

# Perspectives in Flood Risk Assessment and Management

Discussions and recommendations on flood risk management in Canada

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Report from a workshop held in conjunction with the CatIQ 2<sup>nd</sup> Annual Canadian  
Catastrophe Conference, February 1-3, 2017, Toronto, Ontario.



## Executive Summary

Two workshops, entitled *Perspectives in Flood Risk Assessment and Management*, were held in Toronto in conjunction with CatIQ's Canadian Catastrophe Conference on February 3<sup>rd</sup>, 2017. The interactive workshops brought together 110 participants for in-depth discussions on flood risk assessment, management and mitigation in Canada.

Participants were invited to share perspectives towards recommendations for effective flood risk management across Canada and to continue towards a shared goal of building more resilient communities. Three priority areas were identified to move flood risk management forward in Canada:

1. **Data and Shared Understanding** – Various actors (insurers, governments, academia) hold different components of the data needed to understand and visualize flood risk. Sharing hazard and exposure data in a collaborative way that protects proprietary interests will allow for better understanding of risk towards effective and integrated flood risk management. Common understanding of flood hazard, risk, exposure, and vulnerability can lead to informed decision-making, and more approachable and consistent flood insurance policy wording.
2. **Homeowner Education and Awareness** – Canadians are not flood risk-aware and do not know their options for shared responsibility for flood risk management, leading to ineffective uptake of insurance products, but also of incentives offered by municipalities and insurance for installation of flood-protection measures in the home, such as sump pumps and backwater valves. A national-level outreach program, focussing on risk and ways to reduce that risk, is needed for informed decision making. This program will only succeed with the active participation of governments, academia, industry, and others to develop a cohesive strategy with numerous tested methods for outreach and communications.
3. **Proactive Cross-sector Collaboration** – Many diverse actors are involved in flood risk management in Canada, but there typically is not a focus on working together, often due to competition, unaligned goals and objectives, and lack of understanding/knowledge of who is working in this space nationally. A holistic flood management strategy that brings these groups together to share expertise and responsibility for flood risk management in Canada will streamline work that is underway, remove redundancies, and move our shared goals forward.

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# 1 INTRODUCTION

Two workshops, entitled *Perspectives in Flood Risk Assessment and Management*, were held in Toronto in conjunction with CatIQ's Canadian Catastrophe Conference on February 3<sup>rd</sup>, 2017. The interactive workshops brought together 110 participants for in-depth discussions on flood risk assessment, management and mitigation in Canada. The purpose of the workshops was to discuss Canada's current approach to managing flood risk and to identify areas for improvement, including gaps and goals for more effective, collaborative flood risk management. Participants were invited to share perspectives towards recommendations for effective flood risk management across Canada and to continue towards a shared goal of building more resilient communities.

The report begins with a brief overview of the workshops, followed by summaries of panelist presentations and participant table discussions. Recommendations for implementing effective flood risk management practices are then made, based on content from table discussions and final remarks from the expert panel.

## 2 WORKSHOP OVERVIEW

The *Perspectives in Flood Risk Assessment and Management* workshops focused on Canada's direction in managing flood risk and identifying ways to move forward towards building flood-resilient communities. Two workshops were held back-to-back, concurrently with a weather forecasting workshop, to allow participants to be present at both workshops. Moderation was provided by Shawna Peddle, Director, Partners for Action, University of Waterloo, Waterloo, ON, and Šárka Černá, Aon Benfield Impact Forecasting, Prague, Czech Republic. A total of 110 participants attended the workshops, representing the insurance industry, academia, community members, conservation authorities, municipalities, Indigenous, federal and provincial governments, and the public and private sectors.

The workshop began with an introduction by each panelist on their perspectives on the current state of flood risk management through their individual expertise and experience. Workshop participants were then asked to discuss the following questions with others at their table, and report back to the group:

1. How are we currently assessing and mitigating flood risk within our own organizations?
2. What are our interests and goals towards addressing flood risk? Can we find common ground and shared goals?
3. What are the sector-specific gaps and resource needs?
4. Can we work together – what does one sector have that another needs to effectively assess and mitigate flood risk?
5. How can we deal with uncertainty, competition, and historic barriers to move forward on our shared goal of making our communities more resilient to flood?

