HazNet

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FLOODS

LONG-TERM OUTLOOK ON FLOOD LOSSES

EMPOWERING INDIGENOUS EM

ENGAGING CANADIANS IN FLOOD RISK MANAGEMENT

EMERGENCY MANAGEMENT STRATEGY FOR CANADA

FLOOD RECOVERY IN KOOTENAY BOUNDARY REGION

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Editor's Note

As we are sending this issue to print, thousands of Canadians are personally impacted by flooding in their communities. Flooding is the costliest and the most frequent hazard in Canada. Yet, every year there is a sense of unexpectedness as truly difficult times unfold for Canadians across the country. We are grateful to all of those responding and wish all those impacted strength in the long months of recovery ahead.

In this carefully curated issue, we take a deep dive to better understand the process behind flood risk creation and feature some of the leading solutions that were developed in Canada and internationally.

The research section features a national survey that shows that Canadians are typically unaware of their flood risk and are caught off-guard by the economic burden that flooding imposes. Yet, Canadians personally bear roughly $600 million in flood-related losses every year. Find out about the three tools that could improve flood risk management.

Read about an innovative methodology 'Experience Feedback' from flood events to identify lessons learned for flood risk management. This project revealed that flood victims and local officials in Quebec have a genuine interest in sharing their experience to help design better risk management policies.

Looking beyond Canada, we can learn from a study on flood losses in Europe that have occurred since 1870 which shows that growth in flood losses in Europe can be explained by growing exposure, while vulnerability is shown to decline with economic development.

We highlight the STAR-FLOOD project that has investigated efforts to diversify flood risk management (FRM) modes in Belgium, England, France, the Netherlands, Poland, and Sweden. Findings from the project show that a range of FRM modes will be required to anticipate the consequences of urbanization and climate change.

Our feature is a remarkable story told by responders of the amazing teamwork and cooperation witnessed in recovering from the worst flooding in the Kootenay Boundary region's modern history. Through their own words, we highlight key lessons learned for response and recovery.

In our Policy section, Dr Matthew Godsoe shares insights about Canada's recently released Emergency Management Strategy.

Get inspired by the work happening on the ground in the realm of Indigenous emergency management in our Practice section. Read about the groundbreaking work happening in Saskatchewan between the Prince Albert Grand Council and the Canadian Red Cross, and a personal reflection of an Indigenous Masters student working at Indigenous Services Canada.

The Buoyant Foundation Project develops strategies for retrofitting flood-vulnerable homes with amphibious foundations as an alternative to flood risk reduction strategies. Find out how the first full-scale prototype, representing a typical New Orleans shotgun-style house, has expanded internationally.

As with every HazNet issue, we bring some of the most valuable international lessons to Canada. Viking-style flood recovery and building back better takes place in the cultural centre of a village on the banks of the Foss River in York, England, that dates back 1000 years. We examine how the Jorvik Viking Centre not only reopened in just 16 months after a flood, but it was completely rebuilt, renovated, and reimagined in a better way.

Read about key lessons learned from the Black Friday fires in Victoria, Australia that killed 173 people, and damaged thousands of homes and businesses. This article calls for moving beyond the most common emergency management pitfalls of planning for the most recent event - "to be planning to fight the next big fire not the one we have just fought."

In our Awards section, we celebrate Alain Normand as the recipient of the "Scanlon Lifetime Achievement Award", CRHNet's highest honour.

Many thanks to our contributors and peer reviewers for another spectacular issue that brings timely and timeless content of flood risk management. I want to thank our incredibly dedicated and talented team that does the largely invisible work of content solicitation, content creation, copy edits and layout. Many thanks to Nicole Spence, Carime Quezada, Suzy Waldman, Shaun Koopman and Ivan Chow and many other volunteers who make HazNet possible.

A very special "thank you" goes to Tressa Peters, a youth from Lil'wat Nation (British Columbia) for her permission to use her image as our cover shot. Tressa's school, the Xetólacw Community School, is located in the Xetólacw Village site, in the central portion of Mount Currie Indian Reserve No. 6, Lílwat's largest reserve. The village is a planned community that was developed in the 1980s in response to flooding concerns. As flooding risk increases with climate change, communities across Canada may need to learn from Tressa's community about community relocation process.

