton Park region). The initial project will confirm the technology configuration for the controls and quantify constructability concerns. Eight additional gates throughout the river valley are planned for installation in 2022-2024 and the remainder will be installed by 2029.

In additional to the outfall gates, EPCOR has also completed a review of the individual properties within the Cloverdale, Riverdale and Rossdale neighbourhood comparing property configuration and basement elevations against the Provincially designated flood elevations for different flood scenarios. The majority of properties in these neighbourhoods have lot grading and main floors and window wells that are above the expected flood depths. It is estimated that approximately 300 properties would see surface flooding on the road outside their property and 12 properties have been identified with reverse slope driveways that would have greater risk of flood damage due to their location within these flood risk zones.

As we emerge out of the COVID-19 restrictions EPCOR will be conducting proactive outreach in the river valley communities to these high risk properties to confirm that all have a functional backwater valve and highlight areas where additional flood proofing is recommended to reduce risk of flood waters entering homes. Since river flooding typically has sufficient advance notice of rising water levels there are opportunities for property owners to acquire temporary flood protection devices that can be deployed during a high river water event.

EPCOR has also shared flooding risks with the City of Edmonton planning teams for consideration in the development of the Ribbon of Green initiatives and the information has

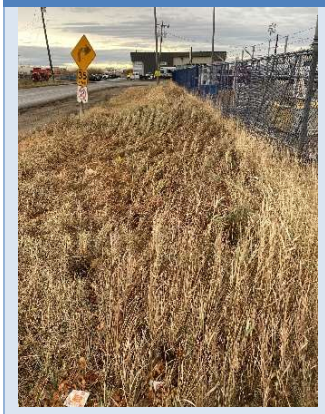
been utilized by EPCOR Water Plants and EPCOR Distribution and Transmission to support their capital planning for flood risk reduction of their critical utility infrastructure. EPCOR also provided information to the City of Edmonton Facilities planning group to support their capital planning efforts. Outreach to the remaining property owners in the River Valley will occur over the next year.

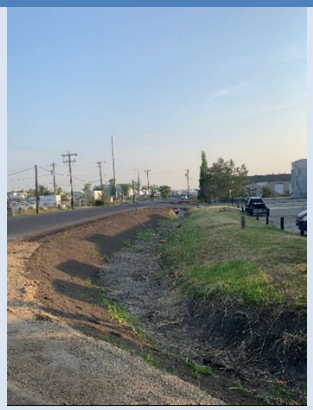
SIRP-SECURE – Theme 4 - Ditches and Swales

Through the development of the SIRP and the review of overland flood paths it was determined that the City of Edmonton historically did not have a preventative maintenance program to maintain the drainage functionality of the ditches, swales and culverts. The majority of ditches, swales and culverts are located in the areas currently not serviced through a traditional piped sewer network. Reactive repairs to these locations were coordinated between Drainage Operations and City of Edmonton Roadways Operations in response to customer complaints and/ or identification of surface flooding by City or Drainage crews moving throughout the City.

Over the last year EPCOR has developed a formal maintenance program for the ditches and swales including a focus on maintaining drainage flow paths and proactive repairs of culverts that have failed. Since April 2020, EPCOR has inspected 1700 of the 4000 culverts in Edmonton and in coordination with the City of Edmonton IIS team has repaired 2.7km of ditches and culverts from this inspection work. An additional 436 culverts that were not recorded in the GIS system were identified through the inspections and these will be surveyed and added to the EPCOR maintenance programs going forward. This approach also allowed for some of these repairs to be captured as part of the Federal stimulus funding to improve the road and ditch networks in the Mistatim and Kinokamau Plains Industrial neighbourhoods.

Mistatim Ditch Rehabilitation – Before and After condition





Majority of ditches were overgrown resulting in blocked flow paths. Vegetation was cleared and culverts repaired to increase flow capacities. New grass seed is being applied and will be maintained annually to maintain drainage functionality

Insurance Sector Collaboration:

EPCOR continues to collaborate closely with the Insurance sector as the availability of overland flooding insurance continues to grow in the community and policies for disaster relief funding eligibility are changing within the Provincial and Federal governments. This section of the report provides an overview of the current state of flood insurance in Canada and where EPCOR has been engaging in the discussions to mitigate risks to the property owner.

EPCOR has been in discussions with many of the insurance providers through various engagement activities with the Canadian Water Network, Insurance Bureau of Canada, Intact Center on Climate Adaptation and the Institute for Catastrophic Loss Reduction. Through these discussions it is evident that this is a complex space and there is not a simple correlation that can be derived from completion of flood proofing of a property leading to a specific decrease in insurance premiums. However there is agreement that flood proofing is a key component to reduce risk and over the long term will result in reduction in premiums for the homeowners that are implementing these techniques vs. others that are not.

To understand the complexity one approach is to consider the number of players that are involved in determining an insurance premium and the complexity of the homeowner and the municipality in communicating the mitigation and adaptation components that have been implemented at either a property or neighbourhood level in a community.

Individual property owners purchase insurance from their broker, the insurance companies then redistribute their risks through the use of reinsurance providers, the reinsurance providers utilize proprietary catastrophic risk models that consider risks a both a broad regional and local scale. Coupled with this analysis occurring within the insurance sectors there are property specific risk mitigations being installed by the homeowner and community scale risk mitigations being installed by the municipality/utility.

The following sections provide an overview of these different dimensions.

Property and Casualty Insurance Overview:

Most Property and Casualty (P&C) insurance providers now provide some form of overland flooding insurance as an option for property owners. The Insurance Bureau of Canada (IBC) has provided information indicating that in Alberta as of end of 2019 approximately 53% of homeowners now have overland flood insurance included in their policy, up from

approximately 30% in 2017. This number is expected to continue to grow as more insurers offer this protection to their policy holders and awareness of flooding risk grows in the community.

IBC publishes an annual report that provides more information on insurance trends in Canada, the 2020 report that provides a list of historical catastrophic events across Canada and a listing of the top P&C insurers based on market share of direct written premiums. There are over 192 P&C insurers in Canada with the top 15 providing policies to 77% of the property owners and the remaining serving the rest of the policy holders. The adjacent below lists the top 15 P&C insurers in 2019 from the IBC 2020 Annual report.

Top 15 Private P&C Insurers – 2019 and respective Market Share % From IBC 2020 Annual Report http://assets.ibc.ca/Documents/Facts%20Book/Facts_Book/2020/IBC-2020-Facts.pdf		
1	Intact Group (15.08%)	15.08%
2	Desjardins Group (8.5%)	8.50%
3	Aviva Group (8.35%)	8.35%
4	The Co-operators Group (5.76%)	5.76%
5	The Wawanesa Mutual Insurance Company (5.69%)	5.69%
6	Lloyd's Underwriters (5.45%)	5.45%
7	TD Insurance Group (5.42%)	5.42%
8	RSA Group (4.81%)	4.81%
9	Economical Group (3.86%)	3.86%
10	Northbridge Group (3.08%)	3.08%
11	Allstate Group (3.00%)	3.00%
12	Travelers Group (2.69%)	2.69%
13	CAA Group (2.13%)	2.13%
14	AIG Insurance Company of Canada (1.95%)	1.95%
15	La Capitale Group (1.84%)	1.84%

The cost of the insurance can vary based on the catastrophic risk models used by the insurers in assessing the risk levels in the community and the individual risk level for the specific property owner considering other property related factors when determining the overall policy components. The insurance market is highly competitive and policy holders are recommended to shop around between the providers to find the least cost mix of insurance to meet their specific needs.

A number of the larger insurance providers have their own internal catastrophic risk and climate modeling teams as well there are a number of firms such as AON and JBA Risk Assurance who offer their catastrophic risk data on a subscription service to insurance brokers and other entities. As part of the development of the SIRP strategy EPCOR purchased access to

the flood risk maps available from JBA Risk Assurance for the Edmonton region. The challenge that municipalities are facing is how to effectively provide information to the catastrophic risk modellers through the multiple layers of brokers, insurers and reinsurers that are actively assessing overall property risks when developing their policy offerings to consumers.

These frameworks for communication are not in place as there was no need in the past as the insurance community did not offer overland flood insurance products. As the industry matures these gaps are expected to close. EPCOR is continuing to engage with these different groups to develop a mechanism for sharing. To assess the SIRP strategy impacts on insurance rates for this report two scenarios were developed and shared with multiple entities in the insurance sector to determine how these could impact property insurance rates.

Scenarios Tested with Insurance sector for impacts on rates

Scenario 1 - A private homeowner contacts EPCOR for a flood inspection and they implement all the recommendations which are then audited through a second inspection by EPCOR. EPCOR flood inspection program aligns with the ICCA approach and the inspectors have completed Fleming college training and are using the report template. Who does the homeowner approach to have his policy reviewed and what does that person need to do with the information to be able to make a decision on the insurance rate for that customer

Scenario 2 - A municipality installs a dry pond that reduces the risk of multiple properties in a neighbourhood. The municipality does not have a relationship with the individual property insurance agents – who should they be working with to get this information in the hands of the individuals within the insurance sector on this lower risk - to they go to the insurers, the reinsurers or the catastrophic risk modellers – how would they figure out who to talk to.

Based on the responses to these scenarios there appears to be three pathways for dialogue with the insurance sector, each requiring a separate approach by the utility and municipality to close the insurance gaps.

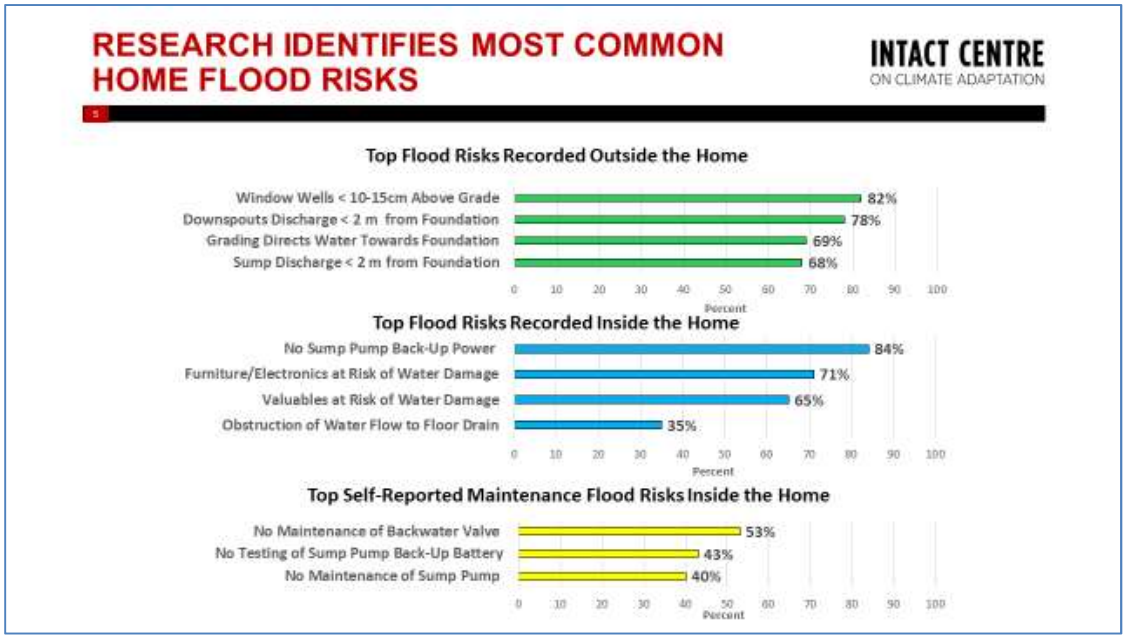
- Pathway 1 - Individual Property Flood Risk Reduction – this pathway reflects the individual actions that a property owner can take to reduce the risk of flooding and share this information with their insurance broker.

- Pathway 2 - Overall Community risk assessment – this pathway considers the overall programs that a community is implementing to reduce the risk of flooding in their community.

- Pathway 3 – Neighbourhood Flood risk - Impact of municipal investments at a community scale to reduce neighbourhood risk for highest risk locations. These investments include the addition of dry ponds, LID, additional storm trunks and outfall gates that protect a group of properties however due to their configuration and operational set up are not easily validated through a mechanism such as a home flood inspection.

For Pathway 1 – Individual Property Flood Risk Reduction - The SIRP-SECURE theme is focused specifically on this aspect providing support through flood inspections and backwater valve subsidies to support the property owner. The focus for EPCOR and the municipality is primarily around community engagement to build awareness of flooding risks and providing the education resources to assist property owners in determining what efforts are required on their property to support their individual discussions with their insurance brokers. EPCOR is aligned with industry best practices for this aspect as described earlier in this report

The Intact Center on Climate Adaptation (ICCA) has also published research on flooding risks to private property, including a pilot program with Saskatoon SK, Burlington ON, and Toronto ON. The following chart shows the most common home flood risks seen in these communities that participated in the pilot program. https://www.intactcentreclimateadaptation.ca/wp-content/uploads/2019/04/Home-Flood-Protection-Program-Report-1.pdf



ICCA and the University of Waterloo have also published information on the typical costs of retrofitting a home to flood proof and provided information on whether these costs are typically borne solely by the homeowner or partially subsidized by the municipality or utility. This full report is attached as Appendix 2 of this document. The interventions in particular from this report that were identified as having potential to result in an insurance credit are summarized in the table below along with information on whether some communities provide a subsidy to support the homeowner with the intervention

Flood Proofing Interventions that are potentially eligible for Insurance Discounts	Estimated Cost Range	Potential for Subsidy Offered by Municipality
Extend Eaves trough Downspouts	$25-$50 per downspout	N
Disconnect downspouts and capping weeper pipes	$100 -$250 per downspout	Y
Flood Alarms on Fixtures	$25-150 per location	N
Install Backwater Valve	$750-1250	Y
Clean Out Backwater Valve	$0 DIY - $100	N
Install Alarm on Backwater Valve	$75-150	N
Seasonal Backwater Valve Maintenance Check by Plumber	$100-250	N
Replace Sump Pump	$350-700 (2-7 year life expectancy)	Y
Install submersible Sump pump and Well	$1500+	Y
Install Sump Pump Back-up Battery	$500-$1500	Y
Install Sump Pump Back-up Generator	$5000+	N
Install Sump Pump Alarm	$75-$150	Y
Seasonal Sump Pump Maintenance Check by Plumber	$100-$150	N
Seasonal Water main shutoff valve Check by Plumber	$100-250	N

Within Edmonton the current subsidy program is $800 per property to support backwater valve installation. The subsidy program does not include options for downspout disconnections or sump pump installations comparable to other communities in Canada. However Edmonton is also unique in not charging property owners for the initial flood proofing inspection with other communities charging a fee (up to $300 per inspection) to cover resource time to complete the flood proofing inspection.

EPCOR will evaluate the subsidy programs for Edmonton prior to the filing of the next PBR to determine if additional subsidies should be offered in our community, in particular focused on

downspout and foundation drain reconfigurations if this is found to be the key driver of high inflow/infiltration during storm events.

For Pathway 2 - Overall Community risk assessment - The recent recognition from the Intact Center on Climate Adaptation and Clean 50 of the overall SIRP strategy developed for Edmonton supports the insurance sector awareness that Edmonton is actively supporting the reduction of flood risks in the community. This information can then be captured by the teams developing the catastrophic risk models within the insurance sector for each community. EPCOR has been engaged with Insurance Bureau of Canada as well in their efforts supporting the National Roundtable on Flood Proofing and in particular on how to improve the overall catastrophic risk models developed through the insurance sector by improving the quality of the topographical mapping available from the Federal Government.

EPCOR continues to actively share the SIRP strategy with both the municipal and insurance sectors and build awareness of our leadership role on addressing the flood risks in the community. Most recently this has included presentations for the Institute of Catastrophic Loss Reduction Friday Forum. Attendees to these forums represent members of the insurance sector across North America. Through these initiatives we expect additional follow up to occur with specific insurers on how to work directly with us on understanding our program and how to incorporate our improvements into their proprietary risk modelling.

For Pathway 3 – Neighbourhood Risk Reduction recognition – EPCOR has reached out to a number of individual insurance companies and has not yet identified a consistent path forward to build awareness in the insurance sector for these investments in a way that would lead to a reduction in an insurance premium for the highest risk properties in the short term. Generally the response is after a number of large storms have occurred and there is evidence of the new infrastructure actually reducing flood damage to a property then there may be a reduction available. This communication gap is also an issue for other major cities in Canada and EPCOR continues through its connections with the Canadian Water Network and Insurance Bureau of Canada will continue to identify methods to bridge this gap.

EPCOR will continue to actively engage with the insurance community in particular through supporting the on-going efforts of the Insurance Bureau of Canada in their efforts aligned with the Federal Task Force on Flood Insurance and Relocation. This program is focused on the neighbourhoods at highest risk aligning with our SIRP strategy to implement flood risk reduction in these locations as a priority. Details on this program are included from the Public Safety department website for the Government of Canada.

Federal Task Force on Flood Insurance and Relocation
https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/dsstr-prvntn-mtgtn/tsk-frc-fld-en.aspx

Background
Natural disasters are increasing in frequency and severity. In light of the growing threat to the safety of Canadians due to climate change and continued urbanization in high-risk flood areas, the Government of Canada is moving forward with a number of measures to help Canadians reduce their financial and physical vulnerability to flooding.
Among these measures, the Prime Minister instructed the Minister of Public Safety and Emergency Preparedness and the Minister of Families, Children and Social Development to create a new, low-cost national flood insurance program to protect homeowners at high risk of flooding and without adequate insurance protection. As well, the Prime Minister asked that they develop a national action plan to assist homeowners with potential relocation for those at the highest risk of repeat flooding. These undertakings are complex, and require a collaborative, multi-disciplinary approach involving federal, provincial and territorial government officials, the insurance industry and stakeholders and partners impacted or concerned by Canada's growing vulnerability to flooding.

Mandate of the Task Force on Flood Insurance and Relocation
The Task Force will examine options for low-cost residential flood insurance to residents of high risk areas. It will also consider options for potential relocation for residents of areas at the highest risk of recurrent flooding.
At the same time, Indigenous Services Canada will work with First Nations partners on a dedicated Steering Committee on First Nations Home Flood Insurance Needs to examine the unique context on reserves. The Government of Canada is also committed to ensuring that broad Indigenous perspectives are included in flood risk management in Canada. The Task Force and Steering Committee will share information with one another, and work closely together to engage with various partners, including with First Nations off-reserve, Inuit, and Métis communities and organizations.
The results of the work of the Task Force will be presented in a public-facing, statement-of-fact report to be delivered to the Deputy Minister of Public Safety and President of the Canada Mortgage and Housing Corporation.

Membership
The Task Force will bring together experts from federal departments and agencies, provincial and territorial ministries, as well as representatives of the insurance industry, including the Insurance Bureau of Canada. Public Safety Canada will lead the Task Force and provide secretariat services throughout the mandate of the Task Force.

Timeframe
The Task Force is expected to commence its work by January 2021 and submit its final report by Spring 2022.

The Insurance Bureau of Canada is leading one of the three subcommittees reporting to this task force. The other two teams consist of one consisting of Federal organizations and one consisting of provincial and territory organizations. All three subcommittee report up into Public Safety Canada.

EPCOR has supported this initiative through the provision of subject matter expertise on our use of the insurance sector products to support the SIRP risk ranking and provided municipal data to support additional risk analysis by the catastrophic risk modellers engaged in these efforts to assess the impacts of improved data sets on over all insurance risk ranking.

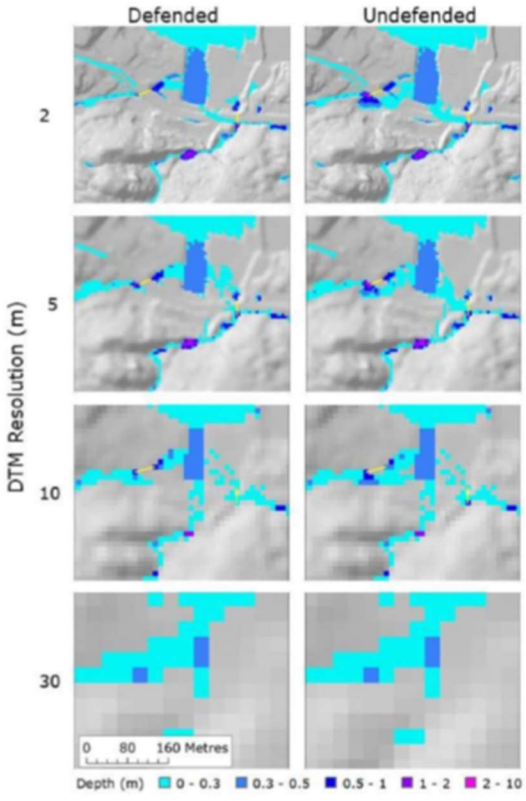
Appendix 3 includes a report completed by Insurance Bureau of Canada evaluating three alternatives to manage the insurance costs for this high risk group. The recommendation from this report to the Federal Government was the establishment of a high risk insurance pool with backstop funding provided through government entities. This report was one of the drivers for the establishment of the Federal Task Force on Flood Insurance and Relocation.

The Canadian Water Network and Insurance Bureau of Canada have also completed additional research to support these efforts. The published report on how to improve Cross Sector Sharing of data was also published in 2019 and shared with governments, insurance sector and municipal utilities across Canada.