Following introductions from the panelists, participants shared expertise and perspectives while engaging in table discussions. After table discussions, each panelist gave a final summary of where to go from here, based on their own expertise, and what they heard from participants. Recommendations and conclusions resulting from these discussions are summarized below.

## **2.1 Panelist Introductions**

### **Ingrid Robinson, Director of Enterprise Risk Management, Brookfield Global Integrated Solutions**

Ingrid outlined Brookfield's approach to flood management as a commercial real estate manager with a global portfolio. Risk management, including flood risk, is approached in three phases, based on client services, including preparation, response and prevention. Ingrid stressed the importance of business continuity through maintaining skilled staff and a sound vendor base for strategic response, planning, testing and communication, as well as the need to safely minimize business disruption and undertake vulnerability assessments (using tools such as IBC's MRAT tool to inform recommendations and decision-making).

### **Matthew Godsoe, Research Unit Manager, Public Safety Canada**

Matthew discussed the tipping point for federal disaster risk management in the mid-1990's, when annual expenditures under the federal Disaster Financial Assistance Arrangements (DFAA) began to exceed annual budgets. Bureaucracies tend to work slowly, requiring innovative alternative funding approaches and partnerships to address flood risk management. Since 2014, the federal Natural Disaster Mitigation Program (NDMP) has been in place, with \$200 million available over 5 years for projects contributing to effective flood risk management in Canada. The New Building Canada Fund has also dedicated funds towards disaster resilience. Uptake on these programs has been modest, and Public Safety is interested in encouraging innovative partnerships to take advantage of these funding sources. Matthew concluded that there are plans to review the current NDMP towards delivery of an improved, more effective, efficient and attractive program upon renewal in 2020.

### **Lapo Calamai, Director of Catastrophic Risk and Economic Analysis, Insurance Bureau of Canada (IBC)**

Lapo noted the tipping point for flood risk management for the property and casualty insurance industry in Canada followed floods in Calgary and southern Ontario in 2013. IBC is actively engaged in proposing government and industry risk sharing towards affordability and availability of overland flood insurance throughout Canada. Progress on offering flood insurance nationally has been stellar over the last two years, with approximately 15 insurers currently offering products to consumers. Lapo noted that much more needs to be done before we will see a mature market, such as improving coverage nationally and improving understanding on coverage options. He also identified four preconditions of sustainability of overland flood insurance in Canada that must be met to facilitate an effective insurance market: mapping; resilient infrastructure (i.e. incorporating projected impacts of climate change into infrastructure standards and improving building codes; land use planning, zoning, and development controls; and, consumer education, awareness, and improved financial literacy.

**Rehana Rajabali, Senior Engineer, Flood Risk and Communications, Toronto and Region Conservation Authority (TRCA)**

Rehana discussed the unique role of Conservation Authorities in Ontario towards management of flood risk through control of development in the floodplain. She noted that this watershed-level approach and collaborative management would be beneficial throughout Canada going forward. Rehana commented on the need to understand risk assessment at a granular level and to merge hazard data with exposure and vulnerability to better plan, prepare, and respond to risk. Effective collaboration across sectors is needed to manage flood risk and create awareness within our communities.

**Steve Litke, Senior Program Manager, Fraser Basin Council (FBC)**

Steve discussed the importance of securing funding and governance arrangements, as well as developing collaborative approaches towards consensus through dialogue and sound technical information. FBC is currently working towards developing flood scenarios to better understand the influence of climate change on BC communities housing more than 2 million people, preparing a regional flood vulnerability assessment, examining what flood management approaches exist in different jurisdictions, and application in a local context.

Overall, the introductions from each panelist provided a brief background on flood risk management nationally. This discussion framed the workshop and invited table participants to provide broader perspective on the shift towards more effective risk assessment and management practices in Canada.