This issue's diverse content from across Canada and the world shows one common theme, a theme of shared responsibility. To build resilience, we need to break the government silos, we need to foster better collaboration and cooperation, we need to build partnerships and we need to engage and move forward as a whole of society. Canadians, communities, governments, and multiple stakeholders all have a role to play in building resilience. As citizens and community organizers, let's roll up our sleeves and start the often-difficult conversations about understanding the risks that our communities face. Understanding this risk is our first step in dealing with it.

HazNet will be turning 10 in the fall. To celebrate this milestone, we will address one of the most urgent and unexplored topic of (in)equity and disaster risk reduction. We welcome your contributions!

Lily Yumagulova,
Editor, HazNet
www.haznet.ca

President's message

For fifteen years CRHNet has multiplied its efforts to network among the various partners and stakeholders involved in disaster risk reduction and emergency management. Our membership reunites a strong representation of the individuals and organisations actively engaged in our field. Our annual symposiums and HazNet (haznet.ca), our magazine, have become our flagships.

The increasing toll disasters pose upon our society and the growing number of organizations committed to disaster risk reduction, invite us to reflect on our role and more importantly on the ways we propose ourselves to contribute to a more resilient Canada. For these reasons, the board of directors initiated a strategic planning process as well as a revision of our image and web presence. The next months will provide us the opportunity to pave the way for the next fifteen years.

Canada's Disaster Risk Reduction Platform

As previously announced, CRHNet now co-chair the Canadian disaster risk reduction (DRR) platform. Our partnership with Public Safety Canada proves to be fruitful. There remains a mutual understanding that CRHNet symposiums and the DRR roundtables could benefit from a joint programming. The current discussions bring new opportunities for CRHNet to achieve its vision of a network of networks.

To materialize this vision, we partnered with Public Safety Canada, the Pacific Northwest Preparedness Society and Emergency Preparedness for Industry and Commerce Council (EPICC) to join our 2018 events. Thus, the Canadian DRR roundtable, Emergency Preparedness and Business Continuity Conference and our CRHNet conference happened in the same venue in Vancouver from October 29 to November 1, 2018. This first joint initiative reinforced our interest in pursuing similar project in the future.

Thus, the International Association of Emergency Managers (IAEM) Canada, Canada's DRR Platform and CRHNet are partnering with the Consortium ÉGIDE to co-host the Disaster Resilience Summit (dr2020.ca) in Montreal, June 16-18, 2020. Let's save the date.

Emergency Management NGOs Consortium of Canada

Reviewing the governance of Canada's Disaster Risk Reduction Platform, there appeared a need to improve the relationships with the national volunteer and humanitarian organizations. Discussions led to the development of the Emergency Management NGO Consortium of Canada (EMNCC). The consortium, through its mission, "optimizes the contribution of non-governmental organizations (NGOs) that help increase disaster resilience in communities in Canada."

In January, 2019, 14 national NGOs have formalized their terms of reference. They will soon develop a memorandum of understanding (MOU) detailing their collaboration mechanisms. EMNCC will designate the NGOs' representative with the DRR platform thus strengthening the relationships.

Core competencies

With the increased interest in the professional certifications in the field of DRR, there appears an even stronger requirement to agree on a common and scientifically valid body of knowledge. CRHNet academic members from across the country actively participate with Public Safety Canada in the identification of the emergency management core competencies. At term, this project will assist academic institutions in developing programs and courses that better fit the professional requirements

IAEM Canada

CRHNet and IAEM Canada now benefit from established communication and collaboration mechanisms. We jointly participate in different forums that illustrate our complementarity. As such, CRHNet is thrilled to participate along with IAEM Canada in a project lead by the Consortium ÉGIDE.

This project aims to assemble teams of academics and IAEM certified practitioners to rapidly respond to disasters occurring in Canada. CRHNet would facilitate the establishment of a common research protocol and IAEM Canada would develop a common deployment protocol. Such a project would allow for the rapid collection of perishable data that would populate the Canadian disaster database in a way that would allow for stronger meta-analysis.

Next steps

Now is the time to build on our last fifteen years' achievements to scale up CRHNet's contributions to a disaster resilient Canada. We should reach out to the other partners that might not even recognise themselves as playing a part in DRR (e.g., small businesses, social clubs, educators, artists).