The six recommendations prioritized for further analysis from this CWN/IBC report are as follows:

Priority	Recommendation
1	The creation of a framework that better recognizes and credits the work done by municipalities to reduce flood risks.
2	Providing Open Access to high-resolution topographical data across Canada.
3	Improved understanding of what information is available to share and where to access
4	Development of a committee of cross-sector representatives to evaluate next steps on data access and/or sharing strategies
5	Development of data standards to support sharing of data across sectors
6	Development of third party data broker via an independent organization with government oversight to coordinate and house relevant data to support flood risk evaluation.

The following figure from this analysis shows the impact of recommendation to improve the accuracy of the topographical maps available from the Federal Government. The study assessed the impact of a 2, 5 and 10 meter grid derived from LIDAR data vs the current 30 meter grid. Municipal data including the pipe network and elements such as dry ponds were also included (Defended vs Undefended in the figure below) for a sub region in the participating communities. The overall accuracy of the insurance flood risk maps was compared along with the computer processing time required to include this additional data. The 30 meter topographic grid results in additional properties being ranked as higher risk of flooding in the insurance catastrophic risk models which results in these properties having their policies assessed at a higher risk level. From this analysis it was determined that the largest benefit to improve accuracy would be the updating of the Federal topographical grid to a 5 meter grid from the current 30 meters grid, aligned with the grid accuracy available in the USA and UK.



Some figures from the detailed analysis completed showing impact of changing topography resolution on accuracy and model run times for Pluvial flooding risks https://cwn-rce.ca/project/improving-flood-risk-evaluation-through-cross-sector-sharing-of-richer-data/

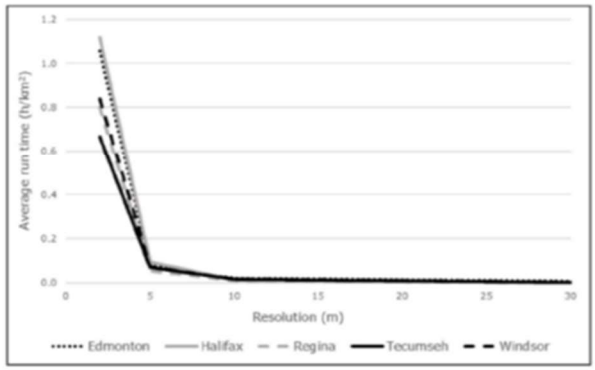


Figure 5. Average model run time per km² for each grid resolution (Adapted from JBA's report to CWN)

Provincial Government Disaster Relief Eligibility:

Another important aspect that municipalities and property owners need to be aware of relates to changing rules for disaster relief funding. This also impacts the highest risk locations and in Edmonton the River Valley neighbourhoods in particular, hence this as a priority item for EPCOR in the coming years to work with these communities.

In the last year, as anticipated, the Province of Alberta has updated the funding and eligibility criteria for properties that are impacted by a major flooding event due to this change in available insurance products. The insert below is from the Provincial website and explains the new criteria and the increased onus on the property owner to obtain appropriate insurance for their property. Of particular note is the introduction of a cost sharing formula for disaster relief funding, a maximum funding cap and a one-time eligibility for any property to apply for the disaster relief funding.

Province of Alberta – Updated Disaster Assistance Recovery Support Policy
https://www.alberta.ca/disaster-assistance-and-recovery-support.aspx

Overview
Recovering from a disaster is difficult. The Government of Alberta makes it easier by providing financial assistance for insurable loss and damage arising from emergencies and disasters through a conditional grant program.

Disaster financial assistance may be accessed after a municipality applies and is approved for a Disaster Recovery Program on behalf of their residents. Once a program is created, residents and other applicants may then apply for financial assistance. A state of local emergency does not have to be declared in order to receive financial assistance under a Disaster Recovery Program.

Changes to the Disaster Recovery Program
The cost and frequency of disasters in Alberta is increasing, and our province needs a strong framework in place for dealing with the growing financial risks. That is why we have made changes to the Disaster Recovery Program (DRP).

Prior to these changes, Alberta was the only province that did not share the financial risk and liability of disaster expenses through cost-sharing mechanisms, thresholds, residential funding limits, or restrictions to assistance in floodways, as part of its disaster assistance program.
These changes will encourage Albertans to mitigate disaster risks by:

- purchasing appropriate insurance
- reducing property development in high-risk areas
- relocating to less disaster prone areas
- mitigating their properties

Cost-sharing

We have implemented a 90:10 cost-sharing arrangement with local governments and private-sector applicants, which include homeowners, residential tenants, small business owners, landlords, agriculture operations, condominium associations and not-for-profit organizations and cooperatives.

This arrangement means we provide assistance for 90% of eligible disaster costs and the impacted community and private-sector applicants are responsible for the remaining 10% of their respective costs.

Homeowner-funding limits
We have implemented a $500,000 funding cap per homeowner application, and a one-time limit on disaster financial assistance per property. These changes take effect for all 2021 disaster events and are not retroactive to years prior to 2021.

If a property has received disaster financial assistance under a Disaster Recovery Program in 2021 and beyond, that property will not be eligible for subsequent DRP assistance in the future.

Assistance from the program will not be available to future applicants who own property at the same physical location.

These limits do not follow a homeowner if they sell the property as the one-time funding limit only applies to the property address.

Homeowner addresses that received assistance under a DRP in 2021 and beyond will be posted online to provide up-to-date information about program funding limits for prospective homeowners, developers, and real estate professionals.

Closing Comments \ Recommendations:

EPCOR will continue to implement the SIRP SECURE strategy as described in this report and continue to collaborate with the insurance sector to improve the awareness and recognition of the flood mitigation efforts in the community.

It is anticipated that as part of the PBR renewal application in 2024 additional recommendations will be made on further customer support programs, including subsidies that can be considered to further encourage home owners to flood proof their properties and reduce their impact to the inflow and infiltration reaching the sanitary sewer network.

EPCOR is also representing the City of Edmonton on the EMRB Stormwater Collaborative and as part of the development of the working plan for this collaborative is sharing the SIRP methodologies to increase flood resiliency in the broader community.

Although there continues to be a lack of a clear path for recognition of the flood mitigation efforts at the community scale by the insurance sector, this is felt to be more of an issue related to timing and the newness of the overland insurance products in the marketplace. EPCOR by continuing to engage in the national discussions will be able to adapt our programs in a timely manner and continue to coordinate with City Planning and Emergency Response teams to adjust to the changing expectations of the community.

Appendix 1 - EPCOR Backwater Valve Subsidy Program – Post Inspection Feedback Survey among properties that did not follow up to claim available subsidy

Appendix 2 – University of Waterloo - Intact Center on Climate Adaptation – Estimated Cost Ranges for Completing Residential Flood Protection Projects - 2019

https://www.intactcentreclimateadaptation.ca/wp-content/uploads/2019/03/Cost-Range-for-Flood-Risk-Reduction-Projects_final_March-14-2019.pdf

Appendix 3 – Insurance Bureau of Canada (IBC) Options for Managing Flood Costs of Canada's Highest Risk Residential Properties – June 2019

http://assets.ibc.ca/Documents/Studies/IBC-Flood-Options-Paper-EN.pdf

EPCOR PROVIDING MORE

EPCOR Backwater Valve Subsidy Program

Post-approval feedback survey among program non-completers.
November 2020

Stone Olafson

Contents

Research Purpose & Approach

As part of EPCOR's Stormwater Integrated Resource Plan, EPCOR proposed a Backwater Valve program to help protect homes in high-risk flood locations. The program was approved, after which EPCOR advertised the program and attracted 1,084 customers to apply for inspection. Of those, 90% were eligible for the program. The first year saw 39% follow through with installation of the Backwater Valves and the subsidy application, and 51% had done so by the end of 2019. While these are positive participation numbers for a program that does not cover full-costs, there is concern that not enough homes are being protected.

The EPCOR team would like to conduct consumer research to;

1. Gather feedback on the program and process overall;
2. Identify any barriers to participation (particularly with those who do not participate when they have already completed the inspection and been approved); and,
3. Quantify any issues to understand how that might extrapolate to the greater community they are trying to reach.

The target sample for this survey is **residents in the program target communities that have applied for the inspection, been approved, but have not followed through with installation/subsidy.** EPCOR identified a total of totaled 330 residents in their database. EPCOR emailed a unique survey link to this group to participate in a brief, 8 minute online survey.

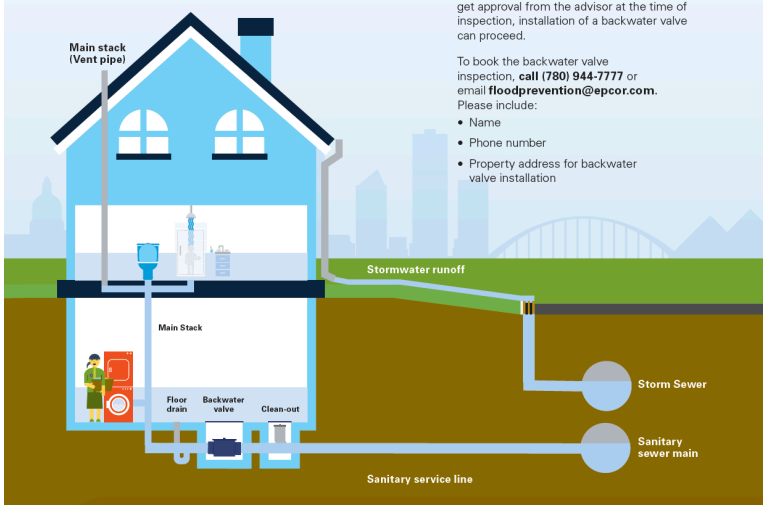
The survey was in field from October 30 through November 9, 2020.

A $5 Tim Horton's e-gift card was offered as an incentive. A total of 113 valid surveys were completed.

EPCOR Backwater Valve Subsidy Program (Website Information)

It is important that you take steps to protect your home from flooding.

Property owners whose home was built prior to 1989 should consider installing a backwater valve to protect them from a sewer line back-up. EPCOR offers financial assistance for homeowners installing a backwater valve. Our program targets homeowners who have had previous basement flooding from sanitary sewer back up and live in areas of Edmonton with previous neighbourhood flooding.



To be eligible for the program you must:

- Not have an existing backwater valve in your home
- Not have previously received a subsidy for the application address
- Have your home separately serviced (single family dwelling or duplex)

Application process

1. **Get pre-approved**
   Before installing your backwater valve, our **Flood Prevention Advisors must complete a backwater valve inspection**. Once you get approval from the advisor at the time of inspection, installation of a backwater valve can proceed.

   To book the backwater valve inspection, **call (780) 944-7777** or email **floodprevention@epcor.com**. Please include:
   - Name
   - Phone number
   - Property address for backwater valve installation

2. **Install the backwater valve within 6 months of our inspection**
   A professional contractor must install the backwater valve. Only the following valves will be subsidized:
   - Fullport Backwater Valve
   - FR-4 Fullport Retro Backwater Valve
   - Adapt-a-Valve

3. **Submit the application within 6 months of our inspection**
   You must submit the application within 6 months of the inspection or the installation will no longer qualify for the subsidy. The application must include:
   - Proof of professional installation with an invoice that notes the model of valve installed
   - Copy of the City of Edmonton acceptable green sticker with permit number

Subsidy conditions

- The subsidy, up to $800, will be paid by cheque made payable to the applicant.
- **Subsidies are subject to available funding and are provided on a first-come, first-served basis.** There are no guarantees to receive a subsidy.

EPCOR

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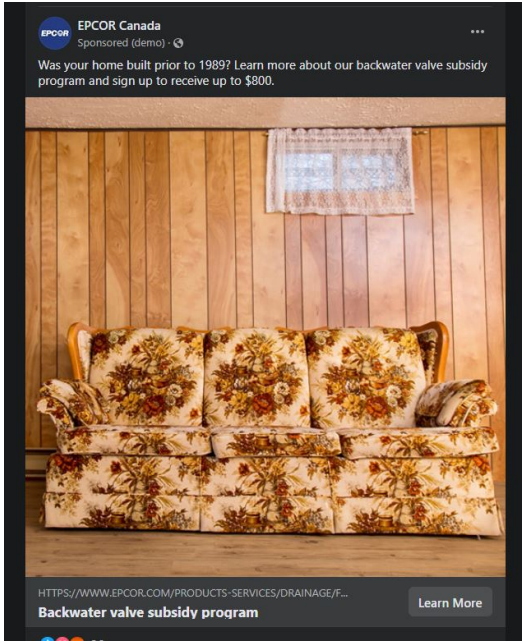
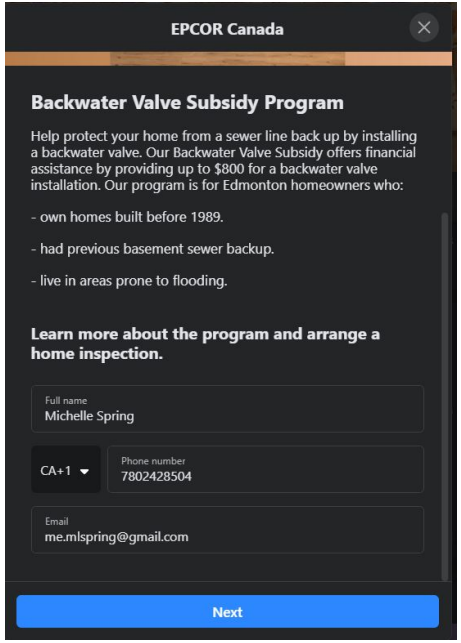
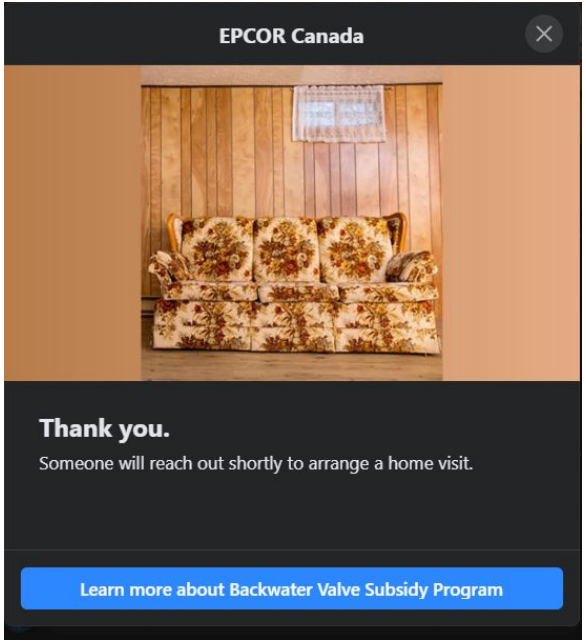
BACKWATER VALVE SUBSIDY PROGRAM

Social Media Advertising







The Story on One Page

(Executive Summary)

Overall, the EPCOR Backwater Valve Subsidy program was rated well by participants (60% gave a rating of 8,9, or 10 out of 10). This is particularly positive if you consider most participants in this survey did not in fact receive the subsidy.

Of those who had an inspection, 20% followed through with installation but did not apply. Reasons for not applying included inconsistencies in paperwork, not having enough time, or having other demands get in the way.

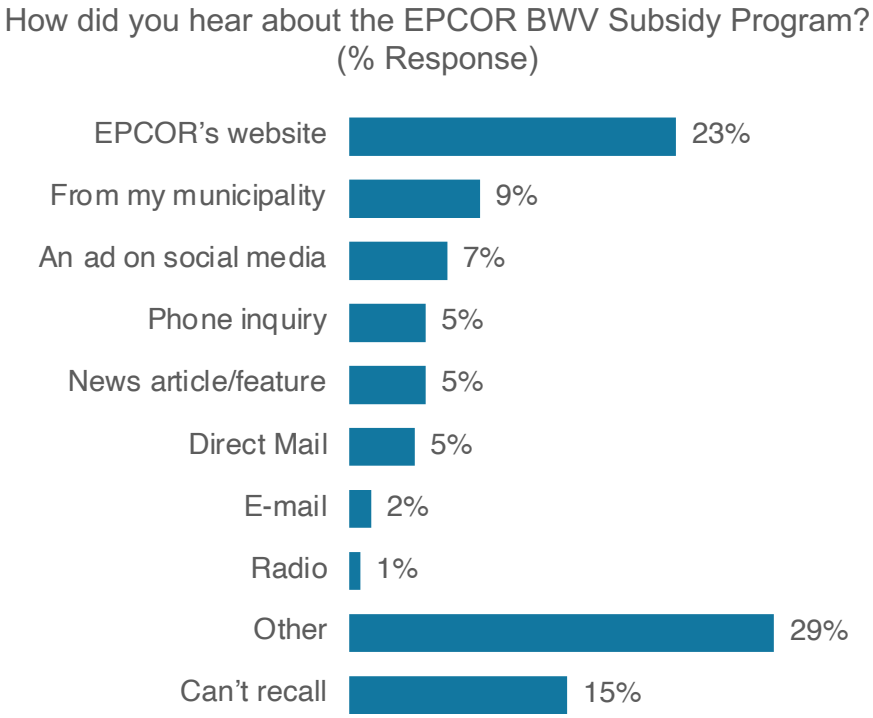
When asked about program specifics**, residents could recall the *requirements* and *subsidy* most often** (though less than ten could recall the subsidy amount). **Less remembered facts about the program were the reasons for eligibility** (i.e. they live in a high-risk community). Only 13% believe their home is at serious risk.

In terms of **program improvements; a higher level of compensation, more time for completion, and stronger coordination with contractors were the strongest suggestions**. The average cost of installation was $2,840, and additional work required averaged $1,320 (noting that not all respondents could recall). Cost vs. benefit is seen as a significant barrier. In addition, several mentioned that the contractor who provided the inspection suggested there was little to no benefit to proceeding (a variety of reasons given including an inappropriate grade or other hinderances).

Recommendations moving forward are provided on slide 19.

DETAILED RESULTS

The majority of respondents indicated they learned about the EPCOR BWV subsidy program through the website.

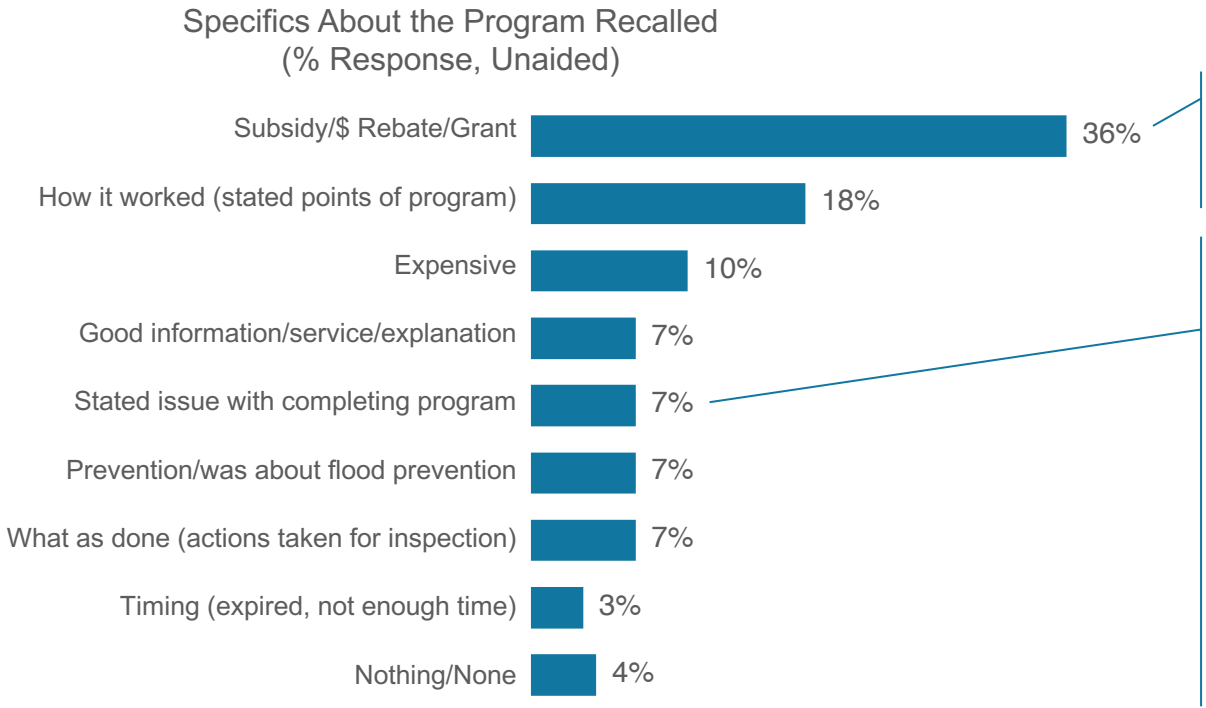


Q1 - To the best of your memory, how did you hear about the EPCOR Backwater Valve subsidy program? (n=113)

The website was the most effective direct source of information about the program, followed by the City of Edmonton and Social Media. Based on feedback in other questions, 'other' sources of information includes local plumbers and contractors (some directly suggesting the EPCOR BWV subsidy program if they were on site for other work, though some also indicated the program on their own website or social channels).

On an unprompted basis, the *subsidy* itself was the most recalled element about the program, followed by key requirements about how it works

(i.e. inspection required, subsidy provided following installation)



5 indicated $800-$850, 3 indicated $750, Two indicated $1,000. The remainder did not indicate dollar amount.