### **3 Workshop Discussions**

Participants were asked to consider five questions within their table groups:

1. How are we currently assessing and mitigating flood risk within our own organizations?
2. What are our interests and goals towards addressing flood risk? Can we find common ground and shared goals?
3. What are the sector-specific gaps and resource needs?
4. Can we work together – what does one sector have that another needs to effectively assess and mitigate flood risk?
5. How can we deal with uncertainty, competition, and historic barriers to move forward on our shared goal of making our communities more resilient to flood?

As the purpose of the workshop was to share perspectives and engage with those outside of the participants' normal network, each table had a random assortment of participants, with varying levels of interest and understanding of flood, flood risk management, government policy, and insurance. The opinions brought forward were based on these perceptions, and reflect that spectrum of understanding. From these discussions, two main themes emerged: "how are we currently addressing flood risk?" and "what are the gaps and challenges impeding effective flood risk management in Canada?"

### **3.1 Emergent Theme #1: How are we currently addressing flood risk?**

When looking at the current state of flood risk management, it was noted that there are a number of available tools, including maps and models produced by municipalities, watershed managers, and those prepared for the use of the insurance industry. Flood hazard maps are used by municipalities for planning, but these may be outdated, unavailable digitally, or inconsistent with flood risk identified by insurers, making it difficult for homeowners and decision-makers to visualize and designate high-risk areas.

Some examples of current management efforts include:

- The District of North Vancouver is working towards proactive flood risk management, including hiring consultants to provide a long-term outlook on climate change and potential impacts on the municipality, and requiring new development applications to consider climate impacts.
- Insurers are launching flood products and developing innovative approaches to understand and quantify risk for product pricing. Insurers rely on commercially available flood models, and most refine their risk assessments based on local flood defenses and mitigation measures. Most indicated that excluding coverage in the highest risk areas was one way of allowing insurers to offer affordable flood insurance products to most policy holders.
- Other noted examples of flood risk management include: installing physical mitigation measures (dykes, berms), controlling development in floodplains, and taking personal actions, such as not storing valuable items in basements and crawl spaces.

### **3.2 Emergent Theme #2: What are the gaps and challenges?**

Although there were a number of points outlining Canada's current role in flood risk management, the majority of discussions centered on challenges, gaps within current practices, and goals for improving flood risk management.

#### **3.2.1 Data and Terminology**

Risk management must be driven by a shared understanding of risk, hazard, exposure, and vulnerability. Hazard data is typically publicly available, through watershed managers, academic institutions, and governments. However, this data is often outdated, and may not consider new upstream developments, changes on the landscape, or the uncertainty of climate change. Also, there is no consistent standard for flood hazard mapping nationally, making it difficult to accurately compare different jurisdictions (*note that the Federal Floodplain Mapping Framework was announced following this workshop, on March 7, 2017*). Flood defenses, such as dykes and dams, are difficult to obtain in digital format, as well.

Some flood risk exposure data is held by insurers, who use this information to price flood products based on models produced by third-party suppliers. The resultant outputs are proprietary, and not publicly-shared. Without consistent and cross-referenced vulnerability and exposure data, it is difficult to compare community-specific vulnerability or risk, or accurately assess potential losses from future flood events. While national-scale flood models do exist that

incorporate defenses (where available), hydrology, and exposure data, licensing is restricted to the insurance industry, resulting in different maps than those used by municipalities to define risk zones used for planning purposes. While the needs of insurers and planners are different, and mapping is targeted for specific uses, this can result in confusion among users of the maps, particularly homeowners.

One suggestion was a national-scale flood model with hazard and risk data that would facilitate common understanding of risk and consideration of climate change for effective adaptation planning. Another table suggested consolidating loss information from multiple insurers to improve data availability and statistical power of the model. This model would be held by a small number of common entities, and updated to consider evolving definitions and views of risks, and to incorporate new information from hydrological and exposure providers. Collaborative creation and housing of this model would also allow for shared goals and prioritization of action in areas with highest hazard and largest loss potential. Public and industry education could also help address the vast discrepancies in flood policy language and offerings between insurers, as each company would be starting from the same general understanding of flood risk.