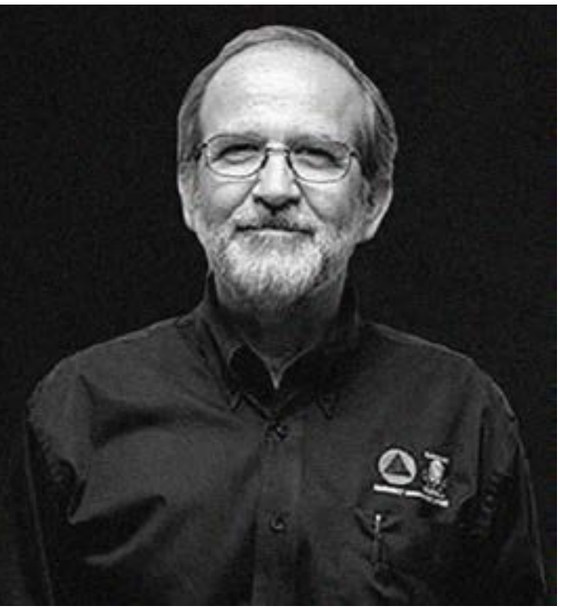
This illustrates the opportunities for CRHNet and its members to demonstrate, educate, mobilize, document and share evidence-based disaster-risk reduction initiatives. We remain engaged and more importantly, committed in championing disaster risk reduction and emergency management in our ongoing activities.

In the meantime, I wish you all success and resilience as we gather in Winnipeg for our 2019 Symposium.

Michel C. Doré, Ph.D., CEM, CGU.

President, CRHNet

Scanlon Award



Alain Normand is an author, lecturer, teacher and expert in Emergency Management. He completed his post-secondary education at the University of Ottawa in political science and public administration. He has worked in the security field, in emergency management, in crisis communications, and in business continuity.

He directed relief efforts in disasters such as the 1996 Saguenay floods, the 1998 Quebec Ice Storm, the 2010 Haiti earthquake, the 2013 Calgary floods, and the 2016 Fort McMurray Fires. A resident of Brampton, Ontario, he is the Emergency Manager for the municipality since 1999 and led the response in SARS, the 2003 Blackout, and the 2013 GTA Ice Storm, as well as many other smaller incidents.

Past-President of the Ontario Association of Emergency Managers (OAEM), he sits on many national and provincial committees. He was a member of the first committee to develop a national standard on emergency management and business continuity now known as the Z1600. He was instrumental in lobbying the CRTC to create the Alert Ready program. He is also a founding member of the NGO Alliance bringing together disaster relief agencies in Ontario and currently working with other NGOs in the creation of the Emergency Management NGO Consortium of Canada (EMNCC).

Alain is the recipient of the 2010 Canadian Award for Emergency Management and two awards from the International Association of Emergency Managers (IAEM) for the creation of the Community Emergency Response Volunteers (CERV) program and the City of Brampton branding approach to emergency public education.

He teaches emergency management and crisis communication at York University. He has taught and occasionally still teaches emergency management courses for other institutions such as Sheridan College, Northern Alberta Institute of Technology, and Humber College. He is a guest speaker at many conferences and seminars and often sought after by media outlets to speak on emergency management issues and on response to disasters.

Alain has been a Canadian Red Cross volunteer for almost 20 years and an ADRA Canada volunteer for 25 years. He now works part-time for ADRA Canada, developing and implementing the national program for In-Kind Donations Management based on the humanitarian role of ADRA International.

During his career as an emergency management professional, Alain has developed and implemented a number of initiatives such as the PX3 Educational Board Games, the CERV program, and the faith-based organization involvement in disaster relief called the Lighthouse program.

Alain is the author of a series of novels on emergency management published by Authorhouse and available on Amazon. With his background as a Seventh-day Adventist, he has written two collections of short stories on biblical topics. He has also contributed many articles and blogs on emergency management and security topics in various forums. In his spare time, he works on new book ideas he aims to publish eventually.

Alain lives in Brampton, Ontario with his wife Nicole. They are empty nesters now that their three children have moved out, all living in the GTA.

2019 CRHNet Award Recipients

Lifetime Achievement Award (LAA)
Alain Normand
Larry Pearce Education Award (LPEA)
First Place ($1000): Brady Podloski, York University
Second Place ($750): Abul Kalam Azad, University of Manitoba
Student Travel Bursary (STB)
1. Ahmadzai, Meladul Haq, Justice Institute of British Columbia
2. Ciardulli, Paolo, University of Waterloo
3. Hamilton, Shawna, University of Waterloo
Volunteer Award (VA)

Creating a method to identify lessons learned from flood events in Quebec

By Isabelle Thomas and Catherine P. Perras

This article presents a research project in which Experience Feedback from flood events is collected in order to identify lessons learned for flood risk management.