Examples of issues:

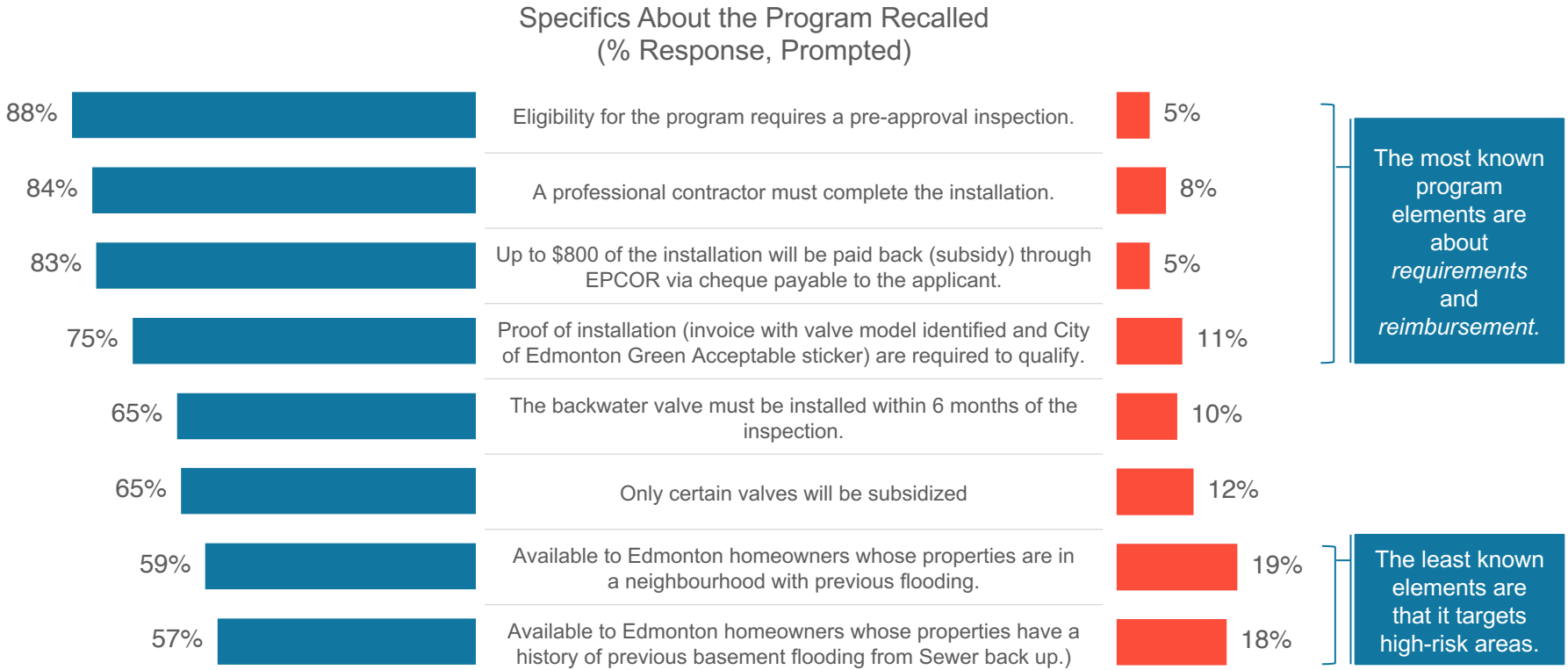
"I recall being approved but not knowing how to find a qualified Contractor."

"They came to do an inspection and approved the backwater valve. But were unable to ascertain if I already had a backwater valve. So I did not know where to go from there?? I want to get one installed if I do not have one."

"That I was not eligible because the amount from the person that installed was summed up with some other items that the installer completed. "

Q2 - What specific points about the EPCOR Backwater Valve Subsidy Program do you recall? (n=113)

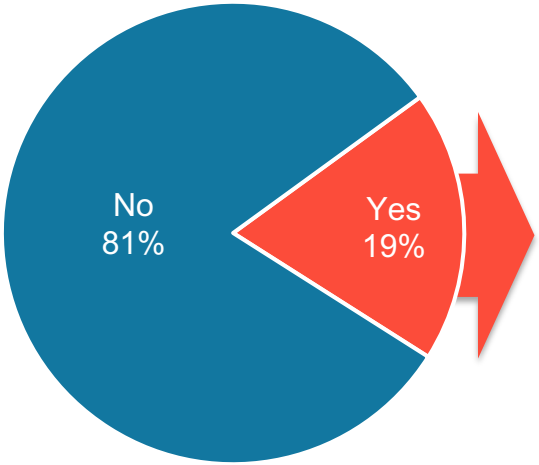
When prompted, more than half of respondents could recall nearly all elements of the EPCOR BWV subsidy program.



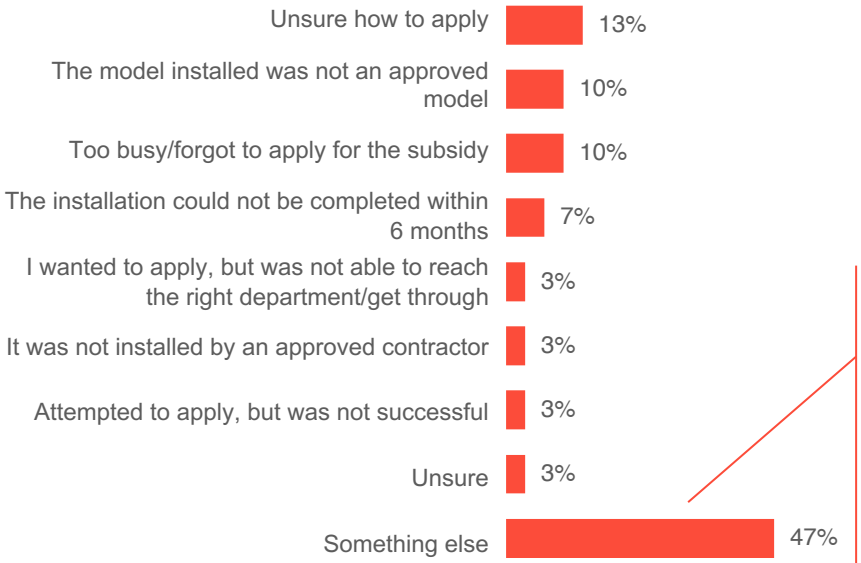
Q5 - Getting a little more detailed, which of the following specific aspects of the EPCOR Backwater Valve Subsidy Program are you aware of? (n=113)

Of those who were approved but did not apply for the subsidy, 19% did in fact have a BWV installed. Time and paperwork are the main reasons for not applying.

Installed a backwater valve following inspection:



Why did you not apply for the EPCOR BWV Subsidy after installing?

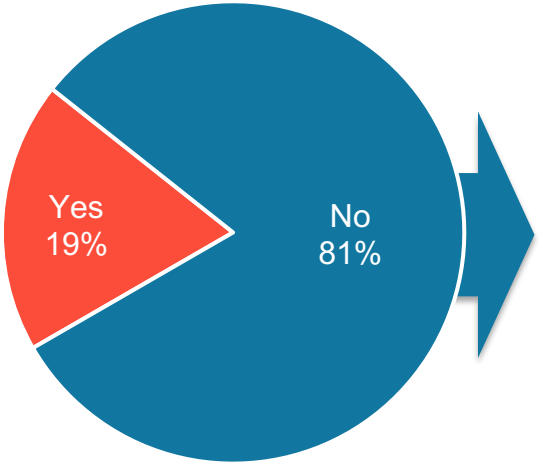


- Forgot/ran out of time/other demands
- Challenges with installer/receipt/other
- Not sure how to apply
- Applied for under another name/recently applied
- Missed deadline (length of time to get work done didn't allow)

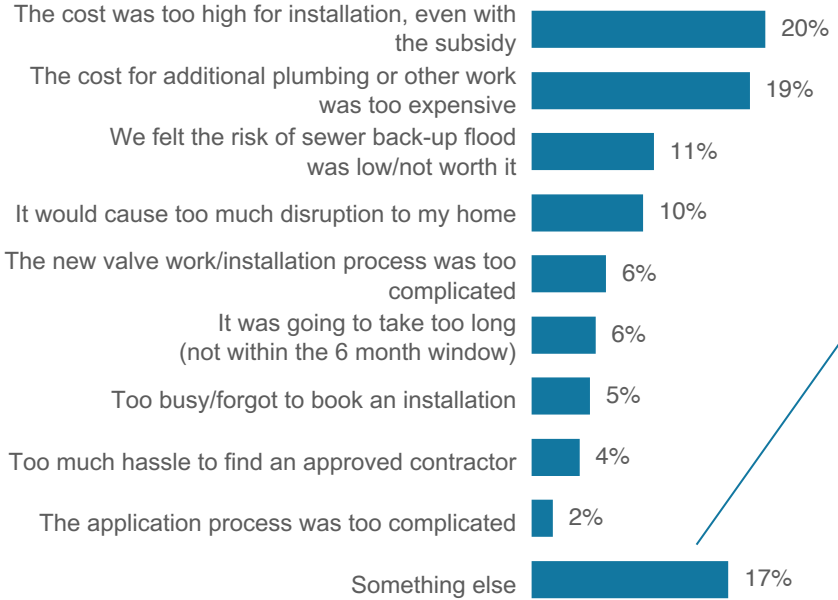
Q6 - As mentioned, our records indicate that your home had an inspection completed and was deemed eligible for the Backwater Valve Subsidy Program, however, the application to receive the subsidy was never made. Did you have a backwater valve installed in your home? (n=113)
Q7 - What is your reason for not applying for the EPCOR Backwater Valve Subsidy after the backwater valve was installed? (n=22)

Of those who were approved but did not install a BWV, cost and feeling the risk was relatively low were the main reasons for not following through.

Installed a backwater valve following inspection?



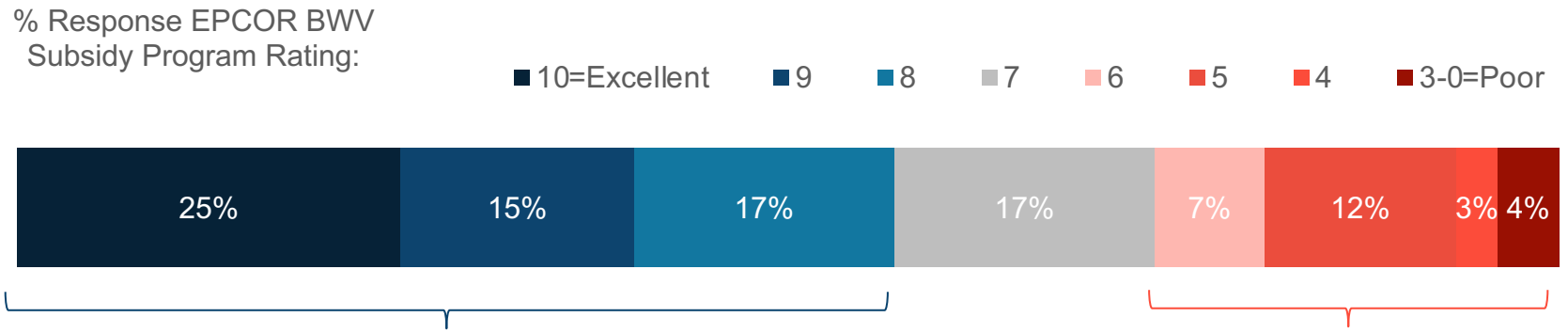
Why did you not install a BWV after the inspection and finding you are eligible?



- 8 I was told there was no/ little benefit by contractor
- 6 Cost/financial reasons
- 6 I was told it was not possible/feasible (grading issues, obstructions etc.)
- 5 Too complicated to do other work required
- 4 I needed more time/timing
- 4 Unsure of next steps
- 2 Covid

Q6 - As mentioned, our records indicate that your home had an inspection completed and was deemed eligible for the Backwater Valve Subsidy. Program, however, the application to receive the subsidy was never made. Did you have a backwater valve installed in your home? (n=91)
Q8 - What is your reason for not installing a backwater valve in your home after the inspection? Please choose all that apply.

The majority of respondents (just under 60%) rated the EPCOR BWV Subsidy program favourably



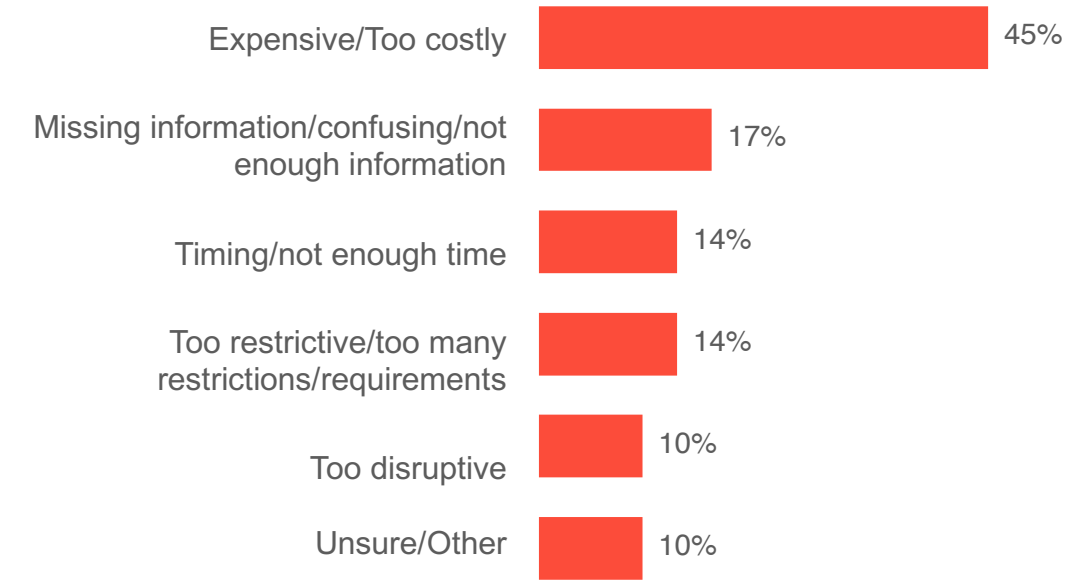
57%
Top 3 Box
(% Total 8,9,10 out of 10)

26%
6 or Lower

Q3 - Overall, how would you rate the EPCOR Backwater Valve Subsidy Program being offered to homeowners? (n=113)

Those who did not rate the EPCOR BWV Subsidy program favourably did so due to the high cost of having the work completed (unaided).

% Response Reason for Rating EPCOR BWV Subsidy Program Six or lower

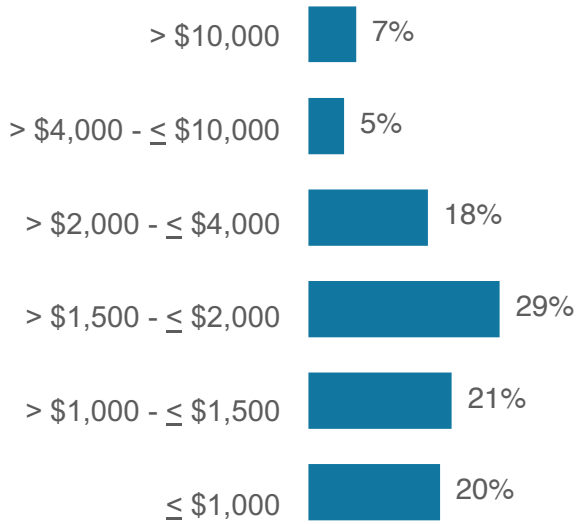


Q4 - What are your reasons for rating the EPCOR Backwater Valve Subsidy Program [6 or lower]?

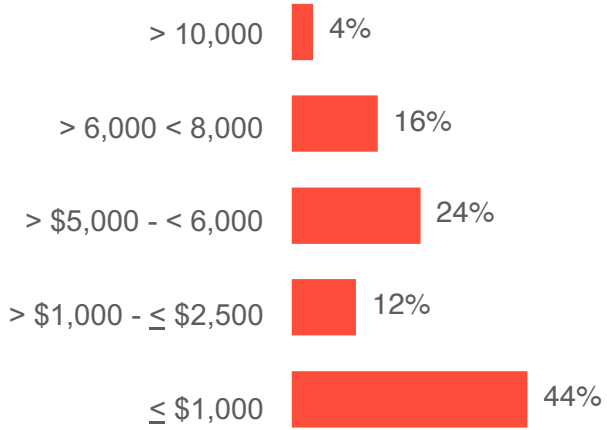
The reported cost of installing a BWV varied widely, though most common range was $1,500 - $2,000.

Stone — Olafson

Mean Cost Estimate BWV Installation: **$2,840**
(n=56 estimates provided)

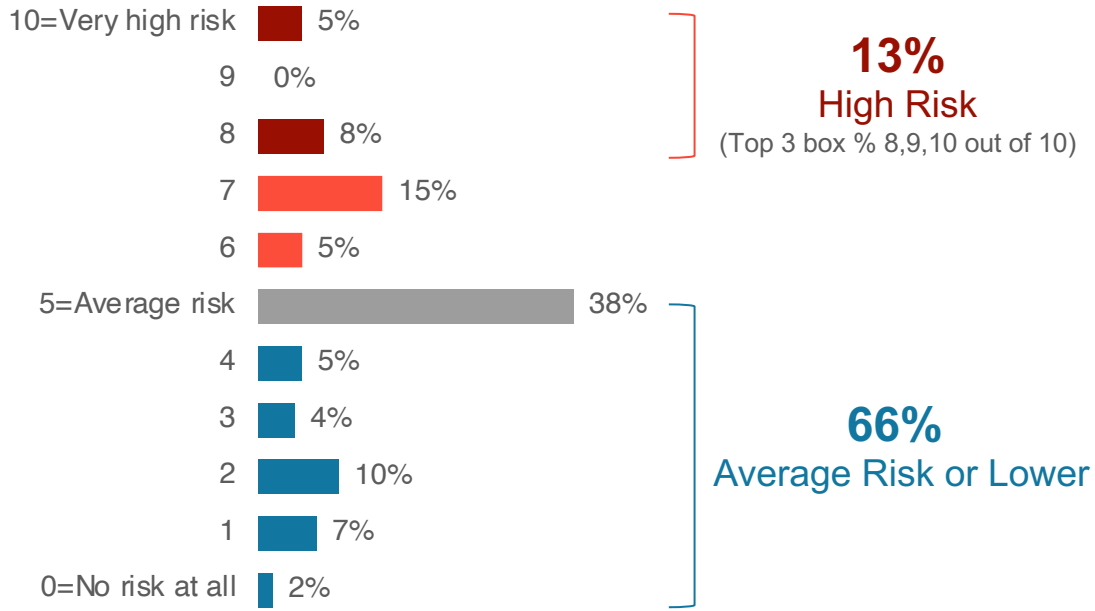


Mean Cost Estimate of Additional Requirements: **$1,320**
(n=26 estimates provided)



Q9 - If you don't mind sharing, what was the approximate total cost to have an approved backwater valve installed in your home? Note that could include not only the cost of installing the backwater valve, but other costs as well (e.g. home repairs etc.). Please input an answer in dollars only (do not enter a dollar sign), to the best of your memory. If you would prefer to not answer, or can't remember, simply leave the field blank.

Even though the program targeted homes and communities with a history or high risk of flooding/sewer backup, few respondents feel the risk is significant.

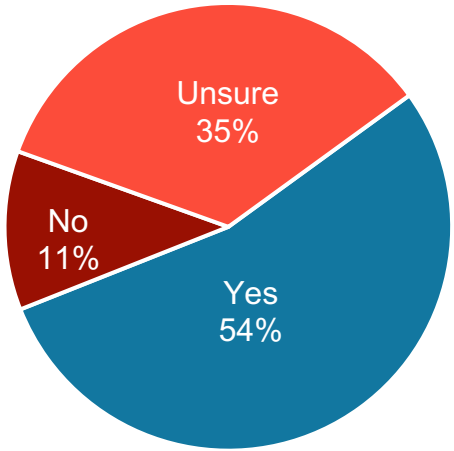


Note that because all of the participants had a home inspection, a number indicated they were told through the process that their risk was either low, or that the BWV would not materially reduce their risk. This may be a contributing reason for the perception of sewer backup and flood risk being low.

Q10 - Overall, how significant do you feel the risk of a sewer back-up/basement flood is in your home? (n=113)

Approximately half of respondents indicate they have home insurance in the event of sewer back-up.

Is your home covered for sewer backup by your private insurance plan?

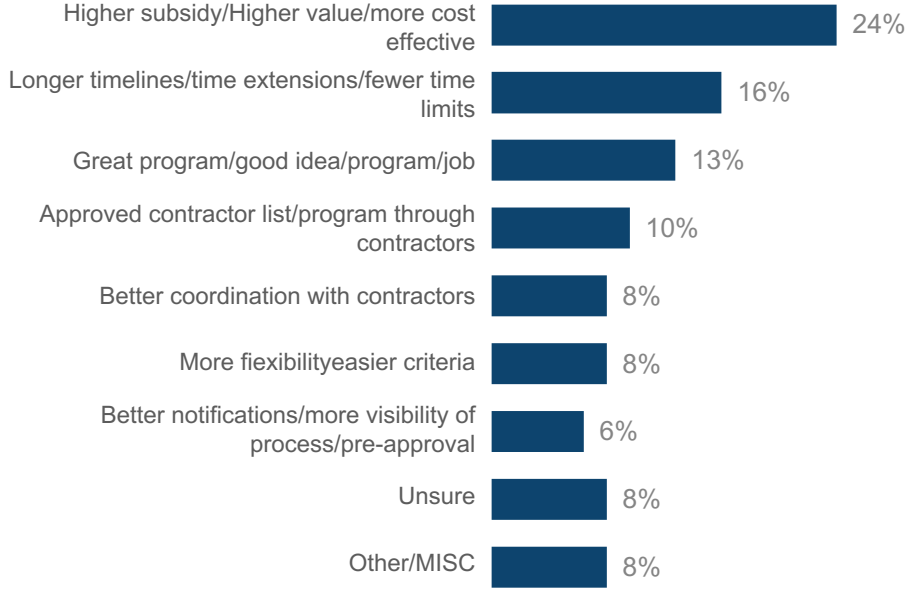


Q11 To the best of your knowledge, is your home covered for sewer backup by your private insurance plan? (n=113)

Edmonton's flood risk study from 2016 identifies community risk, and the overall increasing vulnerability due to both climate change and the time required for infrastructure renewal. What is not identified but has come up in interviews with Edmontonians, is the changing risk-tolerance strategies of insurance companies. The need to absorb both 2014 and 2019 floods have changed rate structures as well as coverage. This should continue to be monitored as sewer back-up and flood risk coverage may change community concerns.