### **3.2.2 Public Education**

Participants highlighted the lack of understanding around flood types and risk, making it challenging to engage, assess risks and potential mitigation options, and agree on appropriate management practices. Homeowners do not realize they are at risk, and are not motivated to take action to make their homes and communities more resilient to flood. Transparent, easy to understand information on flood risk is needed, with dissemination through many actors across the country, including academics, banks, insurers, builders, governments, and others, such as Conservation Authorities and educators. Working together to come to a common approach towards communications and next steps is critical towards creating awareness and resiliency.

Outreach activities need to adopt new approaches to visualizing community and property-level risk, and relating flood risks to those that are already known and understood. Communications must demonstrate personal impacts, such as the cost of insurance, potential impacts on property values, and the extreme disruption a flood event could have on a family. Appropriate communication of risks and costs could drive action, particularly following a major flood event, when there is a small window of opportunity to catch the attention of Canadians before they are distracted by the next event.

Information to better understand flood risk and insurance policy options is also needed – policy language is not consistent, nor is language surrounding caps, deductibles, and coverage inclusions and exclusions. Disaster assistance is not insurance, with different eligibility requirements and limited coverage. Requirements under the federal Disaster Financial Assistance Arrangements (DFAA) are also unknown to most Canadians, including language in most provincial disaster assistance arrangements stating that if flood insurance were available and affordable, losses may not be covered.



Communication among stakeholders is critical to preparation, prevention, response and management of flood risks; however, to improve flood risk management across Canada this information must also be effectively communicated to communities and individuals who are at risk of floods. Education and risk awareness can improve uptake of mitigation measures, as well as better understanding of the risks themselves. Once a homeowner understands whether or not their home is at risk of flooding, they can take precautions, such as purchasing flood insurance coverage, investigating government incentive options, and personal measures, such as sump pumps, grading of properties away from homes, and backwater valves.

Educating customers will increase risk awareness and enable informed decisions in understanding and purchasing flood insurance coverage. The need for more education and awareness also requires consistency and transparency of information. For example, insurance companies need to be consistent with their information to educate homeowners about coverage and policies, with consistent language that is readily accessible to all customers. Outside of the insurance industry, consistency and availability of floods maps is another critical component of education and integrated flood risk management. Preventing development through appropriate zoning is critical - updated flood maps need to be publically available in municipalities across the country, to ensure homeowner awareness and informed decisions to build or purchase homes in designated flood zones. Public disclosure of flood risk information is critical to the larger goal of mitigating and managing risk in communities across Canada.

### **3.2.3 Government Cooperation**

Engagement and participation of all levels of government is needed to move flood risk management forward in Canada. Changes to building codes, improved infrastructure standards to consider climate change, planning to prevent development in floodplains, and outreach to residents are all driven by provincial and municipal policy. Effective partnerships between governments, academia, the insurance industry, and others is needed to make risk information public for informed decision-making, along with government-industry cooperation in developing solutions for high-risk consumers throughout the country. Incentives from government and insurers to act need to be effectively communicated and enforced, and municipal efforts to reduce risk must be identified and highlighted to demonstrate value to residents and elected officials. Finally, agreements need to be in place towards shared responsibility for flood risk management between insurers, governments, and residents.

In Ontario, Conservation Authorities manage development in floodplains. In addition to incentives for developers to avoid riskier areas, it was suggested that the Conservation Authority model be expanded nationally, to allow for watershed-level management towards reducing risk.

### **3.2.4 Cross-Sectoral Collaboration**

In addition to inconsistent or non-existent data, participants also highlighted the lack of collaboration and sharing across sectors, often due to proprietary issues or confusion over how data would be used. Working together to overcome barriers to collaboration will allow sharing of experience and best practices for flood management among stakeholders with common goals.