Flooding in VaudreuilDorion, May 11, 2017 Credits: By Guerinf CC BYSA 4.0

The importance of collecting experience feedback from flood events

In the spring of 2017, the province of Quebec incurred devastating floods, which affected 291 municipalities, flooded more than 5000 residences, and forced the evacuation of over 4000 people (Ministère de la Sécurité publique, 2018). Following this event, the government of Quebec adopted a decree (7772017) to prevent destroyed or highly damaged residences in 020 year flood zones from being rebuilt in certain municipalities, but also allowed these municipalities to apply for collective and individual exemptions from this rule under exceptional circumstances (Éditeur officiel du Québec, 2017). In compliance with the provincial policy, these municipalities have also had to impose mitigation measures during the reconstruction of some residences to adapt these structures to future floods. As more communities become increasingly affected by flood events, it is essential to collect and analyze data from these events to identify lessons learned, improve flood risk management, and build more resilient communities.

However,since the implementation of the decree, there have been few structured feedback mechanisms that have appreciated the consequences that these policies have had on flood risk exposure and vulnerability, and how these current policies can be improved for future disasters.

This is partly due to the fact that the government of Quebec does not have, to this day, a formal Experience Feedback methodology covering disaster risk management (DRM) processes (prevention, preparedness, emergency management, and recovery).

The research project

Hence, our research group from Université de Montréal aims to develop and test an Experience Feedback methodology for flood events through a partnership and an iterative process with *the ministère de la Sécurité publique (MSP) du Québec*, a French public research and expertise centre on risks, mobility, planning and the environment (Cerema), and the cities of Deux-Montagnes and Gatineau who also serve as case studies. These two cities were chosen as partners because they have benefitted from the collective exemptions as stipulated in the decree.

Existing experience feedback methods

Experience Feedback (or Lessons Learned) is a knowledge management practice useful for learning from past experiences. It has been found that an extensive part of the literature on DRM Experience Feedback mechanisms originates from France, where the French government has formalized a methodology to collect and analyze preparedness and intervention data related to flood risk management (BAPC, 2006), and is currently working on a national framework for Experience Feedback practices focused on flood prevention (Dantec, Galibert and Pipien, 2018).

Current methodology

Our method under development is based on the one formalized by the French government and adapted to the Quebec context. Data collected from several sources such as planning documents; financial aid and damages data supplied by the MSP; as well as interviews with flood victims and local officials, are used to assess policies put in place before, during and after the 2017 flood to manage and mitigate risks. Interviews with flood victims and local officials seek to assess their knowledge and level of preparedness before the event as well as their experiences related to DRM processes. The interview structure focuses on four main categories of knowledge and Experience Feedback: flood hazard, exposed territory (population and buildings), consequences of the flood, and risk management and mitigation measures in place. The following chart proposes a simplified Experience Feedback process that practitioners can build on to collect Experience Feedback data in floodaffected communities.

Simplified Experience Feedback Process Authors: Isabelle Thomas and Catherine P. Perras

Prevention and preparedness

The current findings are based on the case study of DeuxMontagnes, a municipality in the metropolitan area of Montreal. In terms of prevention, the research has identified the permanent adaptive measures taken by residents, namely pumps and check valves, and their level of risk awareness before the flood to evaluate the effectiveness of prevention efforts. We found that several residents were not aware of living in a flood zone prior to the 2017 flood, and therefore did not feel the need to implement mitigation measures. For the preparedness phase, differences between residents' capacity to prepare for a flood were discovered. For example, the elderly who could not rely on family and friends for help were not able to prepare appropriately by elevating their furniture or setting up sandbags. Moreover, many elderly do not have the strength to spend the night activating pumps to protect their house from rising waters. Through the interviews, flood victims were also given the opportunity to point out their preferences in terms of early warning procedures and information sources and assess the effectiveness of the early warning systems in place. Many advocated for a telephone alert system.

Flooding in Montreal, May 8, 2017 Credits: By Exile on Ontario St from Montreal, Canada 2017 Quebec Floods Montreal, CC BYSA 2.0

Emergency intervention

The findings for the intervention phase notably included the victims' lack of information about the services available through the Red Cross during and immediately after the disaster. Motivations of those who had decided not to evacuate were also investigated. It was found that while some were afraid of theft, others stayed to try to protect their residence from the flood for as long as possible. These findings will improve emergency managers' understanding of the victims' preoccupations before and during the flood, thereby allowing them to better answer their needs while ensuring their safety.