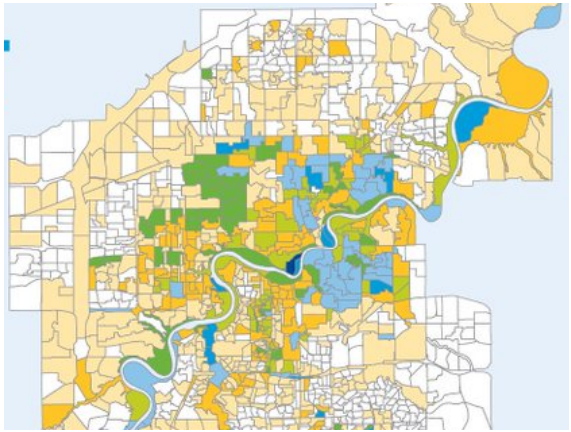
Overall, participants are positive about the program. Suggestions for improvement focus on higher subsidy level, more time to plan and implement, and list of approved/knowledgeable contractors.

Program suggestions going forward % Response, Unaided



Q12 - Is there anything you would like to recommend to improve the EPCOR Backwater Valve Subsidy Program to make it easier to participate? Base: n=63

Implications & Recommendations



Overall this type of program is well received, particularly if you consider that the majority of respondents rated the program well even though they did not complete it themselves and receive a subsidy. Having said that, the goal is broader home-protection and uptake, which is still felt to be too low. This being the case, we recommend the following based on survey results.

1. **The risk is not as well know as it should be, and messages are inconsistent. This type of program should be positioned alongside information about flood risks and plans,** and more emphasis on why *these specific communities* are being offered the program (they are in fact high-risk). EPCOR should also dove-tail anytime flood-prevention, flood issue, or city planning news is released as well as direct target community associations to help shore-up perceptions of relevance.
2. **Extend program time - More time is needed for this type of engagement**. Consider keeping the program open and having reminders/touch-points along the way. It can take up to two years before participants feel prepared financially and/or logistically to move forward.. Aside from cost, timing and length of time was the biggest barrier. Even financially, more time to plan may be helpful.
3. **More direct partnership and communication with Contractors.** There were a few respondents who wanted maximum flexibility (e.g. the option to install themselves with a follow up inspection), however, **the vast majority wanted steps even more streamlined**. E.g. have a set list of contractors that are approved, understand the program, can submit paperwork for the subsidy either on behalf of their client OR be subsidized for doing the work themselves. In this way, there may also be some reduction in conflicting information coming from contractors (several indicated their contractor told them the BWV option had little to no benefit).
4. **If possible, help with a little more financial support**. The mean budgets provided for doing the work was just under $3,000. The greatest barrier indicated was overall cost.
5. **Understand where insurance companies are going so residents know the risks;** in the future, the cost of installation may help offset higher insurance coverage costs and/or prevent direct costs if back-up and flood are no longer covered.

For more information, please contact:

Kristine@stone-olafson.com

Stone – Olafson

Estimated Cost Ranges for Completing Residential Flood Protection Projects

Introduction to the Home Flood Protection Program

The Home Flood Protection Program is an educational service designed to help homeowners reduce their risk of basement flooding and minimize damage if flooding occurs. The program is developed by the Intact Centre on Climate Adaptation (ICCA) at the University of Waterloo.

Introduction to the Estimated Cost Ranges for Residential Flood Protection Projects

This list has been developed to give homeowners an idea of what it might cost to complete a do-it-yourself (DIY) flood protection project or to pay a qualified professional to complete a project for you. Estimated life expectancies have been provided for select projects. A note has also been made about whether or not the listed projects commonly qualify for government subsidies or insurance discounts. Check with your local authority having jurisdiction (e.g. municipality) and insurance provider to confirm qualification.

Cost Categories

Cost range categories to complete a project have been set as follows:
Low- $0-$1000
Medium- $1,000- $5,000
High- Over $5,000

Best practices for Hiring Contractors

For more information about best practices for hiring a contractor, please see this resource created by the Province of Ontario. Your Rights when starting Home Renovations and Repairs

Faculty of Environment, University of Waterloo
200 University Avenue West, Waterloo, ON N2L 3G1
www.homefloodprotect.ca

What to Consider Before You Get Started

- ✓ Check for local government subsidies and insurance discounts that can help cover the cost of your project.
- ✓ Check your local by-laws to make sure that your project meets local requirements.
- ✓ Secure required permissions and permits before you begin.
- ✓ Call before you dig to ensure your safety and the protection of local utility services. Call Before You Dig

Help us improve the Resource List

We welcome your input! If there is a business that you would like to see added, please share it with us. Please direct all requests to Intact.Centre@uwaterloo.ca.

Please note: The Intact Centre on Climate Adaptation is providing this list for the convenience of interested homeowners only. The Intact Centre on Climate Adaptation is in no way providing advice or quotations for projects of any kind.

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Outside the Home

Low- $0-$1,000 Medium $1,000-$5,000 High Over $5,000

Eaves Troughs and Downspouts

Description	Cost Category	Estimated Cost Range	Potential Government Subsidy	Potential Insurance Discount
Clean out eaves troughs	Low	$250-$400	N	N
Install eaves troughs and downspouts	Medium-High	$6-$10 per linear foot	N	N
Install soffits and fascia	Medium-High	$10-$15 per linear foot	N	N
Extend downspouts	Low	$25-$50 per downspout	N	Y
Disconnect downspouts and capping weeper pipes	Low	$100-$250 per downspout	Y	Y

Foundation and Walls

Description	Cost Category	Estimated Cost Range	Potential Government Subsidy	Potential Insurance Discount
Insert expanding polyurethane into cracks less than 1/4"	Low	$50-$100	N	N
Urethane injection of poured foundation cracks over 1/4"	Low-Medium	$400-$800	N	N
Excavate and repair foundation crack over 1/4"	Medium-High	$1,000-$2,000	N	N

Exterior damp proof of foundation	Medium-High	$150-$300 per linear foot	N	N
Exterior damp proof of foundation and installation of foundation drainage	High	Minimum $5,000	N	N
Repointing soft mortar	Low-Medium	Minimum $500, $4-$7 per square foot	N	N
Repointing hard mortar	Low-Medium	Minimum $500, $5-$10 per square foot	N	N
Replace deteriorating brick	Low-High	Minimum $500, $25-$50 per linear foot	N	N

Landscaping

Description	Cost Category	Estimated Cost Range	Potential Government Subsidy	Potential Insurance Discount
Install a rain garden	Low-Medium	$500-$2500	Y	N
Install rain barrel	Low	Up to $500	Y	N
Install a cistern	Low-Medium	$500-$4500	Y	N
Install infiltration gallery	Low-Medium	$500-2500	Y	N
Build wooden retaining wall	Medium-High	(min $1500) $30-$50 per square foot	N	N
Build concrete retaining wall	High	(min $5000) $40-$70 per square foot	N	N

Major regrading of lawn or garden beds around foundation walls	High	$5,000+	N	N

Driveways, Walkways and Patios

Description	Cost Category	Estimated Cost Range and Life Expectancies	Potential Government Subsidy	Potential Insurance Discount
Seal asphalt driveway	Low	$.30 per square foot (1-3 year life expectancy)	N	N
Resurface existing asphalt driveway	Medium-High	$3- $5 per square foot (10-20 year life expectancy)	N	N
Install interlocking brick	Medium-High	$8-$16 per square foot (15year+ life expectancy)	N	N
Install permeable paving	Medium-High	$10-20 per square foot	N	N
Install concrete driveway, no pattern	High	$12-$20 per square foot (30year+ life expectancy)	N	N
Install concrete slab patio	Medium-High	$15-$25 per sq. ft. (30- 40 year life expectancy)	N	N
Install concrete patio stones on a correctly prepared subgrade	Medium-High	$5-$7 per square foot (30-40 year life expectancy)	N	N
Install permeable paving walkways and patios	Low-Medium	$6-$8 per square foot (20-30 year life expectancy)	Y	N

Doors and Stairwells

Description	Cost Category	Estimated Cost Range	Potential Government Subsidy	Potential Insurance Discount
Replace caulking and weather stripping around doors	Low	$50-$250 per door	N	N
Install exterior door	Low-Medium	$750-$3,000	N	N
Install exterior basement stairwell	High	$10,000 and up	N	N
Install garage door	Low-Medium	$500-$2,500 per door	N	N

Exterior Drains

Description	Cost Category	Estimated Cost Range	Potential Government Subsidy	Potential Insurance Discount
Closed circuit television (CCTV) camera scoping of drain lines	Low	$250-$500	N	N
Clear blockage in drains	Low	$250-$500	N	N
Install drain at existing basement walkout stairwell	Low-Medium High	$750-$1,500 (new construction) $5,000+ for retrofit	N	N
Install drain at bottom of sloped driveway	High	$5,000+	N	N

Windows and Window Wells

Description	Cost Category	Estimated Cost Range	Potential Government Subsidy	Potential Insurance Discount
Replace caulking around windows	Low	$250-$500	N	N
Replace windows	Medium-High	$600-$1000 per window	N	N
Install window well covers	Low	$25-$50 per window	N	N
Install window wells	Low-Medium	$900- $1,500 per window	N	N

Plumbing Fixtures

Description	Cost Category	Estimated Cost Range	Potential Government Subsidy	Potential Insurance Discount
Install or repair outdoor faucet	Low	$250- $500	N	N
Flood alarms on fixtures such as water softener	Low	$25-$150	N	Y

Inside the Home

Low- $0-$1,000 Medium $1,000-$5,000 High Over $5,000

Storm and Sewer Laterals

Description	Cost Category	Estimated Cost Range	Potential Government Subsidy	Potential Insurance Discount
Closed circuit camera inspection of sewer latera	Low	$250-$500	N	N
Install interior sewer lateral cleanout	Low	$500	N	N
Snake out obstruction in sewer line	Low	$250-$500	N	N
Repair collapsed or damaged section of sewer line below yard	Medium-High	$3,000+	N	N

Floor Drains

Description	Cost Category	Estimated Cost Range	Potential Government Subsidy	Potential Insurance Discount
Snake out obstruction in sewer line below house	Low	$250-$500	N	N

Repair collapsed or damaged section of sewer line below house	Medium	$1,000-$2500	N	Y

Backwater Valves

Description	Cost Category	Estimated Cost Range	Potential Government Subsidy	Potential Insurance Discount
Install backwater valve	Medium	$750- $1250	Y	Y
Clean out backwater valve	Low	$0 DIY-$100	N	Y
Install alarm	Low	$75-$150	N	Y
Seasonal maintenance check by plumber	Low	$100-$250	N	Y

Foundation Drains (Weepers)

Description	Cost Category	Estimated Cost Range	Potential Government Subsidy	Potential Insurance Discount
Closed circuit camera inspection of foundation drains	Low	$250-$500	N	N

Sump Pits and Pumps

Description	Cost Category	Estimated Cost Range and Life Expectancies	Potential Government Subsidy	Potential Insurance Discount
Replace Sump Pump	Low	$350-$700 (2-7 year life expectancy)	Y	Y
Install submersible pump and well	Medium	$1,500+	Y	Y
Install backup battery	Low-Medium	$500 - $1,500	Y	Y
Install backup generator	High	$5,000+	N	Y
Install alarm	Low	$75-$150	Y	Y
Seasonal maintenance check by plumber	Low	$100-$250	N	Y

Exposed Foundation Walls and Floors

Description	Cost Category	Estimated Cost Range	Potential Government Subsidy	Potential Insurance Discount
Install interior damp proofing	Low-Medium	$100-$150 per linear foot	N	N
Damp-proof foundation and install perimeter drainage tiles	Medium-High	$2,500+	N	N

Urethane injection of cracks greater than 1/4" in poured concrete	Low-Medium	$400-$800 each	N	N
Injection repair of tie rod hole	Low-Medium	$250-$500	N	N

Finished Walls and Floors

Description	Cost Category	Estimated Cost Range	Potential Government Subsidy	Potential Insurance Discount
Insulate basement	Low-Medium	$1 and up per square foot	N	N

Plumbing

Description	Cost Category	Estimated Cost Range	Potential Government Subsidy	Potential Insurance Discount
Install new main shut off valve	Low	$150-$300	N	N
Seasonal maintenance check by plumber	Low	$100-$250	N	Y

Limiting Indoor Humidity

Description	Cost Category	Estimated Cost Range and Life Expectancies	Potential Government Subsidy	Potential Insurance Discount
Install bathroom exhaust fan	Low-Medium	$500-$1,200 (10-15 year life expectancy)	N	N
Install dehumidifier	Low	$150-$300 D-I-Y	N	N

Electrical

Description	Cost Category	Estimated Cost Range	Potential Government Subsidy	Potential Insurance Discount
Install new breaker panel	Low-Medium	$1,000-$2,000	N	N

Information Adapted from Carson Dunlop Home Reference Book, 2013; Jeff Thompson, Thompson Environmental, 2017; Ron Bolender, The House Doctor, 2018

IBC BAC | Insurance Bureau of Canada
Bureau d'assurance du Canada

Options for Managing Flood Costs of Canada's Highest Risk Residential Properties

A Report of the National Working Group on Financial Risk of Flooding

June 2019

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Executive Summary

Every year, thousands of Canadians experience financial losses due to severe weather. The losses to insurers and their policyholders and losses to governments and, by extension, taxpayers are escalating. Wildfires, floods, hailstorms and windstorms are occurring with greater frequency and intensity. Scientific evidence published by the Intergovernmental Panel on Climate Change and in the U.S. National Climate Assessment is now showing that the escalation in severe weather around the globe is attributable to climate change and that these loss trends will only worsen in the future. In Canada, as is the case in many nations, flooding is the threat where we are facing the greatest cumulative losses and the threat for which we are least prepared.

Recognizing this emerging trend, the Honourable Ralph Goodale, Minister of Public Safety Canada, the Honourable Larry Doke, Saskatchewan Minister of Government Relations (being responsible for Emergency Management) and Heather Bear, Vice-Chief of the Assembly of First Nations convened a National Roundtable on Flood Risk in Regina in November 2017. As recommended by that National Roundtable, an Advisory Council on Flooding was created in early 2018 with the purpose of advancing the national agenda on flood risk management. An early deliverable of the Advisory Council was the creation of a public-private sector Working Group on the Financial Management of Flood Risk, co-chaired by Public Safety Canada[1] and the Insurance Bureau of Canada (IBC). In May 2018, Federal/Provincial/Territorial Ministers of Emergency Management asked this Working Group to refine options for managing the financial costs of high-risk residential properties while drawing upon international models, such as Flood Re in the United Kingdom. IBC has been asked to report on these options, developed through Working Group consultations, to Public Safety Canada, through the Advisory Council on Flooding. This paper is the resulting product, and was authored by IBC with input from members of the Working Group.

This paper considers the views of both the private and the public spheres of society, and focusses primarily on measures to transfer residential property risk from public sector disaster financial assistance programs, which are funded by the taxpayer, to private sector insurance solutions, which are primarily funded by the property owner. The paper's goal is to present some of the existing options to address the financial management of flood in high-risk zones based on a suite of commonly agreed principles. These principles were first identified at the National Roundtable and have evolved through consultations with various stakeholders. Taken together, the principles are designed to incent community and individual resiliency while decreasing pressure on public finances.

[1] Public Safety primarily worked to facilitate the participation of various stakeholders, and to provide strategic linkages to the other Working Group under the Advisory Council on Flooding (the working Group on Flood Data and Mapping). The views expressed in this paper do not necessarily reflect the view of the federal government.

These principles are:

AFFORDABILITY:

An optimal approach should provide affordable protection for high-risk properties to ensure maximum participation (Appendix II).

INCLUSIVITY:

An optimal approach should provide an insurance solution to all primary-residence property owners irrespective of the level and type of flood risk they face, e.g., pluvial, fluvial or coastal (Appendix III). Indigenous residences, which are often covered by commercial insurance, and other vulnerable communities require particular attention and possibly a concurrent program.

EFFICIENCY:

The price of insurance should reflect as much of the risk as possible, thereby incenting appropriate flood risk reductions among all stakeholders.

OPTIMAL COMPENSATION:

Insurance solutions should provide predictable and wholesome compensation to residential property owners and therefore diminish residential pressure on publicly funded disaster assistance programs.

SHIELD THE TAXPAYER:

An optimal approach should reduce reliance on ongoing taxpayer-funded subsidies by creating the conditions necessary for expansion of private market insurance coverage.

FINANCIALLY SUSTAINABLE:

An optimal approach should be financially self-sufficient where systemic losses are reduced over time.

Application of these principles involves trade-offs. For instance, the principles of efficiency and affordability can be in opposition. To receive the price signals required to incent prevention and mitigation actions, the homeowner should pay for the full risk that they bear. However, many homeowners, particularly those with low incomes, simply cannot afford the premiums that would be required to cover that full risk.

Consequently, premiums need to be capped, and the resultant residual risk needs to be subsidized from other sources. In any scenario, government investments in flood mitigation are essential to lower the homeowner's risk to an affordable level. Design of the three options listed in this paper involves addressing such trade-offs in varying ways.

Canada must increase its resiliency to residential flood risk to keep people safe and financially viable. The solutions presented below are intended to provide better outcomes for individual Canadians and are less about reducing pressure on public accounts. Currently, flooding is Canada's most costly natural peril and accounts for roughly three quarters of federal Disaster Financial Assistance (DFAA) payments. However residential losses account for only 5-15% of that total - a greater portion by far, perhaps as much as 70%, is spent on recovery of public infrastructure. Therefore, any risk-transferring solution for residential infrastructure will present modest cost-savings for public treasuries. (This paper focuses exclusively on residential property and not on larger public/critical infrastructure, which may require a different approach and should be the subject of further study.)

Regardless, considering the amplifying effects of climate change on future precipitation patterns and sea levels, governments must be concerned about Disaster Risk Reduction – lowering the public safety and personal financial risk of those Canadians living in high risk areas.

The desired end state for flood disaster risk reduction is a future where every Canadian is both physically and financially safe from flooding and where each individual is empowered to manage their own risk. This end state reflects an overall reduction in flood risk and will result from a whole-of-society approach to building resilience (Appendix VII).

A flood disaster risk reduction approach for Canada should fit within the broader Emergency Management Strategy and should take a 'whole of society' perspective. Such an approach should leverage significant stakeholder partnerships in infrastructure to reduce climate risk in the most exposed communities AND elevate risk awareness and incent de-risking efforts amongst all stakeholders. Within this context of lowered risk, insurers can introduce new products and employ premium structures that will further incent responsible behaviour.

To elaborate, this approach should have three prongs:

a **ELEVATE RISK AWARENESS/ENGAGEMENT:**

Elevate consumer and government awareness to incent active flood-risk reduction to ensure price signals are properly received and understood. This should include conveying risk-assessment information to all participants throughout all stages of the property development, transaction, financing and insurance processes.

b **IMPROVE RISK IDENTIFICATION:**

Improve and align public-facing risk maps that allow insurers as well as property owners and governments to collaborate on identifying, updating and managing risk. These maps must be evergreen in that they reflect continuous improvement of the underlying flood hazard modelling to reflect investments in flood defences.

c **AGGRESSIVELY MITIGATE RISK:**

Aggressively invest in reducing the number of Canadians who live in areas at high risk of flooding, through flood mitigation and strategic retreat from these high-risk areas (Appendix V). This will require bold political leadership that resists allowing people to rebuild in harm's way. Investments in flood mitigation should incorporate natural infrastructure wherever possible, given lower maintenance and increased auxiliary benefits of such approaches.

The options presented below will only be successful at addressing financial risk of flood if undertaken in context with the measures outlined above. Taken together they can provide a roadmap to the desired end state (Appendix VII) that reflects a nationally cohesive, yet regionally flexible approach to addressing flood risk. Given a 'whole of society approach', responsibility for delivering these measures lie with a range of actors from banks, mortgage insurers and realtors, to property and casualty insurers to municipal, provincial and federal government agencies to non-government organizations.

It was recognized by stakeholders that any of the options discussed below need to be considered as decades long, transitory measure to achieve the desired end state. The structure of any option should, as much as possible, incent all actors including governments, insurers and consumers, to reduce flood risk throughout the transition and reward behaviour for doing so.

A number of stakeholders collaborated to conduct significant international analyses (Appendix IV) and chose to focus on three potential options for Canada. A global survey of flood programs shows that approaches vary widely and that no country has a perfect solution to address high risk residential flooding. In Australia, flood insurance is risk based. Insurance premiums are based on the level of flood risk that a property will face, as well as the cost of rebuilding or repairing the property. In the United States, efforts to move the National Flood Insurance Program toward a risk-based funding model, while initially successful, were largely reversed by subsequent legislation. The program continues to have a significant debt, and is also hampered by the government's recent practice of providing only short-term funding for the program. In the Netherlands, the contingent liability for overland flood is endemic and, as a consequence, private insurance is basically unavailable (a large portion of the Dutch population is at high-risk of flooding). When residents get flooded, the government intervenes through a combination of different resilience-building measures that include physical assets retrofits (whenever possible), strategic retreats and property buyouts. In U.K., a high risk insurance solution, called Flood Re, provides insurance for all high risk properties in the country (Appendix VI).