Furthermore, there is little acknowledgement of proactive flood risk management prior to a disaster, as motivation for action only comes when a disaster strikes. In the case of homeowners, for example, it is only once their home has flooded that they seek options like insurance coverage and subsidy programs to protect their homes. The disaster itself becomes motivation and management efforts remain reactive. There is a need to recognize that preparing in advance and adopting a long-term perspective will lead to better flood risk management and mitigation.

Improved communication is critical to the future of flood risk management in Canada. Workshop participants and panelists asserted the need for more effective communication among key players and the public to create national awareness of flood risk and opportunities to reduce that risk. This communication approach should include a more in-depth conversation with financial players (credit rating agencies, banks, credit unions, and pension funds), as impacts of climate change on their assets is a financial stability risk. Industry associations are also key players in communication, as these drive their members on climate risk evaluation, investigating the business case for adaptation, and identifying priority mitigation actions.

Any holistic communication framework must also include clearer linkages and shared goals to identify and understand flood risk. As stakeholders work together to address flood risk management they must transcend historic focus on floodplain mapping (which considers fluvial, or riverine flood risk) towards consideration of pluvial (urban) flooding. Common language and understanding of flood and flood risk will lead to a shared approach on defining the problem and consistent messaging for other audiences, such as the public and homeowners. Overall, the implementation of cross-sector communication strategies will foster stronger relationships among stakeholders and enable effective dissemination of flood risk information. Moreover, improved communication will benefit Canadian homeowners and assist with their education and awareness of flood risk.

Improved communication and homeowner education and awareness will help address the need for effective collaboration among stakeholders. Cross-sector collaboration was identified as a big piece missing from Canada's current approach to flood risk management. Communication efforts can promote discussion across sectors, increase understanding of the issue and management practices, leading to more effective partnerships and collaboration among stakeholders to tackle flood risk management across the country. Once cross-sector communication practices are made a priority and are effectively implemented, different groups can more easily collaborate with one another on planning towards flood risk mitigation.

It was also noted that there is a need to focus on proactive management rather than relying primarily on reactive responses. Across the country, many municipalities and organizations are focusing their efforts after a disaster occurs, but there is a need to stress the importance of proactive management and collaboration to better prepare and plan for future events. Proactive partnerships will improve resource sharing, including risk data and flood maps and models before events, leading to better preparation and response. This would involve integrating data

and information from diverse providers, including municipalities, Indigenous, federal and provincial governments, the insurance industry, banks, universities, business and community organizations, and developers. It would involve determining what work is being done nationally, and highlighting efforts to task experts with moving the agenda forward. Collaboration amongst experts allows for a bigger and more effective impact than any individual acting alone, and would enable cooperative agreement towards responsibility for preparedness and recovery.

A focus on cross-sector partnerships would also develop relationships that would be beneficial during a disaster event through centralized information and data sharing. By eliminating competitive advantage, each group can bring their expertise and experience to the table, and focus primarily on consistent data, policy alignment, and effective flood risk management across the country. Overall, bringing together cross-sector perspectives through collaboration will break down information silos and create a holistic approach to management.

### **3.3 Panelist Concluding Remarks**

Following the table reporting, each panelist was asked to give a concluding statement on their thoughts about what would move flood risk management forward in Canada.

**Ingrid Robinson** commented that a better understanding of risk through standard measures and publicly available mapping was critical, in addition to centralized access to funding and incentives to bring the right partners together. Infrastructure owners must also be involved to inform policy from the perspective of those who would be required to consider a changing climate in planning, construction and maintenance.

**Matthew Godsoe** noted that there was no linear path towards policy and legislative change, requiring us to be prepared when an opportunity presents itself. We have to work together to put all the right pieces in place, as there is a short time to institute sweeping changes within government after an event happens. Partnerships and planning are critical in the time between events, to ensure policy options meet the needs of all stakeholders and can be presented effectively when the time is right.