After reviewing international experience, stakeholders focused on three main options to address the financial cost of managing high risk properties. These options can be considered along a spectrum of intervention/effort from a pure market option (low intervention) where high risk homeowners bear all their own risk to a government-backed option where these homeowners are partially subsidized by taxpayers to an structured insurance pool option (High intervention) where these homeowners can be fully protected. The differences along the spectrum relate to the level of programming effort available to assist homeowners.

Option I – Pure Market Solution: Risk borne by homeowners

In this option, the flooding of private residences is no longer covered by government DFA programs and homeowners can self-insure, purchase insurance from the private insurance market or relocate. There are no subsidies in place to provide perverse incentives and premiums are risk-based, which would mean that a significant portion of homeowners will be excluded from the insurance market. As governments invest in flood defence infrastructure and targeted buyouts of properties at high risk of repeated flooding, insurance becomes more available and affordable. To increase take-up rates, the government could consider introducing means-tested subsidies through taxation-based voucher programs or other mechanisms to ensure that vulnerable populations are not left behind.

Option I strongly meets the Working Group's key principles in two key areas, namely in efficiency and financial sustainability. Insurance premiums are fully transparent in that they reflect the true risk that a homeowner faces. As a result, accurate price signals should incent market behaviour – from pressure on community leaders to mitigate risk, to individual behaviour to enact property-level mitigation. In terms of optimal compensation, this scheme has the potential to provide superior indemnification for the insured, though it falls short for the uninsured and most vulnerable. Another possible strength of this program is its ability to encourage the development of the insurance market, provided that governments refrain from offering broad disaster assistance after an event, thus creating expectations of continuous bailouts in the future. (In some cases, some kinds of government-disaster assistance may still be appropriate post-event, though their frequency and eligibility should be restricted.)

Option I fares poorly in terms of affordability (Appendix II) and inclusivity for the zones most at risk, as insurance may be very expensive to obtain, if available at all, and because the risk falls entirely on the shoulders of homeowners.

International experience has shown that this option may leave significant numbers of Canadians financially exposed. In Australia, few high-risk individuals buy risk-based insurance because it is too expensive. Furthermore, governments may be subject to immense pressure to intervene in the aftermath of a disaster, regardless of their initial stance – Germany's reneging on its anti-interventionist position after two major floods is a case in point.

Option II – Evolved Status Quo: Risk borne by blend of homeowners and governments

In this option the private sector takes on as much contingent liability for flooding as its risk appetite allows, while leaving the highest-risk properties, where premiums would be unaffordable, to be covered ex post by government DFA programs.

This second option comes out strong from a household affordability standpoint given that no additional contribution is expected from residents at high risk. Once disaster strikes, however, provincial variations in eligibility criteria and payments render affordability inconsistent. Presently, there is significant confusion as to what homeowners can expect from DFA compensation and how such DFA programming relates to insurance payouts (Appendix VIII).

This option maintains pressure on all orders of government to invest in flood mitigation because they continue to hold the contingent liability for properties at highest risk. Expenditures on mitigation may de-risk properties to the point where insurance becomes available and affordable.

This option scores low on optimal compensation, since high-risk homeowners are subject to the limits of what DFA programs would cover. Financial sustainability could become problematic due to the ever-rising pressure of flooding costs for the government. From the point of view of the other principles – inclusivity, efficiency and promoting private market development – Option II falls short, mostly due to provincial DFA variability, its inability to promote mitigating behaviours and the lack of market mechanisms at the individual homeowner's level.

To somewhat reduce the government's exposure, this option could be augmented by transferring some of the government's risk to the insurance and global reinsurance market, similar to what the United States and Mexico are doing with portions of their DFA programs. Although the government would continue to bear some of the risk, the insurance/reinsurance option could provide a buffer, making DFA-type disbursements more predictable from a budgeting and accounting perspective. (Reinsurance can absorb large losses, and commissions are certain and can be easily budgeted. By contrast, DFA outlays are not as easily predictable due to the uncertainty of catastrophic events and the variability of loss amounts. Reinsurance thus provides a government with a better budgeting tool.) Reinsurance premium reductions may also be used to reward desired government behaviour, such as making public investments in infrastructure to de-risk regions at high-risk of flood damage.

Option III – Create a High-Risk Flood Insurance Pool

This solution involves building a high-risk flood pool of properties that would not otherwise be offered affordable insurance (or any flood insurance). Property owners would pay premiums that are as risk-based as possible. However, to ensure affordability and, therefore, take-up, these premiums could be capped and subsidized through a range of possible mechanisms.

High-risk property owners could be offered overland flood insurance through their existing insurer who would then make the determination on whether to relegate a particular policy to the pool. Premiums are collected by the insurer and then remitted to the pool, providing one source of pool capital. Other sources of capital could include contributions by governments, levies applied to homeowners and levies applied to municipal property tax. The pool could be run in a shared public-private partnership – administered by the insurance industry but governed and guaranteed by the government/global reinsurance market.

Two stages of capitalization would be required. Initially, the pool would require an influx of capital over a transition period to become self-sufficient. Government contributions and levies on homeowners or municipal ratepayers could be applied on a time-limited basis to ensure the pool becomes fully capitalized. To limit drawdowns on pool capital during this period, governments could pay all incoming claims. Once the pool is fully capitalized, these contributions/levies could cease and governments could stop most of their financial assistance for flood-related damage to residential properties.

At this point, a low-maintenance form of capitalization would be required to cover the subsidy necessitated by capping premiums. This ongoing capitalization could come from a range of government contributions or levies. Alternatively, the ongoing subsidy could be limited by offering high-risk consumers several choices of fully risk-priced coverage with varying levels of compensation. The consumer could choose the coverage they can afford.

As a high-risk property is de-risked through individual or community-based mitigation measures, the insurer may choose, upon an annual review, to cover the property as a normal customer thereby providing a means to exit the pool. Capitalization approaches should be structured to ensure that governments, insurers and consumers are properly incented to shrink the pool over time.

Option III scores high points in terms of affordability, inclusivity and optimal compensation, as it offers an insurance product at affordable rates to all high-risk homeowners in Canada. Depending on the measure used to make insurance affordable (different coverage limits, deductibles or subsidies), premiums may be more or less efficient in reflecting risk and eliciting the desired behaviours.

Similarly, the peace of mind conveyed by the fact that affordable insurance is within reach, no matter the risk profile, may relay a false sense of security that could delay policyholders from taking important mitigation action, especially if repeat claims are allowed to be part of the program. For these reasons, Option III gets only passing grades in terms of its efficiency. Although designed to withstand losses and remain financially sustainable, the pool would require an ongoing focus on mitigation and, from time to time, it may require a capital infusion. This is the reason for a neutral-to-strong mark in terms of its financial sustainability.

Measuring the three options against the six principles

A summary of how these options have been scored is provided below in Table 1. These scores are qualitative and inherently subjective. They result from lengthy stakeholder discussions and can change based upon policy choices made when executing each option. This summary is, therefore, not definitive.

Table 1: Reviewing Options against Principles

🟢 STRONG 🟡 NEUTRAL 🔴 WEAK	RISK BORNE BY		
PRINCIPLES	**HOMEOWNER (OPTION 1)**	**GOVERNMENT (OPTION 2)**	**HIGH-RISK POOL (OPTION 3)**
Affordability	🔴	🟢	🟢
Inclusivity	🔴	🟡	🟢
Efficiency	🟢	🔴	🟡
Optimal Compensation	🟡	🔴	🟢
Shield the Taxpayer	🟢	🔴	🟡
Financially Sustainable	🟢	🟡	🟡

The multi-stakeholder Working Group believes the three options presented in this note offer viable courses of action to reduce the number of properties at high risk of flooding. All of them have distinct strengths and weaknesses in the way they meet the guiding principles.

For any of these plans to be successful, all levels of government must commit to long-term investment in complementary measures such as mitigation, better flood mapping and consumer awareness initiatives. It is also necessary to create a system where mitigation investments are reflected in the models insurers use to price risk, which should then lead to improvements in availability and affordability of insurance. Each of these plans has the potential to take Canada through a period of transition to the desired end state.

Options for Managing Flood Costs of Canada's Highest Risk Residential Properties

Mandate

The Canadian Minister of Public Safety and the Saskatchewan Minister of Government Relations (being responsible for Emergency Management) convened a National Roundtable on Flood Risk in Regina in November 2017. As recommended by that National Roundtable, the Advisory Council on Flooding was created in early 2018 with the purpose of advancing the national agenda on flood risk management. An early deliverable of the Advisory Council was the creation of a public-private sector Working Group on the Financial Management of Flood Risk, co-chaired by Public Safety Canada[2] and the Insurance Bureau of Canada (IBC). In May 2018, Federal/Provincial/Territorial Ministers of Emergency Management asked this Working Group to further refine options for managing the financial costs of high-risk residential properties while drawing upon international models such as Flood Re (Appendix VI) in the United Kingdom. IBC has been asked to report on these options, developed through Working Group consultations, to Public Safety Canada, through the Advisory Council on Flooding. This paper is the resulting product, and was authored by IBC with input from members of the Working Group.

Issue

Given a progressively warming atmosphere and rising sea levels, current climate forecasts project that the escalation in flood events, as witnessed over the past decade, will continue into the future. Canada must increase its resiliency to residential flood risk to keep people safe and financially viable. The solutions presented below are intended more to provide better outcomes for individual Canadians and less about reducing pressure on public accounts. Currently, flooding is Canada's most costly natural peril and accounts for roughly three quarters of federal Disaster Financial Assistance (DFAA) payments (Appendix VIII). However residential losses account for only 5-15% of that total - a greater portion by far, perhaps as much as 70%, is spent on recovery of public infrastructure – an issue not covered by this paper. Considering the amplifying effects of climate change on future precipitation patterns and sea levels, governments are concerned about Disaster Risk Reduction – lowering the public safety and personal financial risk of those Canadians living in high risk areas.

[2] Public Safety primarily worked to facilitate the participation of various stakeholders, and to provide strategic linkages to the other Working Group under the Advisory Council on Flooding (the working Group on Flood Data and Mapping). The views expressed in this paper do not necessarily reflect the view of the federal government.

Flood Disaster Risk Reduction and a Desired End State

The desired end state for flood disaster risk reduction is envisioned as a future where every Canadian is both physically and financially safe from flooding and where each is enabled to manage their own risk. This end state reflects an overall reduction in flood risk and will result from a whole-of-society approach to building resilience (Appendix V). Targeted investment in climate action and disaster mitigation that includes flood risk reduction will result in fewer Canadians living in high-risk zones with better access to affordable flood insurance.

A Flood Disaster Risk Reduction approach for Canada should fit within the broader Emergency Management Strategy and should take a 'whole of society' perspective. Such an approach should leverage significant government partnerships in infrastructure to reduce climate risk in the most exposed communities AND elevate risk awareness and incent de-risking efforts amongst Canadians. Within this context of lowered risk, insurers can introduce new products and employ premium structures that will further incent responsible behaviour.

To elaborate, this approach should have three prongs:

a **ELEVATE RISK AWARENESS/ENGAGEMENT:**
Elevate awareness of governments and Canadians to incentivize active risk reduction and engagement on flood risk to ensure price signals are properly received. This should include risk assessment being conveyed throughout all stages of the property development, transaction, financing and insurance process;

b **IMPROVE RISK IDENTIFICATION:**
Improve and align public facing risk maps that allow insurers as well as property owners and governments to collaborate on identifying, updating and managing risk. These maps must be evergreen in that they reflect continuous improvement of the underlying flood hazard modelling to reflect investments in flood defenses;

c **AGGRESSIVELY MITIGATE RISK:**
Aggressively invest in reducing the number of Canadians living in areas of prioritized high flood risk through flood mitigation and relocation from high-risk areas (strategic retreat-Appendix V). This will require bold political leadership and resistance to rebuilding in harm's way. Investments in flood mitigation should incorporate natural infrastructure wherever possible given lower maintenance and increased auxiliary benefits of such approaches.

The options presented below will only be successful at addressing financial risk of flood if undertaken in context with the measures outlined above. Taken together they can provide a roadmap to the desired end state that reflects a nationally cohesive, yet regionally flexible approach to addressing flood risk. Given a 'whole of society approach', responsibility for delivering these measures lie with a range of actors from banks, mortgage insurers and realtors, to property and casualty insurers to municipal, provincial and federal government agencies to non-government organizations.

Furthermore, stakeholders have emphasized that we are decades away from reaching that desired end state and that implementation of any of the options below should occur over a transition period. The structure of any option should, as much as possible, incent all actors including governments, insurers and Canadians, to reduce flood risk throughout the transition and reward behaviour for doing so.

Canadian Considerations

There are 10.9 million residential properties across Canada. Most are at risk of water damage of some sort (e.g., sewer backup, rain damage, burst pipes). However, based on flood modelling conducted by IBC, 2.2 million homes are at risk of overland flood, including fluvial (riverine), pluvial (rainfall) and coastal floods[3]. The number of homes at high risk would vary from 800 thousand at a 1 in 20 year risk categorization to 1 million using a 1 in 100 year risk categorization.

The limited insurability of overland flood risk has meant that taxpayers are bearing a significant burden for overland flood damage across the country, as is evident by examining spending on the federal Disaster Financial Assistance (DFAA) program. Since the 1970s, federal transfer payments for flood assistance have totaled $4.9 billion– or roughly two/thirds of total DFAA spending. These costs have more than quadrupled in 40 years, swelling from a cumulative $300 million in the 1970s, to $1.2 billion in the 2000s, to a staggering $3.7 billion in the first four years of this decade. Only 5-15% of these DFA costs are for residential losses – the rest is dominated by restoration of public infrastructure. An IBC assessment of provincial DFA programs shows a similar cost breakdown. While the recent restructuring of the DFAA has devolved more of these costs to provincial tiers of government, and although residential losses vary from province to province, taxpayers remain the ultimate funding source for flood loss compensation.

[3] IBC Flood analysis, JBA and Associates Risk Mapping, January 2016

Despite the exclusion of overland flooding, insurers have paid for sewer back up losses related to flood on residential policies, as well as for automotive and commercial losses as well as ex gratis payments such as those made following the 2013 southern Alberta floods. Extreme weather payouts including flood have more than doubled every five to 10 years since the 1980s. For each of the past six years, these industry payouts have been close to or above $1 billion in Canada. By comparison, insured losses averaged $400 million a year over the 25-year period from 1983 to 2008. As of 2005, water claims have become the number one cause of property insurance losses across the country. The impacts of extreme weather, driven by climate change, are escalating.

However even in the current context the situation is changing. In 2015, consistent flood models became available for all of Canada south of sixty degrees latitude. These models enabled some insurers to begin underwriting overland flood risk. As of spring 2019, 16 insurers now offer overland flood products to about 77% of Canadian property owners. IBC estimates that about 34% of Canadians are now insured for overland flood risk. This number will increase as these flood models improve and as the nascent private insurance market develops. As society transitions towards a future where most low and medium risk is borne by the private sector it will create a challenge that must be considered in the context of the 'high risk' solution.

The challenge facing insurers is how to predict risk in an era of climate change. Flooding is complex and we expect that the return periods used to gauge flood risk are not static. In other words, severe flooding is becoming more common. Overland flooding is comprised of three types of peril. First, fluvial or floodplain flooding is water that overflows the banks of a river or lake to inundate nearby properties. This is flooding which is easiest to model and predict because it follows known topography.

Alternatively, pluvial or urban flooding results when intense rainfall overwhelms urban drainage systems and water flows into nearby homes. Pluvial flooding is much more difficult to predict and for insurers to model and yet with climate change, the frequency and intensity of such severe storms is rising. These storms can happen anywhere and even low risk communities may get overwhelmed.

Finally, coastal flooding from storm surge is also difficult to model given tidal influences and will be compounded by rising sea levels projected over the next few decades.

As a result, observers sometimes believe that insurers will only assume low and medium risk where they are guaranteed to profit, leaving high risk properties alone. However, in actuality, insurers are pressured by consumer demand and competition to take on increasing amounts of unpredictable risk and are seeking to manage this by diversifying their exposure across geographies and by using deductibles and compensation limits or caps to control uncertainty. As we have seen in other countries, insurers will avoid known areas of high risk but will eventually cover most other scenarios and offer more generous compensation as the market matures.

Addressing the financial risk of high-risk residential properties alone does little to address the overall risk profile of the nation. There has been a growing recognition by insurers and other stakeholders that flooding is a significant risk for Canadians that demands a whole-of-society response. This approach would leverage significant government partnerships in infrastructure to reduce climate risk in the most exposed communities. As well, it elevates risk awareness and incents de-risking efforts among consumers and businesses. In this framework of lowered risk, insurers can introduce new products and use premium structures that will further encourage responsible behaviours.

The University of Waterloo and the Geneva Association provided international insights to the Working Group and their examination of the flood management programs in G7 countries offers insights into solutions that may be applicable in Canada. Every country with a flood management program has had to wrestle with the same issues. The approaches developed by other nations span along a continuum that ranges from insurance-based to government relief solutions, including approaches that are fully private, fully public or in between.

To make residential flood insurance commercially viable in Canada, the international experience clearly points to four preconditions that are essential to establishing a strong flood risk management culture.

1. There must be accurate and up-to-date flood hazard mapping to allow all tiers of government – as well as insurers, developers and other key private sector stakeholders – to make smart decisions about asset management, urban planning and flood risk management;

2. There must be ongoing and adequate investment in public and private flood defences, and sewer and storm water infrastructure;

3. There must be widespread awareness of flood risk and a sound understanding by all stakeholders – including governments, communities and individuals – of the physical and financial consequences of flood risk and the tools available to ensure Canadians are prepared; and

4. Access to post disaster assistance for residential flooding should be limited/structured in a manner that encourages investments in mitigation and strong disaster reduction behaviours.

International experience also shows that there should be careful consideration given to a budget line approach where a clear cost-benefit relationship can be established between the capital needed to fund rebuilding and the investments made to reduce risk.

Whichever solution is adopted, it should be expected that a period of transition will occur. Key advice provided by stakeholders during the development of the options highlighted the need for both a transition period and acknowledged the evolving and increasing impact climate change will have on the financial risk facing high risk properties. The need for a transition period stems chiefly from the lack of authoritative and reliable risk mapping coupled with a lack of flood risk awareness by Canadians. Courageous decisions to systematically relocate Canadians out of harm's way, a process called strategic retreat (Appendix V), should be an element of any overall strategy.

As climate change will continue to impact the risk profile of Canadian communities, the number of Canadian properties at high risk to overland flood damages is expected to grow in the absence of significant action taken to reduce risk.

It is important to understand that no solution we have found can sustain itself financially if the number of properties at high risk grows. To ensure the financial stability of, whichever program is put in place, there must be a supporting effort to reduce the number of properties deemed 'high risk'. Increasing attention on flood mitigation will be required in the coming years and links must be made to flood models to reflect when 'derisking' has occurred to ensure that insurance offerings reflect the change in terms of availability and affordability (Appendix II).

Disaster Financial Assistance in Canada

PROVINCIAL AND TERRITORIAL GOVERNMENTS

Every provincial and territorial government has a responsibility for disaster management, including the financial management of disasters. Each government has established financial relief programs for homeowners and residential tenants affected by a disaster. It is up to each province and territory to determine eligibility, but most disaster relief programs mirror the eligibility requirements of the federal DFAA to ensure the province or territory qualify for maximum cost sharing of disasters with Canada.

If the damage to the residential property was the result of an event that could not be insured, the homeowner is eligible for payments under their provincial/territorial disaster relief program if the provincial or territorial government chooses to provide financial assistance. (Note: In Ontario the disaster assistance may be made available for uninsured essential losses. Ontario is unique in covering uninsured losses vs. those that are uninsurable). However, all of these programs limit the level of relief they provide both in caps and in eligibility requirements. Only primary residences are covered. They are not insurance programs.

If insurance is "readily and reasonably available," disaster assistance programs do not cover the damage regardless of whether the property owner purchased the insurance or knew it existed, with the exception of Ontario.[4]

FEDERAL GOVERNMENT

Disaster Financial Assistance Arrangements (DFAA) is a federal program that reimburses provinces and territories for some of their disaster response and recovery costs related to catastrophic events. One of the eligible costs provinces and territories can make claims for under DFAA is assistance paid to owners of residential properties. One of the aims of the program is to help provinces and territories support disaster recovery through financial assistance to property owners repair damage to basic and essential property only to its pre-disaster condition. The program is not intended to compensate for all damages that result from a disaster. The DFAA guidelines clearly indicate that damage or losses that are insurable (readily and reasonable available) are not eligible under the program.

[4] Beeby, D. (2017, January 22). Homeowners ill-informed about flood compensation, poll suggests. Retrieved from: www.cbc.ca/news/politics/flood-insurance-basement-disaster-compensation-goodale-feltmate-1.3941023

Principles

This document explores a range of financial solutions to manage costs for properties that are considered at high risk of flooding. These solutions are necessary to reduce homeowners' financial vulnerability in the short-term and to provide them with enough time to lower their contingent liability of flooding over the longer run. These options will be measured according to the following principles which have evolved through consultations with stakeholders. Taken together, the principles are designed to incent community and individual resiliency while decreasing pressure on public finances.

These principles are:

AFFORDABILITY:
An optimal approach should provide affordable protection for high-risk properties to ensure maximum participation.

INCLUSIVITY:
An optimal approach should provide an insurance solution to all primary residence property owners irrespective of the level and type of flood risk they face (e.g. pluvial, fluvial, coastal – Appendix III). Indigenous residences, which are often covered by commercial insurance, and other vulnerable communities require particular attention and possibly a concurring program.

EFFICIENCY:
The price of insurance should reflect as much of the risk as possible, thereby incentivizing appropriate flood risk reductions amongst all stakeholders.

OPTIMAL COMPENSATION:
Insurance solutions should provide predictable and fulsome compensation to residential property owners and therefore diminish residential pressure on publicly funded disaster assistance programs.

SHIELD THE TAXPAYER:
An optimal approach should reduce reliance on ongoing taxpayer-funded subsidies by creating the conditions necessary for expansion of private market insurance coverage.

FINANCIALLY SUSTAINABLE:
An optimal approach should be financially self-sufficient where systemic losses are reduced over time.

Application of these principles involves trade-offs. For instance, the principles of efficiency and affordability can be in opposition. To send the price signals required to fully incent consumer behavior, the homeowner should pay for the full risk that they bear. However, many homeowners, particularly those with low-incomes, simply cannot afford the premiums they would pay if truly risk-priced.

As a result, premiums need to be capped and the resultant residual risk needs to be subsidized from other sources. In any scenario, investments in flood mitigation need to be made which lower the homeowner's risk to an affordable level. Design of the three options listed below involves addressing such tradeoffs in varying ways.

There can also be a trade-off between affordability and financial sustainability and a solution should aim to optimize the compromise between the two as transparently as possible. For instance, it is important that the connection between price and risk be clear and obvious, even in circumstances where affordability is a priority. Premium caps, a means-based voucher system and/or tax rebates could be considered to maintain the plan's affordability. To contain the scheme's size and ongoing costs to government, it will be important to consider measures such as admission restrictions (to existing homes rather than new buildings, or to only primary residences, for example), the establishment of better building codes, climate-savvy land use planning and limited assistance payouts. Furthermore, financial efficiencies could be achieved through improvements to program administration and delivery.

International Review

The University of Waterloo and the Geneva Association conducted an extensive international review. Through their efforts, it was demonstrated to stakeholders that the approach to handling the high risk of flood varies from country to country.

Australia's flood insurance is risk based private market where the system calculates premiums that reflect the level of flood risk a property will face, as well as the cost of rebuilding or repairing the property. The role of the government is limited to mitigation investment, flood mapping and basic event aid that is income-tested; including to property owners to offset costs to make homes safe and habitable where insurance does not respond. Information on flooding and data is available through the National Flood Information Database which insurers can use to calculate premiums for an individual address as opposed to a postal code. Many high risk homeowners simply do not purchase expensive insurance and face financial ruin if a severe flood occurs.

In the United States, efforts to move the National Flood Insurance Program toward a risk-based funding model, while initially successful, were largely reversed by subsequent legislation. All home owners with a 1% risk or higher annual chance of flood with a mortgage from federally regulated or insured lenders are required to have flood insurance. The program continues to have a significant debt, and is also hampered by the government's recent practice of providing only short-term funding for the program. To contain costs, government offers loans or grants to homeowners in order to undertake mitigation efforts, on a means-tested sliding-scale. Local governments have to restrict development in 1/100yr flood zones or have the flood zones elevated if not protected by a levee.

In the Netherlands, the contingent liability for overland flood is endemic and, as a consequence, private insurance is basically unavailable (a large portion of the Dutch population is at high-risk of flooding). When residents get flooded, the government intervenes through a combination of different resilience-building measures that include physical assets retrofits (whenever possible), strategic retreats and property buyouts. By focusing on mitigation, the Dutch government is investing in improvements in communities' flood resilience, which ought to result in much less flooding in the future. Despite high up-front costs, heavy public intervention and implementation complexities due to federal-provincial layers of government – the Dutch approach to flood remains the fastest way to transition residual risk communities to insurable levels.

The U.K.'s solution for managing the financial risks for properties at high risk of flooding (known as Flood Re (Appendix VII) came into effect in April 2016. It is a temporary plan to ease high risk regions into a risk-based pricing regime. It was designed to be in place until 2039 to provide enough time for government to adequately de-risk private properties to levels granting affordable insurance. After the transition period is complete, the expectation is for consumers to be able to purchase insurance directly from insurers at a risk-based price. However, this system has already undergone changes and remains largely untested. For example, properties in the highest tax bracket were originally going to be excluded from the system, but due to political pressure, they are now being included.

The central government is responsible for both releasing building permits and providing disaster assistance, so incentives have long been aligned for responsible land plan use – quite the opposite on this side of the ocean, where federal and provincial governments responsible have little control over issuing building permits. One takeaway from the British experience that merits some consideration is that the scheme will take quite some time to get up and running. Furthermore, UK insurers are skeptical that governments will make the mitigation investments necessary for Flood Re to wind down by 2039.

Options

Leveraging this international review, the Working Group has developed three possible options for the financial management of properties at high risk of flood. These options can be considered along a spectrum of intervention/effort from a pure market option (low intervention) where high risk homeowners bear all their own risk to a government-backed option where these homeowners are partially subsidized by taxpayers to an structured insurance pool option (High intervention) where these homeowners can be fully protected. The differences along the spectrum relate to the level of programming effort available to assist homeowners.

The underlying assumption for the three options is continuous investment in protective infrastructure and in targeted buyouts to shrink the size of the group at high risk. Each one of these options has strengths and weaknesses and the selection of any one involves tradeoffs based on government priorities.

OPTION I – PURE MARKET SOLUTION - RISK BORNE BY HOMEOWNERS:

Private residences would no longer be covered by DFA programs and homeowners either self-insure, move, or transfer their flood contingent liability to the private insurance market. There are no subsidies in place to create perverse incentives and premiums are risk-based, which may mean that a portion of high-risk homeowners will opt out of the insurance market. As the government invests in adaptive infrastructure and targeted buyouts of immitigable properties, insurance becomes more available and affordable. To increase take-up rates, the government could consider introducing means-tested subsidies through taxation-based voucher programs or other mechanisms to ensure that vulnerable populations are not 'left behind'.

OPTION II – EVOLVED STATUS QUO - RISK BORNE BY BLEND OF HOMEOWNERS AND GOVERNMENTS:

In this option the private sector takes on as much contingent liability for flood as its risk appetite allows, while leaving the highest risk properties, where premiums would be unaffordable, to be covered ex post by government DFA programs. To somewhat reduce the government's exposure, this option could be augmented by transferring some of the government's risk to the global re-insurance market, similar to what the United States and Mexico are doing with portions of their own DFA programs. To do so, the government would need to define its risk appetite and leave re-insurers to take on the excess loss up to a pre-defined maximum liability, with anything in excess being borne by taxpayers. Although the government would continue to bear some of the risk, the re-insurance option would provide a buffer, making DFA-type disbursements more predictable from budgeting/accounting perspective. Note that the greater the number of jurisdictions participating, the lower the relative premium due to risk diversification. Reinsurance premium reductions may also be used to reward desired government behavior, such as making public investment in infrastructure investments to de-risk priority areas. This option is the one that received the least amount of attention amongst Working Group members as it is the closest we have with the status quo.

OPTION III – CREATE A HIGH RISK FLOOD INSURANCE POOL:

This solution involves creating a high risk flood pool of properties that is managed separately from what is considered normally insurable risk. The pool is run in a shared public-private partnership – administered by the insurance industry but governed and guaranteed by the government/global reinsurance market. The pool would need sources of both pre-capitalization to get the pool up and running and ongoing capitalization to subsidize the difference between true risk pricing and premium caps needed to assure affordability. The pool could be pre-capitalized either through a fund contributed to by governments, similar to how the Caribbean Catastrophe Risk Insurance Facility (CCRIF) was set-up, and then be supported by premiums paid into the pool and levies assessed on all homeowners or, if feasible, municipal ratepayers. In the meantime, claims could be paid out through federal and provincial disaster assistance programs. Ongoing capitalization could be paid by levies and/or through government contributions. Ongoing capitalization must be structured to ensure that all actors are incented to reduce the size of the pool over time.

This was the option that was the most discussed during meetings with stakeholders. Working group members debated the design of proper incentives (both positive and negative) to stimulate appropriate de-risking behaviour on the part of homeowners. Concerns were raised on how to ensure proper incentives were designed to ensure that government mitigation investments would continue. Other concerns focused on ensuring that the private market took on as much risk as possible and did not use the pool to enhance profitability.

Options assessment

In this section, each option will be examined with respect to how well it meets the key principles (see above) and the expected impacts for key constituencies such as federal and provincial/territorial governments, private industry and individual homeowners. Wherever applicable, we will tease out lessons from international jurisdictions that use similar schemes.

OPTION I – PURE MARKET SOLUTION - RISK BORNE BY HOMEOWNERS:

In Option I, government focuses solely on mitigation efforts and strategic retreats and does not provide financial relief to individual homeowners, no matter how large and devastating the flood event. To manage their contingent liability for flood, residents have the option to either self-insure or to obtain private coverage. Very rapidly, competitive market forces and rising demand will accelerate the expansion of private insurance supply to provide the option of coverage for nearly all residential properties in Canada, bar the immitigable ones or those for whom effective mitigation would be too costly (in which case, the government could provide buyout options and means-tested premium subsidies). Even with widespread availability, some Canadians may find the cost of coverage to be prohibitive and these homeowners may decide to self-insure more by necessity than by choice.

Clear communication about government's intention to stop providing disaster relief, and, as importantly, the resolve to follow up on those intentions post-event is paramount for the success of Option I and for the expansion of the private market. Also, equally important is active communication about flood risk and mitigating measures that homeowners can undertake to lower their risk as well as the establishment of a national program for climate-smart retrofits and a shared federal/provincial program for larger infrastructure investment in municipalities.

In order to facilitate the move towards Option I, the government could set a short transition timetable for DFAA/DFA reform in which it develops national flood risk maps, conducts active communication campaigns and provides enough time for homeowners to prepare, while continuing to offer relief assistance.

To contain costs, government could offer loans or grants to homeowners in order to undertake mitigation efforts, on a means-tested sliding-scale. At the end of the transition period, to incentivize insurance uptake and responsible mitigation while providing some form of financial buffer, the government could consider assisting flood victims mostly through loans rather than grants, very much like FEMA currently does.

The closest example to this scheme is the Australian model. The Australian model is based on a private-market solution, where flood cover is not subsidized and largely risk-priced, and where government's role is limited to mitigation investment, flood mapping and basic post event aid that is income-tested; including to property owners to offset costs to make homes safe and habitable where insurance does not respond. The Australian insurance industry developed an industry-wide flood mapping tool, which most insurers use to determine risk zones and for pricing (though insurers can use additional information as they see fit).

This helps create consistency in coverage across the industry – with insurers sharing a similar view of risk. Insurers can choose whether or not to offer flood cover but when they do, legislation requires that it be bundled with basic home insurance. Over 90% of insured homeowners have flood cover. If flood is not covered, legislation also requires that insurers clearly inform policyholders.

The definition of "flood" is also set by federal legislation, so that there is little confusion as to whether or not an event is covered and applicability of coverage does not depend on each insurer's interpretation. The coverage offered is very comprehensive and only ocean surge is excluded.

The insurance industry is now covering a substantial level of flood risk exposure, and, as a result, premiums have increased dramatically since the legislation was introduced. Flood insurance for high-risk properties is available, but is very expensive – and as a consequence virtually all high-risk zones remain uninsured. (Premiums for flood insurance alone in these areas can average over $10,000 while the average premium for all other perils together in these areas is in the order of $1,000). Option II would be based on a similar model to Australia's, covering most of the flood risk, with perhaps some targeted premium subsidies for vulnerable populations.

STRENGTHS:

Option I's biggest strength is perhaps its efficiency in leveraging market incentives to encourage de-risking behaviours. These include investing in adaptive measures for existing private infrastructure, and encouraging strategic retreat in areas where risks cannot be mitigated, but also demanding better standards for new communities with respect to land use planning, building codes and materials. The ultimate result should be less residential flooding and lower treasury outlays in the future. Another advantage is that this scheme allows government to focus almost exclusively on mitigation instead of having to devote resources to disaster management. Last but not least, private insurance is more efficient than disaster assistance in emergency response situations as qualifying criteria are much less ambiguous and claim payments tend to be delivered much quicker, allowing flood victims to recover sooner.

WEAKNESSES:

Option I's key weakness is its potential to lead to avoidance. Experience in Australia and Germany however show that this model is problematic. In Australia, many high risk homeowners simply do not purchase expensive insurance. They roll the dice and face financial ruin if a severe flood occurs. In Germany, governments have stepped in and bailed homeowners out despite having discontinued formal government assistance programming. The political pressure has proven to be just too great. At this time, it is likely similar problems would emerge in Canada.

FIT WITH GUIDING PRINCIPLES (TABLE 2):

Option I strongly meets the key principles in several areas, namely in efficiency, and financial sustainability, all thanks to full price transparency and its ability to leverage market mechanisms to incentivize the right behaviour. In terms of optimal compensation, this scheme has the potential to provide superior indemnification for the insured, though it falls short for the uninsured. Another possible strength of this program is its ability to encourage the development of the insurance market, provided that governments refrain from offering disaster assistance post-event, thus creating expectations of continuous bailouts in the future.

This is a simple principle, but not an easy one. Government may be subject to immense pressure to intervene in the aftermath of a disaster, regardless of its initial stance – Germany's reneging on its anti-interventionist position after two major floods is a case in point. Meanwhile, Option I fares poorly in terms of affordability, and inclusivity for the zones most at-risk as insurance may be very expensive to obtain, if available at all, and because the risk befalls entirely on the shoulder of homeowners.

Table 2: Reviewing Option 1 against Principles

STRONG NEUTRAL WEAK	RISK BORNE BY	
PRINCIPLES & OBJECTIVES	**HOMEOWNERS (OPTION 1)**	
Affordability		Private coverage is very expensive
Inclusivity		Most high-risk Canadians won't be covered
Efficiency		Absolute risk-price transparency, elimination of perverse incentives
Optimal Compensation		Varies according to protection status
Shield the Taxpayer		Strong incentives to retrofit assets and/or avoid moving into a high-risk area, however government may feel obliged to assist disaster victims, thus creating expectations for future bail-outs
Financially Sustainable		Parallel mitigation may be accelerated

OPTION II – EVOLVED STATUS QUO - RISK BORNE BY BLEND OF HOMEOWNERS AND GOVERNMENTS:

This option is very similar to the status-quo, as provincial/federal governments (taxpayers) are in charge of managing residual risk properties through the DFA/DFAA and they have the option (though so far unexercised) of using the insurance and reinsurance market to off-load a portion of that risk.

For the uninsured portion, the Dutch model may offer some insights on how to manage residual risk properties. In the Netherlands, the contingent liability for overland flood is endemic and, as a consequence, private insurance is basically unavailable (a large portion of the Dutch population is at high-risk of flooding). When residents get flooded, the government intervenes through a combination of different resilience-building measures that include physical assets retrofits (whenever possible), strategic retreats and property buyouts.

By focusing on mitigation, the Dutch government is investing in improvements in communities' flood resilience, which ought to result in much less flooding in the future. Despite high up-front costs, heavy public intervention and implementation complexities due to federal-provincial layers of government – the Dutch approach to flood remains the fastest way to transition residual risk communities to insurable levels.

One barrier to implementing Dutch style interventions is that municipalities stand to lose tax revenue/population, though this may be what is required to achieve the federal government's objective of reducing the overall risk in the system and ultimately DFAA costs. These issues may be amplified in communities where there are geographical or socio-economic limitations which restrict options for relocating residents.

STRENGTHS:

Option II is the simplest to implement as it does not require any major change to the current system. Furthermore, the use of the insurance and reinsurance market conceivably allows for the partial risk transfer to the private sector, which could reduce the volatility of disaster assistance payments, making flood risk more predictable and sustainable. This option can be evaluated as affordable, at least pre-event, as it doesn't require any targeted outlays on the part of high-risk residents to manage their flood contingent liability.

Last but not least, insurance and reinsurance premiums may be structured to incent de-risking by local governments, including through investments in mitigation infrastructure and by limiting building permits in flood zones.

WEAKNESSES:

This policy option falls short in several areas:

1. It is expensive for governments, and may not be fiscally sustainable in an ever-warmer and flood-prone climate.
2. It does not eliminate moral hazard at the individual resident level. There is no price mechanism to fully reflect the inherent flood liability risk and thus no market-based incentives to encourage mitigation (this is a big reason why the burden on the government is growing);
3. It creates uncertainty with respect to eligibility and compensation amounts;
4. It reinforces expectations for ongoing government bailouts, thereby hindering demand for private insurance;
5. It lacks clarity concerning how private sector insurance and disaster assistance programs ought to work together. For instance, in some provinces, sewer back-up is excluded from disaster assistance, but overland flood is eligible. Concurrent causation events, capped coverage and variable flood definitions all have the potential to create administrative difficulties and leave communities inadequately protected;
6. It lacks efficiency from an administrative point of view – provinces may have to wait up to ten years before receiving DFAA transfers;
7. The high cost of insurance and reinsurance may not offer much savings to governments;
8. The government's tendering process for selecting an insurer or reinsurer adds complexity to the process.

FIT WITH GUIDING PRINCIPLES (TABLE 3):

Option II comes out strong in terms of household affordability given that no additional contribution is expected from residents at high risk.

Once disaster strikes, however, provincial variations in eligibility criteria and payments render affordability inconsistent. Financial sustainability is problematic due to the ever-rising pressure of flooding costs for the government, though this could be somewhat offset if some of the risk is transferred to the private market.

From the point of view of the other principles – inclusivity, compensation, efficiency and promoting private market development – Option II falls short, mostly due to provincial DFA variability, lack of de-risking behaviour by the individual and the lack of market mechanisms at the individual homeowner's level.

Table 3: Assessing Option 2 against Principles

● STRONG ● NEUTRAL ● WEAK	RISK BORNE BY	
PRINCIPLES	**BLEND OF HOMEOWNERS AND GOVERNMENTS (OPTION 2)**	
Affordability	● PRE-EVENT ● POST-EVENT	It depends on province & discretionary trigger & peril
Inclusivity	●	Although most Canadians are covered, limitations to primary residences and the uncertainty most Canadians face with payouts affects it's rating here
Efficiency	●	Little risk price-transparency, fosters perverse incentives
Optimal Compensation	●	Varies according to province & discretionary trigger & peril; long waiting times to get relief due to excessive bureaucracy and uncertainty re. eligibility
Shield the Taxpayer	●	Taxpayers subsidize flood losses albeit at different levels across the country
Financially Sustainable	◐	Parallel mitigation and the use of re-insurance market are needed to contain growing public costs

OPTION III – CREATE A HIGH-RISK FLOOD INSURANCE POOL:

This solution involves building a high risk pool of properties that is managed separately from what the private market is willing to insure. The pool can be structured in many different ways and because of its complexity, several possible measures are considered regarding its operating principles, capitalization and governing rules.

GOVERNANCE:

The pool could be run as a shared public-private partnership – administered and operated by the insurance industry but guaranteed by the government (federal/provincial/municipal) and the global reinsurance market. Its Board could be comprised of representatives from different orders of government, the insurance industry and consumer groups.

The pool could be centrally administered but could operate regional sub-pools to limit cross-subsidization between jurisdictions and to account for the varying levels of risk and land-use policy across the country. This would also sharpen incentives around mitigation and land-use planning.

The scheme should be a temporary solution to replace government assistance to private residents. Its transitory nature would be contingent on continuous mitigation efforts from all levels of government, private residents and infrastructure owners.

Due to the centrality of mitigation, de-risking incentives should be embedded in the scheme's operations. For example, individual homeowners could be required to show proof of spending in retrofitting measures to obtain premium discounts and/or to continue to qualify for a subsidy. All levels of government should be required to invest in protective infrastructure and commit to a plan that identifies at-risk regions and sets yearly targets to mitigate flood risk in these areas. Failure to do so could result in financial penalties, for instance, in the form of pool re-capitalization requirements.

Municipalities and provincial governments could together commit to providing needed infrastructure investment – first by identifying the properties at risk and costing out the required projects, second by setting yearly investment targets to de-risk and committing to reaching those goals and finally by tracking progress on their own roadmaps to flood resilience.

OPERATING MECHANICS:

The pool is meant to be a transitional mechanism to a future state where risk mitigation and market competition has resulted in private market overland flood products being available to all Canadians. For this transition to take place, the pool must be structured to:

- Continuously incent governments to invest in targeted flood mitigation
- Continuously incent insurers to expand their coverage outside the pool
- Continuously incent homeowners to undertake property level mitigation measures

The insurance industry would serve as the distribution channel, while providing underwriting, claims handling, administrative and operational functions for the pool.

The pool would guarantee automatic admission to residents that are willing but unable to access private flood insurance – either because it is not yet available in their geographic area or because the premiums would be prohibitively expensive. Although flood insurance take-up should remain voluntary, the offer of flood coverage would become mandatory – private insurers would have to decide whether to underwrite that risk themselves or cede a portion or the entirety of it to the pool.

As a property is de-risked through individual or community-based mitigation measures, the insurer may choose, following an annual review, to cover them as a regular property. This provides a means to exit the pool. Capitalization approaches should be structured to ensure that governments, insurers and consumers are properly incentivized to shrink the pool over time.