**Lapo Calamai** concluded that the question of effective flood risk management is bigger than the insurance industry, and bigger than those at the table today. We need to bring in financial markets, as the issues of flood resiliency and mitigation are often underappreciated by other sectors of the economy. We need to raise the profile of preparedness based on economic viability AND social equity. We must also find an effective partnership between governments and the insurance industry. The Office of the Parliamentary Budget Officer has reported that we spend \$600 - \$900 million each year on flood relief; essentially, taxpayer money is acting as insurance. We must find a way to reduce that taxpayer burden through mitigation, not compensation.

In addition, we must define what the problem is – public and institutional focus is overwhelmingly on floodplain management and fluvial flood. But we can't just manage floodplains, as 70-80% of losses are actually from urban (pluvial) flooding. We also need a

cross-sectoral perspective involving mortgagers, real estate, and others towards policy recommendations looking at a long-term solution to solve this problem. We need to bridge the data disconnect through better understanding of roles, objectives, and needs of all stakeholders – who can share data so that those who need it get it.

**Rehana Rajabali** identified opportunities – data sharing, overcoming traditional barriers, and engaging emerging players through effective academic and business partnerships. We need a ‘supergroup’ outside of the competitive space that considers and embraces the interests of all stakeholders. She noted that an informed public is the first line of defense, but if we are to encourage individual action, we must make risk information available, consistently, to all. We need accurate modelling and mapping as the base to ensure common understanding of risk in plain language for effective decision-making at all levels. We need effective pluvial modelling, and funding to better understand our infrastructure needs – this is the new frontier of reducing risk from urban flooding. We also need someone who can connect the dots and communicate on what mitigation can actually do to reduce risk.

**Steve Litke** noted that we need consistent communications and education, as it is very difficult for municipalities to tackle risk without residents knowing it even exists. We need to overcome challenges around proprietary data so we can share while still maintaining competitive advantage. We also need a better idea of how decisions actually impact risk reduction through feedback loops. Switching to private insurance from public relief is an opportunity to send a price signal towards investing in prevention both at the individual and municipal level.

## 4 CONCLUSION

Three priority areas were identified to move flood risk management forward in Canada:

1. **Data and Shared Understanding** – Various actors (insurers, governments, academia) hold different components of the data needed to understand and visualize flood risk. Sharing hazard and exposure data in a collaborative way that protects proprietary interests will allow for better understanding of risk towards effective and integrated flood risk management. Common understanding of flood hazard, risk, exposure, and vulnerability can lead to informed decision-making, and more approachable and consistent flood insurance policy wording.
2. **Homeowner Education and Awareness** – Canadians are not flood risk-aware and do not know their options for shared responsibility for flood risk management, leading to ineffective uptake of insurance products, but also of incentives offered by municipalities and insurance for installation of flood-protection measures in the home, such as sump pumps and backwater valves. A national-level outreach program, focussing on risk and ways to reduce that risk, is needed for informed decision making. This program will only succeed with the active participation of governments, academia, industry, and others to develop a cohesive strategy with numerous tested methods for outreach and communications.

3. **Proactive Cross-sector Collaboration** – Many diverse actors are involved in flood risk management in Canada, but there typically is not a focus on working together, often due to competition, unaligned goals and objectives, and lack of understanding/knowledge of who is working in this space nationally. A holistic flood management strategy that brings these groups together to share expertise and responsibility for flood risk management in Canada will streamline work that is underway, remove redundancies, and move our shared goals forward.

Partners for Action was created to address these three components of effective flood risk management in Canada. Emphasis in 2017 will be placed on a national flood risk communications program, and we welcome partners to join us in a collaborative movement towards proactive partnership and co-creation of data and shared information.

The flood workshop *Perspectives in Flood Risk Assessment and Management* gave participants the opportunity to assess Canada's current role in flood risk management. Panelist and table discussions identified key challenges and gaps, as well as ways in which flood risk management can be improved. The recommendations presented in this report are offered to build on and advance Canada's flood risk assessment and management future.