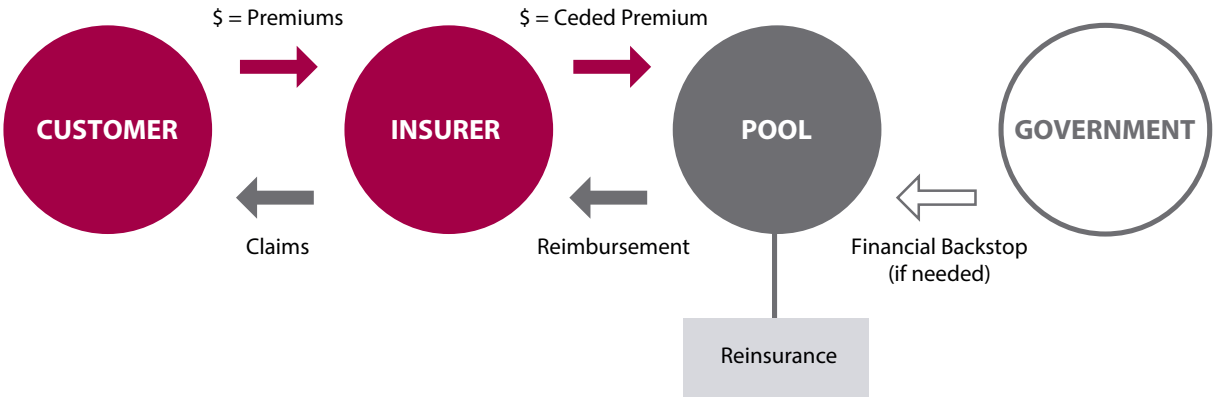
Capital and operating revenues for the pool could come principally from premiums on insurance policies, homeowner levies, government contributions, incomes from portfolio investment and re-insurance payouts. Operating expenses could come from losses and other underwriting expenses, re-insurance premiums, and operating costs. The pool could operate as a not-for-profit entity, and would thus not be subject to either provincial or federal tax. Any profit should be retained within the pool structure to increase the pool's capital base.

When a property gets flooded, the homeowner would submit the claim to the insurance company, which then would provide indemnification. At the same time, the insurer would make a cash call on the high-risk pool for its corresponding share of the claim (see Chart 1).

While premiums could be capped to ensure affordability, as much as possible they should reflect the underlying risk to reduce individual risk hazard. One solution to reach the optimum balance between price signaling and affordability could be to use declining premium subsidies funded by a levy on homeowners for a pre-determined –and well communicated - duration of time. Such a measure would make up for any financial shortfall to the scheme caused by premium limits, yet still introduce the urgency to mitigate at the individual level.

Alternatively, another solution to preserve affordability could be to maintain risk-based premiums, but offer different levels of coverage and/or deductibles, so that high-risk Canadians have access to coverage at a level of their choosing and based on what they can afford. For this solution, different products can be offered, ranging from stripped-down insurance limits to full replacement value coverage.

Chart 1: High risk pool operational management



CAPITALIZATION:

During the launch phase, the pool will need some form of financial support as collected premiums alone won't be sufficient to pay for incurring claims and operating costs. The scheme will need to have enough capital reserves to achieve financial viability.

Some capitalization options include:

1. Pre-capitalization could be achieved through a combination of one-time grants and long-term preferential loans from governments, as well as levies on property taxes and on the insurance industry. A budgetary line-item may be required in this case.
2. The accumulation of premiums and retained earnings could go towards capitalization, while government funding could be re-directed to pay for recurring liabilities (i.e. losses and operating expenses). No line-item would be necessary, but some form of disaster relief program may need to continue for some time after the scheme's inception.

Once full capitalization would be achieved, all governments should exit residential DFA programming. However, backstopping of the pool may still be required if ever its capital base were to erode following many cumulative flooding events and/or a lack of progress in mitigation efforts.

EXIT STRATEGY:

The high risk pool would ramp up over a period of years until it is fully capitalized and, ideally, self-sustaining. But the pool itself should be a transitional strategy and should not be a permanent mechanism. All consumers would be able to purchase insurance at a mostly risk-based price through the pool. As risk is decreased through mitigation or as insurers' risk appetite grows through competition and risk diversification, more and more consumers should exit the pool. At some point, the pool would ideally be collapsed and a pure market system should prevail.

***

The closest example to this scheme is the United Kingdom Flood Re program, which became operational in April 2016. It is a temporary plan to ease high risk regions into a risk-based pricing regime. It was designed to be in place until 2039 to provide enough time for government to adequately de-risk private properties to levels granting affordable insurance. After the transition period is complete, the expectation is for consumers to be able to purchase insurance directly from insurers at a risk-based price.

Despite the similarities between our Option III and Flood Re, there are significant differences between the Canadian and the UK context that make it difficult to simply adopting the British model wholesale. For example, in the UK, the flood insurance market is mature, having been around since the 1950s. Insurers have a lot of experience in this space and a good understanding of the underlying risk in different geographies, thanks to decades of claims history and up-to-date government-sponsored flood maps. Furthermore, the central government is responsible for both releasing building permits and providing disaster assistance, so incentives have long been aligned for responsible land plan use – quite the opposite on this side of the ocean, where federal and provincial governments responsible have little control over issuing building permits.

In terms of lessons learned, it is still early to tell whether the UK scheme is worth emulating since it has not been put to test yet. It has been in place for less than two years and no major flood has occurred since then. One takeaway from the British experience that merits some consideration is that the scheme will take quite some time to get up and running. This is potentially a drawback for its application to Canada, considering our relatively more complex government structure, federal-provincial power dynamics, and the nascent state of the flood insurance market. Furthermore, UK insurers are skeptical that governments will make the mitigation investments necessary for Flood Re to wind down by 2039.

STRENGTHS:

Option III's main strength is that it allows for a transition to building more climate resilient communities, while promoting risk-sharing among property owners, private insurers and all levels of government. A major caveat, though, is that its success depends entirely on a whole-of-society continuous public and private investment in mitigation, maintenance, reducing exposure, and strategic retreat disaster mitigation, including significant and sustained investments by government. It is also necessary to create a system to connect implemented adaptive measures to re-calculated risk. Without these, the pool is likely to get larger and run into solvency problems.

Another strong point of this program is that it delivers insurance payments rather than public assistance. This is an enhancement to the homeowner's experience as coverage is more comprehensive, there is less ambiguity in terms of qualifying criteria, and generally, claim payments are much quicker than under DFA programs.

A fourth point is the universality of this scheme – under Option III all Canadians, coast to coast, can be covered for flood risk, either through the private market or the high-risk pool. And finally, the scheme is compatible with embedded mechanisms to limit perverse incentives while keeping premiums affordable.

WEAKNESSES:

There are numerous disadvantages with this option, and they are all mostly relating to its administration:

1. *Lengthy negotiation-to-implementation phase* - The setting up and operating of this scheme may take many years, as it will require an agreement between the federal government and all 10 provinces and three territories – a tall order considering that insurance is a provincially regulated industry. (Flood Re took decades between initial discussions and inception and the California Earthquake Authority took several years of heated negotiations before it was created. Considering Canada's more complex governing structure, it is safe to say that the design of the pool will not be a short-lived experience.)

2. *Administrative costs:* The administrative costs of setting up the pool and establishing a governance system scheme will be higher than running the current federal DFA program for residential flooding.

3. *Protection gap for certain citizen classes* - Questions remain unanswered regarding the treatment of some homeowner groups, such as repeat flood victims and low-income Canadians who would normally qualify for regular insurance but can't afford it. Under Flood Re there are limits on who can belong to the pool (only homes built before a cut-off date qualify) and repeat victims won't be considered. Affordability may still be an issue for vulnerable Canadians, despite the premium subsidy. An alternative solution may be needed for lower income cohorts, such as further support determined through means testing.

4. *Possible needs for recurring government assistance:* Even after full capitalization is achieved, the pool may periodically require swift government backstops in case of very large losses or a multitude of cumulative losses. While re-insurance would be used to provide additional capacity, only a portion of the pool's risk should be ceded as it remains an expensive option. A strong focus on mitigation remains the most cost-effective and the best long-term solution to address this issue.

FIT WITH GUIDING PRINCIPLES (TABLE 4):

Option III scores high points in terms of affordability, inclusivity, and optimal compensation as it basically offers an insurance product at affordable rates to virtually all high-risk homeowners in Canada. Depending on the measure used to make insurance affordable (different coverage limits, deductibles or subsidies), premiums may be more or less efficient in reflecting risk and eliciting the right behaviours.

Similarly, because premiums do not fully reflect risk levels and coverage is easily available, policyholders may delay necessary mitigation action, especially if repeat claims are allowed to be part of the program. For these reasons, Option III gets only passing grades in terms of its efficiency.

Although designed to withstand losses and remain financially sustainability, the pool may require government to provide a capital infusion from time to time (see above), on top of on-going focus on mitigation. This is the reason for a neutral to strong mark in terms of its financial sustainability.

Table 4: Reviewing Option 3 against Principles

● STRONG ● NEUTRAL ● WEAK	RISK BORNE BY	
PRINCIPLES & OBJECTIVES	**HIGH-RISK POOL (OPTION 3)**	
Affordability	●	Premiums are capped and means-based tests may be used to qualify vulnerable Canadians for further support
Inclusivity	●	Offered universally to high risk Canadians
Efficiency	◐	Depends on how incentives are designed from the level of subsidy to qualifying requirements, to policy limits
Optimal Compensation	●	Offer more comprehensive and larger coverage than DFAs
Shield the Taxpayer	●	Depends on whether overland flood insurance is bundled with homeowner insurance or sold separately
Financially Sustainable	◐	Large or several cumulative losses may imperil solvency, especially in the early stages. It requires absolute government commitment to mitigation

Conclusion

This study explored a range of financial solutions for residual risk properties. Clearly, stakeholders should collaborate to reduce communities' financial vulnerability in the immediate term and to provide them with enough time to lower their risk profile over the longer run so that market solutions become accessible. Any of the financial management mechanisms presented needs to be paired with necessary spending in physical risk treatment measures (e.g. mitigation, maintenance, exposure reduction, and strategic retreat) to contain, if not decrease, the number of dwellings that falls in the high-risk category in order to achieve the desired end state.

The desired end-state will reflect an overall reduction in flood risk and will foster a whole-of-society approach to building resilience. Targeted investment in climate action and disaster mitigation that includes flood risk reduction will result in fewer Canadians living in high-risk zones with better access to affordable insurance.

Therefore, the options should be considered a transitory step towards a desired end-state and should be considered within the context of a three-prong approach to climate risk:

I. Elevate consumer and local government awareness and engagement on flood risk to ensure price signals are properly received;

II. Improve and align public facing risk maps that allow insurers as well as property owners and governments to collaborate on identifying, updating and managing risk; and

III. Continue to invest in reducing the number of Canadians living in high risk to flood damage.

Appendix I: Financial Risk of Flood Working Group Participants

Input on this report was provided by members of a Financial Risk of Flood Working Group consisting of:

Public Safety Canada (co-chair)[5]
Craig Stewart (co-chair), Insurance Bureau of Canada
Agis Kitsikis, Swiss Re
Alain Lessard, Intact Financial Corporation
Alana Lavoie, Federation of Canadian Municipalities
Alex Kaplan, Swiss Re
Andrea Minano, University of Waterloo
Barbara Turley-McIntyre, The Co-operators Group Limited
Blair Feltmate, Intact Centre on Climate Adaptation, University of Waterloo
Catherine McLennon, Province of Ontario
Christine Stevens, Province of Ontario
Helen Collins, Province of Ontario
Daniel Hains-Cote, Province du Québec
Daniel Henstra, University of Waterloo
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Johanna Morrow, Province of British Columbia
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Natalia Moudrak, Intact Centre on Climate Adaptation, University of Waterloo
Paul Cutbush, Aon Benfield
Pascal Chan, Canadian Real Estate Association
Philipp Wassenberg, Munich Re
Sara Jane O'Neill, Federation of Canadian Municipalities

[5] Public Safety primarily worked to facilitate the participation of various stakeholders, and to provide strategic linkages to the other Working Group under the Advisory Council on Flooding (the working Group on Flood Data and Mapping). The views expressed in this paper do not necessarily reflect the view of the federal government.

Shawna Peddle, Partners for Action
Syzan Talo, Guy Carpenter
Thomas Börtzler, Munich Re
Trish McOrmond, Government of Alberta

Insurance advice was provided on this report through an internal Insurance Bureau of Canada Flood Working Group comprised of:

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Alain Lessard, Intact
Amy Graham, RSA
Carolina Yang, Travelers
David MacInnis, Allstate
Derek Stewart, Wawanesa
Diane Sullivan, TD
Francois Langevin, TD
Isabelle Girard, Intact
Jean-Raymond Kingsley, OdysseyRe
Kevin Smart, Aviva
Kirstie Horrocks-Cutler, CAA
Matthieu Jasmin, Desjardins
Patrice Raby, La Capitale

The report was drafted by the policy team at the Insurance Bureau of Canada:

Claudia Verno
Chris Rol
Javeria Niazi
Kristen Wansbrough
Lee Spencer
Craig Stewart
David McGown
Pierre Babinsky
Bernard Marchand

Appendix II: Addressing Affordability

To address the transition point between those who can afford anything and those that can afford nothing, IBC proposes that we could apply the approach, based on the principle of residual income, used by Hudson et al. (2016)[6] in which objective (un)affordability is determined by the difference between the residual income above the poverty line (the "threshold level of income") and the expected deductible.

Because Statistics Canada does not produce a figure or has a definition of "poverty line", IBC proposes to use the federal agency's "Low-Income Cut-Offs" (LICO) concept, which defines income thresholds below which "a family will likely devote a larger share of its income on necessities of food, shelter and clothing than the average family". The approach essentially estimates an income threshold at which families are expected to spend 20 percentage points more than the average family on food, shelter and clothing. The cut-offs use Statistics Canada's Survey of Consumer Finances to produce low-income rates. They vary depending on family size (from 1 to 7 people) and area of residence (rural, small, medium, large, very large urban setting). This variability is intended to capture differences in the cost of living amongst community sizes. Depending on provincial governments' definitions and prerogatives, less stringent income thresholds than LICO could be applied.

The expected deductibles range is quite large and could vary between $500 to up to $50,000[7] or more.

$$Affordable_{j,q} = \begin{cases} 0 \; if \;\; \pi_{i,j,t} \geq Income_{j,q} - LICO - E(D_{i,j,t}) \\ 1 \; if \;\; \pi_{i,j,t} < Income_{j,q} - LICO - E(D_{i,j,t}) \end{cases}$$

Where: $\pi_{i,j,t}$ = *Premiums for household i, in region j, in time t*

$E(D_{i,j,t})$ = *the expected deductible*

$Income_{j,q}$ = *disposable income in the qth percentile in region j*

$LICO$ = *Low-Income Cut-Offs*

Insurance is objectively unaffordable if $Affordable_{j,q} = 0$ as insurance costs would cause a household to join the ranks of low-income households. Conversely, as long as households are able to stay above the LICO threshold, affordability becomes subjective.

[6] Paul Hudson, JW Wouter Botzen, Luc Feyen, Jeroen CJH Aerts - Incentivizing flood risk adaptation through risk based insurance premiums: Trade-offs between affordability and risk reduction, Ecological Economics, n. 125, 2016

[7] https://excaliburinsurance.ca/flood-insurance-ontario/
Or https://www.getfloodinsurance.ca/canadian-options

Appendix III: Key Definitions

The following section provides definitions for some key concepts that will be used in the discussion of the different schemes.

Full indemnification vs. financial relief:

Indemnification is the compensation insurance offers to the insured for a loss, in whole or in part, by payment, repair or replacement. Financial relief is a transfer payment by the government to an individual for a loss. In Canada, financial relief through provincial DFA programs varies widely. Provinces have different eligibility criteria for activating their programs and do not activate assistance programs for all events, leaving the inundated with minimal to no assistance in some cases; some provincial DFA programs are more comprehensive in what they cover, but most offer only limited protection with restrictive caps and a focus on essential property.

Furthermore, once residents are deemed entitled to financial relief, there is quite a lot of variability in terms of its amount, as assistance caps vary from a maximum of $80,000 in Nova Scotia, up to $300,000 in British Columbia, while other provinces still have no limits (Alberta, Newfoundland). These different assistance levels leave some Canadians in a better financial position post-event than others, given the strong provincial differentials in home values and rebuilding costs. For instance, Nova Scotia residents can hope to get up to a maximum of 36 cents to the dollar of what it costs to rebuild a home, while Alberta and Newfoundland & Labrador residents may be made whole post-event.

Insurance affordability vs. affordable insurance:

Insurance ought to be affordable to be a viable option. Yet affordability is not a characteristic of insurance, rather it is a relationship between the cost of acquiring insurance (premiums, deductibles, caps) and a person's revenue. For some people any type of insurance coverage is affordable, no matter how expensive it is; for others, no insurance is affordable unless it is free.

"AFFORDABLE" INSURANCE HAS MEANING ONLY IN THE CONTEXT OF:

1. Individual revenue
2. Level of coverage, deductibles, caps
3. Personal choice

If the cost of obtaining satisfactory insurance coverage exceeds what a household can afford, then the issue of affordability is real. Lower-income households have little discretionary spending power on how to allocate their resources to cover essential needs (food, shelter) relative to other items. For them, insurance affordability is not subjective. By contrast, higher-income households possess a discretionary budget that they can chose to allocate according to personal choice, risk appetite and awareness, and hence, for them insurance affordability may be subjective. The problem of low insurance take-up with this cohort is not tied to their inability to afford the premium, but rather to product value perceptions.

There is a threshold in the income continuum that separates households into two groups – those for whom affordability is objective and those for whom it is not. A methodology based on the principle of residual income is one amongst many that can be used to determine such threshold (see Affordability in Appendix II). Government support, if any, can focus on targeting those households for whom the issue of affordability is objective. As for the group for which insurance is subjectively "unaffordable", any kind of support would be a matter of public policy decision, though efforts should be directed to change product perceptions.

Flood risk and who should be covered by the plan:

Flood risk can be attributed to three primary sources: Fluvial, pluvial and coastal flooding.

FLUVIAL FLOOD can be a result of water levels rising in lakes and rivers due to rain or extensive volumes of melted snow, or overflow of dams and channel. Fluvial risk is often predictable and can be modelled and mapped based upon flood return intervals across discrete geographies (e.g. floodplains) – this is the primary peril affecting the target population and the focus of this paper. Insurance for homeowners in these risky areas is either unaffordable or not available and is likely to remain so in absence of mitigating measures that can bring it to insurable levels (this may involve their physical removal to a safer setting).

PLUVIAL, OR SURFACE WATER FLOOD, is caused when heavy rainfall creates a flood event independent of an overflowing water body. There are two common types 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 back-up); 2) Run-off or flowing water from rain falling on hillsides that are unable to absorb the water. Hillsides with recent forest fires are common sources of pluvial floods, as are suburban communities on hillsides. Pluvial flooding can happen in any urban area — even higher elevation areas that lie above coastal and river floodplains. As a consequence, pluvial risk is less predictable and can affect anyone. Insurance for sewer back-up is widely available and typically offered as an optional endorsement to homeowner insurance. Flood coverage available in many areas for this type of flooding.

COASTAL, OR SURGE FLOOD is produced when high winds from hurricanes and other storms push water onshore — 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 modelled and predicted. Because insurance for this peril is in its infancy and thus still very limited, Canadians living along coastal areas may be considered in the plan.

Policy limits (caps) and deductibles:

Insurance limits are the maximum amount of money an insurance company will pay for a covered loss. Generally, the higher the coverage limit, the higher the premium. If limits are in place, one may still be eligible to acquire disaster financial assistance. For example, in some provinces, flood insurance policies may have a cap of $30,000. Insurance evaluators will come and assess the DFA eligible losses and their associated compensation. The DFA payment will be total DFA-eligible losses less the amount payable by insurance.

The deductible portion of an insurance claim is an amount that a policyholder agrees to pay, per claim, toward the total amount of an insured loss. The damage associated with the deductible is still considered insurable damage and therefore not eligible for DFA.

High-risk pool:

A high-risk pool takes the risk facing individuals and transfers it to a larger group. It is a vehicle that can be used to effectively transfer individual risks to the entire group. Each member of the group pays a relatively small insurance premium, which corresponds to a small but certain loss of income, but in so doing the risk of incurring a larger loss is avoided. While the risk facing one specific person is largely unknowable, the risk for a larger group can be calculated with a great deal of certainty.

Reinsurance:

In lay terms, a reinsurer is the insurer of a primary insurer. By covering the insurer against accumulated individual commitments, reinsurance gives the insurer more security for its equity and solvency and more stable results when catastrophic floods occur. Insurers may underwrite policies covering a larger quantity or volume of risks without excessively raising administrative costs to cover their solvency margins. In addition, reinsurance makes substantial liquid assets available to insurers in case of exceptional losses.

The main advantage offered by insurance and reinsurance is that they allow for the partial or full risk transfer to the private sector, while reducing the volatility of disaster assistance payments. Taking care of flood risk in an increasingly wetter climate becomes more predictable and sustainable.

The risk of under- or over-protection from flood contingent liability is inherent in any of these options. Good planning and forecasting may be required prior to considering any of them. Given the evolving nature of the risk, the solutions should be continually reevaluated. Future scenario modelling is fundamental to any mid-range risk assessment.

The government's tendering process of selecting an insurer or reinsurer may be adding complexity to choosing risk transferring to the private sector. Premiums may be structured to incent de-risking by local governments, including investments in mitigation infrastructure and limiting building permits in flood zones.

Mitigation:

The purpose of mitigation is to lower the contingent liability profile of residual risk properties to acceptable levels so that insurance becomes affordable and available. Mitigation can be implemented both at the level of the individual homeowner (e.g. sump pumps, terrain grading, etc.) and local government (larger infrastructure investment, i.e. water reservoirs, dykes, berths, and natural infrastructure, such as wetlands, reforestation, ponds, etc.).

In severe cases, collaborative mitigation may not be sufficient and strategic retreats may be the only option to reduce risk.

Appendix IV: Reviewing Strategic Retreat - A public policy option to reduce disaster costs

Since the 1980s, the frequency of climate-related disasters, such as floods and storms, has increased significantly around the globe. According to Impacts, Adaptation and Vulnerability by the Intergovernmental Panel on Climate Change Working Group II, enhancing resilience is equivalent to reducing the risk of climate change impacts on society.

Resilience can be strengthened by decreasing the probability of a hazard occurring through managed retreat, avoiding or reducing its potential effects, and facilitating recovery from damages when impacts occur. Managed retreats and property buyouts, which are popular types of strategic retreat, have gained prominence in the last two decades as part of mitigation policies in some countries (the Netherlands and the United States, for example). By making strategic retreat part of the entire gamut of strategies it can lead to improvements in communities' flood resilience.

Though rarely used, this policy option has been considered in Canada in some cases. The following is a list of examples of strategic retreat seen in Canada:

Breezy Point, Manitoba

Due to repetitive flooding in the northern part of Breezy Point, Manitoba, in 2009, the provincial government decided to terminate the leases on the Crown land and remove residences from the flood-prone properties. The Manitoba government declared that frequent flooding of the settlement posed a risk to the lives of the residents as well as any rescuers required to come to the aid of people in the area. The government gave residents time to voluntarily terminate their leases and move out before facing forced eviction. It offered buyouts to permanent residents but not to the cottage holders in the area.

Perth-Andover, New Brunswick

In 2012, the New Brunswick government announced that it would spend $8 million to move or flood-proof homes destroyed or damaged by flooding in Perth-Andover, a village at high risk of repeat flooding. The residents were given the choice of relocating to higher ground or staying and having their homes flood-proofed. Notably, although homes were moved, businesses were not and this was controversial locally.

High River, Alberta

The Town of High River, Alberta, is located at the critical choke point of the Highwood River, and the Wallaceville neighbourhood was at very high risk of flooding. In 2013, the town offered mandatory buyouts to Wallaceville residents, based on its 2013 property assessments. The houses and deep infrastructure were cleared and the area is currently being naturalized to make room for the river. This naturalization has also reduced the risk for other High River communities' downstream in future high flow events.

Conclusion

When considering strategic retreat options, governments need to decide whether the program should be mandatory or voluntary. When governments make the program mandatory, there is often a push-back by property owners wishing to stay. Municipal governments are particularly susceptible to pressure from homeowners who want to remain in their homes. When developing a strategic retreat policy, governments need to take into account the emotional attachment that individuals have to their homes and properties.

Strategic retreats in the form of buyouts have been successfully used as part of mitigation strategies in other countries and, despite early implementation challenges in Canada, they are a viable option; and should be part of the mitigation policy. Buyouts are especially suitable for properties facing repeat losses. One noteworthy feature of a Canadian voluntary buyout program is that homeowners who choose to stay in the high-risk areas are not eligible to make future claims from government disaster assistance programs.

Appendix V: A Whole-of-Society Response to Climate Change and Increasing Flood Risk

In order for any plan for the financial management of flood risk to succeed there needs to be a broader commitment to reducing the impacts of our changing climate on Canadian communities. Because the paper is focused on the financial management of flood risk, there has not been any real examination of the other factors necessary for the long-term success of any financial management plan. The importance of climate adaptation was borne out in the Vancouver Declaration on Clean Growth and Climate Change and through the subsequent development of the Pan-Canadian Framework.

Adaptation and the mitigation of risk must accompany any of the financial management options being considered. Climate change will change the flood risk profile in many parts of the country, and without an ongoing commitment to address that risk flood related damages will be more common and more severe in communities across Canada. Some of that risk can and should be borne by property owners, but federal and provincial governments have a sizable role to play in improving education, flood risk assessment, funding for mitigation, and setting standards for future development.

According to IBC, these priorities should be undertaken alongside the development of that solution to ensure that Canada develops a strong flood risk management culture alongside a mechanism for the financial management of flood risk:

a Prioritize and invest in resilient infrastructure to help communities adapt to emerging climate realities. Infrastructure decisions should be made through a climate adaptation lens that includes recognizing the important role of natural infrastructure in reducing climate change impacts.

- Ongoing mitigation investments by all levels of government will be needed to address current vulnerabilities and to offset future climate related impacts. The federal government has allocated $2 billion for a Disaster Mitigation and Adaptation Fund[8] and made another $5 billion eligible over the next five years for green infrastructure projects.[9] This cannot be a one-time funding envelope and ongoing funding will be required as a prerequisite for a successful financial management of risk solution.
- Flood risk can also be reduced by assessing the value of and incorporating innovative infrastructure options (i.e. natural infrastructure) into community infrastructure planning and decision-making.

[8] Canada Federal Budget 2017, p.122
[9] Ibid, p115

b Update and Improve Canadian Risk Maps.

- A key outcome of the 2017 National Roundtable on Flood Risk was identifying the need to explore mechanisms for sharing up-to-date flood data and flood maps to better understand the risks and to predict future risks. Although each community will be impacted in different ways by climate change, water is a hazard most will need to address. Many communities and property owners still lack the ability to assess their risk – much less mitigate it. Developing strong tools and better data can enhance our capacity for preparedness, response and recovery.

c Educate, engage and incent home and business owners to mitigate their risks at the property level.

- The National Roundtable on Flood Risk also identified the need to better engage with Canadians to communicate the changing nature of flood risk. Although there is a clear role for government here, there are many other actors that are committed to similar goals. There are extensive opportunities for all stakeholders to collaborate to advance the public's understanding of flood risk.

d Update building codes and standards to improve climate and disaster resilience objectives, and improve land use planning.

- Canada's population will continue to grow in coming years and we will see growth both in existing communities and the emergence of new communities. On a practical level this means that we will have the opportunity to do better going forward and ensure that new homes and new communities are more resilient. The National Research Council is leading an effort to update codes and standards to improve resiliency. When these new standards are developed, fast-tracking them into building codes will help protect Canadians against flood and other climate related impacts. A significant part of flood risk can also be avoided by making smart land-use planning decisions, and there is a clear role for governments in setting smart development rules.

The options being considered for the financial management of flood risk deal with only one component of the problem, and that is the risk that we have not mitigated. These options address existing risk in places where, in hindsight, we ought not to have built residential communities. The options do not address new risks or worsening of existing risk. Unless that risk is addressed through ongoing investments, more properties will find themselves at risk and these financial management options will not provide a sustainable solution. It is imperative that governments recognize the ongoing responsibility they have to invest in ongoing mitigation and making communities more resilient if they want a sustainable financial management solution for flood.

Appendix VI: International Flood Insurance Programs

COUNTRY/ CATEGORY	AUSTRALIA	USA	NETHERLANDS	UK
Basis and Evolution of Approach	• Relocation plays a part • Risk based pricing	• The National Flood Insurance Programme • Relocation plays a part	• No private insurance for river or sea flooding • Relocation " Room for the River" program	• Private insurance against flood risk damage is bundled with general insurance
Private Role	• Primary Insurer	• Administrator	• None	• Administrator
Public Role	• Provides a standardized flood definition	• Primary Insurer and Regulator	• None	• Primary Insurer and Regulator
Implementation/ Scheme	• Flood insurance is risk reflective. Calculated based on level of risk at a property, cost of rebuilding or repairing the property • Calculating a flood premium by: Likelihood of flooding; Expected depth of flooding relative to the insured building; and Expected cost of recovery. • Local governments are responsible for producing their own plans and building their own defences	• Covered up to $250,000 • All home owners with a 1% risk or higher annual chance of flood with a mortgage from federally regulated or insured lenders are required to have flood insurance • HUD provides disaster recovery resources for the lenders • Local governments have to restrict development in 1/100yr flood zones or have to be elevated if not protected by a levee	• Private ex ante, premium optional • Government ex post compensation • Insurance for surface water flooding is bundled with standard insurance	• Flood Re • Private, ex ante, premium bundled • Private sector flood insurance is included as standard with contents and building coverage • Basic structural flood insurance is a pre-requisite for a mortgage • Central government is about policy; Implementation is the responsibility of others
Highest Risk	• Priced based on risk	• Included	• Included	• Flood Re
Cost of Insurance for Policy Holders	• Average Flood insurance premium in Queensland by Allianz is $8200 (2013)	• Avg. cost is $700 per plan (costs vary depending on level of protection and risk)	• Post-disaster relief fund used as primary compensation for property-owners	• Insurance excess for flood cover is now £250 (standard deductible) • Average household pays £176 in building insurance every year
Link B/t Insurance and Risk Reduction	• TBD	• Premium/deductible / indemnity limit • Awareness raising/client consulting	• None	• None
Coverage Rates	• 93% of home building and contents policies contain flood cover	• Uptake is 75% of those legally required to have coverage	• Very low	• 95%

Appendix VII: Flood Re as an option for Financial Management of Flood for High Risk Properties in Canada

Introduction

Flood Re is an agreement between insurers and the government in the U.K. that updates previous agreements. Flood Re, which became operational in April 2016 after the previous agreement expired, addresses the financial management of flood risk for high-risk properties and could serve as a potential model for a Canadian program. However, to implement a similar program in Canada, the model would have to be changed significantly because of the many differences between the two countries.

How Flood Re works

STRUCTURE

Flood Re is a reinsurance pool in the U.K. for flood insurance for residential and small commercial properties at the highest level of risk. The pool is used to pay insurers for claims they pay out. The reinsurance pool was established to ease the transition to full risk-based pricing of insurance over the course of 20 to 25 years. Gradual increases in premiums and improved risk mitigation will make it possible for private insurers to offer risk-based coverage by the end of that time period.

Below are some internal aspects of Flood Re.

- Of the properties in the U.K. that are insured against flooding, it is estimated that 350,000 properties will benefit from Flood Re coverage. It will take a few years of Flood Re being operational before an accurate number is available.
- Consumers purchase insurance from their insurers and submit claims directly to them.
- Insurers choose whether the flood risk portion of a policy is ceded into the Flood Re pool.
- If claims following a flood event exceed Flood Re's reserves, Flood Re can impose "Levy 2" which calls on insurers for additional funding.
- There is no formal public backup mechanism.

- The government has no role in the scheme's day-to-day management.
- The government has provided insurers with a non-binding "letter of comfort," acknowledging that the government will provide flood risk mitigation investments and developing policies to help manage flood risk.
- Insurance is sold in a competitive marketplace in the U.K. This means that insurers have the discretion to price policies (not Flood Re) as they choose and customers have the freedom to do business with whatever company they choose.

ADMINISTRATION COSTS

Costs of running the Flood Re system include underwriting, administration, ongoing mitigation and levy collection expenses. Specific costs include:

- Underwriting the separate pool liability for Flood Re: £16 million–£49 million per year ($27,590,720–$84,496,580 CAD)
- Setting up the pool: £8 million–£12 million ($13,799,480–$20,693,040 CAD)
- Running the pool: £6 million–£10 million per year ($10,346,520–$17,244,650 CAD)
- Collecting levies: £1 million per year ($1,724,812 CAD)

FUNDING STRUCTURE

Funding to cover Flood Re's costs comes from three sources:

1. A levy paid by insurers, which is based on their market share (known as Levy 1)
2. Ad hoc payments by insurers (known as Levy 2), used under extraordinary circumstances
3. Premiums for the properties ceded to the Flood Re pool.

Flood Re's Levy 1 maintains the cross-subsidization that existed under the previous insurance schemes in the U.K. For properties at low to no risk of flooding, the cross-subsidy is not anticipated to increase costs to consumers. The annual market-share levy amounts to £10.50 ($18.11 CAD) per policy. Levy 1 is paid by all insurers that underwrite policies for household buildings and contents, which totals £180 million ($302,691,212 CAD) per year. Insurers will pay the levy each year for the first five years of the scheme. If the pool needs to be topped up due to Flood Re's reserves being exceeded due to post-flood claims, this can be done through the ad hoc, or Levy 2, payment system. All insurers that pay the market-share levy must also make any required ad hoc payments to the Flood Re administrator.

The third source of income for Flood Re is the premiums (a fixed amount per ceded policy) that Flood Re charges insurers. These premiums are calculated based on Council Tax bands. Insurers choose whether to recover the cost of these premiums from consumers. However, Flood Re was designed on the principle that properties located in bands in which people pay lower taxes should be assessed lower premiums to promote affordability.

PREMIUMS PAID BY INSURERS

Flood Re assesses premiums for the ceded flood risk portions of policies for high-risk properties using a tier system in which insurers ceding expensive homes pay a higher premium than insurers who cede less expensive homes. According to the 2016 Financial Management of Flood Risk report published by the Organisation for Economic Co-operation and Development, Flood Re premiums for the lower-income households are indirectly subsidized through the pricing of reinsurance for the flood portion of bundled household policies. Flood Re then provides standard prices for reinsurance coverage for properties in Council Tax bands in which the level of flood risk is irrelevant. While insurers are free to set the premiums for bundled coverage, the set price of the flood risk portion that insurers transfer to Flood Re provides a notional ceiling on the premiums for high-risk properties.

Every five years, Flood Re will review the premiums and Levy 1. Flood Re's scheme is designed to increase premium thresholds to align them with the Consumer Price Index at the start of every financial year, but any changes to the premiums require the approval of the Secretary of State. The fixed premium scale currently ranges from £210 to £540 ($362–$931 CAD), depending on the Council Tax band classification in which the property is located.

Disadvantages of the Flood Re system

Flood Re is a temporary plan to ease the transition to a risk-based pricing regime. It was designed to be in place until 2039. After the transition is complete, consumers will purchase insurance directly from insurers at a risk-based price. If the government, through mitigation efforts, does not reduce the overall level of risk over the course of the time that Flood Re is operational, the government and insurers will once again have to tackle affordability in the context of a mandatory insurance regime. If the risk is not addressed and lowered, then the Flood Re system that is used to transition to a risk-based system will have failed. If the transition toward risk-based pricing is successful, flood insurance will still be unaffordable for a small number of homeowners. Some form of support will need to continue beyond 2039.

As flood-related financial losses rise globally, and climate change continues to represent additional risk, it is important that the underlying flood risk be addressed through mitigation measures by both governments and individuals. If this risk isn't addressed, the Flood Re system may not work according to plan. The pool may increase in size, the windup of the pool could be delayed or the risk-based price of insurance for high-risk properties could be prohibitively expensive when the pool winds up. There is no guarantee that future governments will invest in flood mitigation, and there is concern that the current government's commitment to appropriate mitigation measures is waning. The government has already proposed cuts to the budget for additional flood defences.

While Flood Re remains in place, governments and individuals may forgo the necessary mitigation simply because there is a financial management scheme in place. Moral hazard is a risk any time the true cost of risk is hidden. Flood Re measures affordability strictly on the basis of property value and does not include metrics such as those that assess exposure, vulnerability and risk, which can better reflect vulnerability to flood damage.

Comparing flood insurance in Canada and the U.K.

UK	CANADA
Home insurance is mandatory, but flood insurance is voluntary and often bundled with home insurance.	Home insurance is voluntary, and flood coverage is optional.
Cross-subsidization, and the attendant moral hazard, is a feature of the insurance market.	Private insurance market is risk based.
The premiums that insurers pay to Flood Re are assessed through a Council Tax band system.	Canada would need to group properties using property assessment data or another mechanism to assess risk and flood vulnerability.
Flood insurance being offered since the 1950s, and Flood Re is only the most recent financial management scheme for flood risk.	Insurers started to offer residential overland flood insurance in 2015.
The federal government in the U.K. has more control over flood mitigation decision-making.	Canadian provinces and territories (and municipalities) are responsible for land-use planning decisions and flood mitigation spending.
Government gives a letter of comfort regarding ongoing mitigation and flood risk management, there is no guarantee that this mitigation will take place.	It would be difficult to bind future governments to this type of agreement.

Conclusion

While insurers and the government in the U.K. have come to an agreement in establishing the Flood Re pool, it is a tailored arrangement that works for circumstances specific to the U.K. While a reinsurance pool may be an attractive option for managing the financial risks associated with flooding in Canada, there are sufficient differences between the U.K. and Canada to make the adoption of the Flood Re model in Canada difficult.

Appendix VIII: Comparing Disaster Assistance Approaches across Canada

PROVINCE/ TERRITORY	DISASTER ASSISTANCE CLAIM ELIGIBILITY	SPECIAL NOTES IN THE PROGRAM	AVERAGE CONSTRUCTION COST (PROVINCE)	AVERAGE CONSTRUCTION COST (METROPOLITAN)	MAXIMUM COMPENSATION RATIO (PROVINCE)	MAXIMUM COMPENSATION RATIO (METROPOLITAN)
Alberta	Up to 90% (maximum limit is not mentioned)[10] Item limits are basic models		250,000	320,000	0.90	0.90
British Columbia	80% of eligible damage to maximum payment of $300,000 https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/dfa/private_sector_guidelines.pdf Item limits are basic models	In British Columbia, to be eligible for disaster financial assistance it must be from a peril that is not insurable. As insurable damages from wind, wildfires, earthquakes, SBU or sump pit back-up and water entry from above ground sources such as roofs and windows are not eligible[11].	300,000	380,000	0.80	0.79
Manitoba	80% of eligible damage up to a maximum payment of $240,000 https://www.gov.mb.ca/emo/recover/home/dfa_home.html Item limits-basic models	Ineligible costs include[12]: - Insurable losses - Damaged items or property that could have been insured at an available and reasonable rate are not eligible - Insurable hazards such as SBU or sump pump back-up, snow load and wind damage are also not eligible.	220,000	230,000	0.80	0.80
New Brunswick	100% of eligible damage, to a maximum payment of $160,000[13] Item limits-basic models		190,000	210,000	0.63	0.57
Newfoundland and Labrador	Limits to be confirmed		250,000	250,000	1.0	1.0
Northwest Territories	80% of eligible damage, maximum payment of $100,000		220,000	230,000	0.45	0.43
Nova Scotia	100% of eligible damage, maximum payment of $80,000[14] Item limits-basic models		210,000	220,000	0.38	0.36

[10] http://www.aema.alberta.ca/documents/DAG-2017.pdf
[11] Government of British Columbia. (2018). Disaster Financial Assistance. Retrieved from: https://www2.gov.bc.ca/gov/content/safety/emergency-preparedness-response-recovery/emergency-response-and-recovery/disaster-financial-assistance
[12] Government of Manitoba. (2018). Disaster Financial Assistance. Retrieved from: https://www.gov.mb.ca/emo/recover/home/dfa_home.html
[13] https://www2.gnb.ca/content/gnb/en/news/public_alerts/report_damages/2018_flood.html
[14] https://novascotia.ca/dma/emo/disaster_financial_assistance/program_limits.asp

PROVINCE/ TERRITORY	DISASTER ASSISTANCE CLAIM ELIGIBILITY	SPECIAL NOTES IN THE PROGRAM	AVERAGE CONSTRUCTION COST (PROVINCE)	AVERAGE CONSTRUCTION COST (METROPOLITAN)	MAXIMUM COMPENSATION RATIO (PROVINCE)	MAXIMUM COMPENSATION RATIO (METROPOLITAN)
Nunavut	Not specified		130,000	130,000		
Ontario	90% eligible damage to a maximum payment of $250,000[15] Item limits-basic models	Damage from sewer back up is only covered if you are a person from a low-income household[16]	240,000	300,000	0.90	0.83
Prince Edward Island	Not specified		210,000	210,000		
Quebec	90% of eligible damage, maximum payment of $200 000[17]. The maximum will be indexed annually based on CPI for Quebec beginning on March 1st 2019, with the increase capped at $5 000 per year. Item limits-basic models		270,000	300,000	0.74	0.67
Saskatchewan	95% eligible damage, maximum payment of $240,000[18] Item limits-basic models		240,000	270,000	0.95	0.89
Yukon	Not specified		230,000	230,000		
Canada	190,000	Eligible costs to a province are net costs after any recoveries from insurance payouts. Costs of restoring or replacing items that were insured or insurable are not eligible.	250,000		0.76	

[15] http://www.mah.gov.on.ca/Page13744.aspx
[16] Government of Ontario. (2018). Provisions for low-income households. Retrieved from: http://www.mah.gov.on.ca/Page13754.aspx
[17] https://www.securitepublique.gouv.qc.ca/fileadmin/Documents/securite_civile/aidefinanciere_sinistres/programmes/Decret_459-2018_programme_general_du_28_mars_2018.pdf
[18] http://publications.gov.sk.ca/documents/313/106696-PDAP-Claim-Guidelines.pdf

Source: Floodsmart Canada, IBC Flood maps[19]

Calculations: $$\textit{Maximum Compensation Ratio} = \frac{\textit{Maximum Provincial Payment}}{\textit{(Average Construction Cost x Provincial Eligible Damage)}}$$

[20] Flood Smart Canada. (2018). FLOOD INSURANCE & DISASTER ASSISTANCE: Understanding the differences in order to better serve your flood-related needs. Retrieved from: http://floodsmartcanada.ca/flood-insurance-disaster-assistance/#collapse10

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