Recovery

Regarding the recovery phase, it was found that many victims who had to demolish their residence would have preferred that option even if they were allowed to rebuild, mostly because they preferred to move outside the flood risk area. The prevention and mitigation measures put in place by the residents who rebuilt their residence were also analyzed. The findings show that those whose residence had suffered limited damages tended to repair it identically, and therefore did not reduce their vulnerability to future floods. This highlights the need for a continuous program to promote and finance building adaptations in the long run. Also, the need for updated flood maps and regulation is crucial for the rebuilding process. At last, awareness and communication on risks and adaptation opportunities are needed to strengthen resilience.

Mitigation measure: Elevating a house in Deux-Montagnes, October 25, 2018 Credits: Catherine P. Perras

Methodological lessons learned

This project has revealed that flood victims and local officials have a genuine interest in sharing their experience to help design better risk management policies. Even though residents and public authorities want to move on from disasters as quickly as possible, taking the time to collect data and identify lessons learned from all phases of DRM, and for all stakeholders, can only be beneficial for building and reinforcing resilience in the long run. Lessons learned are useful not only for the studied territory but also for other areas facing similar risks.

We sincerely thank the residents and local officials who agreed to participate in the study. This research is funded by the Ministère de la Sécurité publique du Québec via the Cadre pour la prévention de sinistres 20132020 of the Quebec Government [CPS 171806] through funding of $ 215,000. The France-Quebec cooperation with Cerema is funded by the Ministère des Relations internationales et de la Francophonie. For more information on this initiative, visit the Copari website (French only)

www.copari.info.

Catherine P. Perras works as a research assistant at Université de Montréal and is currently completing her Masters in Urban Planning. She previously obtained an undergraduate degree in international management from McGill University. Her research focuses on flood risk prevention and adaptation, disaster recovery and urban resilience.

Isabelle Thomas is a professor at the School of Urban Planning and Landscape Architecture at the Université de Montréal. Her research focuses on environmental planning, climate change vulnerability and adaptation, and community resilience. She notably developed a method of analysis of social and territorial vulnerability to floods in urban areas, as well as risk communication strategies.

References

Bourdeaux, I. and Gilbert, C. (1999) Procédures de retour d'expérience, d'apprentissage et de vigilance organisationnels: Opération structurante de recherche. Available at: http://temis.documentation.developpement-durable.gouv.fr/docs/Temis/0080/Temis00801 26/21071_1.pdf (Accessed: 4 February 2019)

Bureau de l'Analyse et de la Préparation aux Crises du Ministère de l'intérieur et de l'aménagement du territoire (BAPC). (2006) Guide méthodologique : « La conduite du retour d'expérience, éléments techniques et opérationnels ». Available at: http://www.mementodumaire.net/wpcontent/uploads/2012/07/guide_methodo_REX.pdf (Accessed: 4 February 2019)

Dantec, G., Galibert, T. and Pipien, G. (2018) Retours d'expérience des inondations: Propositions d'un dispositif d'organisation et d'un guide méthodologique. (Report No. 011553-01). Available at: http://www.cgedd.developpementdurable.gouv.fr/IMG/pdf/01155301_rapport_cle2114ea .pdf (Accessed: 4 February 2019)

Éditeur officiel du Québec. (2017) Décret 7772017. Available at: http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=1&file =67054.pdf (Accessed: 4 February 2019)

Ministère de la Sécurité publique (MSP). (2018) Plan d'action en matière de sécurité civile relatif aux inondations. Available at: https://www.securitepublique.gouv.qc.ca/fileadmin/Documents/securite_civile/inondation/ Plan_action_inondations.pdf (Accessed: 4 February 2019)

Engaging Canadians in flood risk management

By Daniel Henstra and Jason Thistlethwaite

Canada needs a strategy to increase public awareness of flood risk and encourage people to protect their property from flood impacts.

Flooding is Canada's most common and most costly hazard, yet Canadians are typically unaware of their flood risk and are caught off-guard by the economic burden that flooding imposes. In actuality, Canadians personally bear roughly $600 million in flood-related losses every year. This suggests we need to do better in informing Canadians about their flood risk and to engage them in managing this risk.

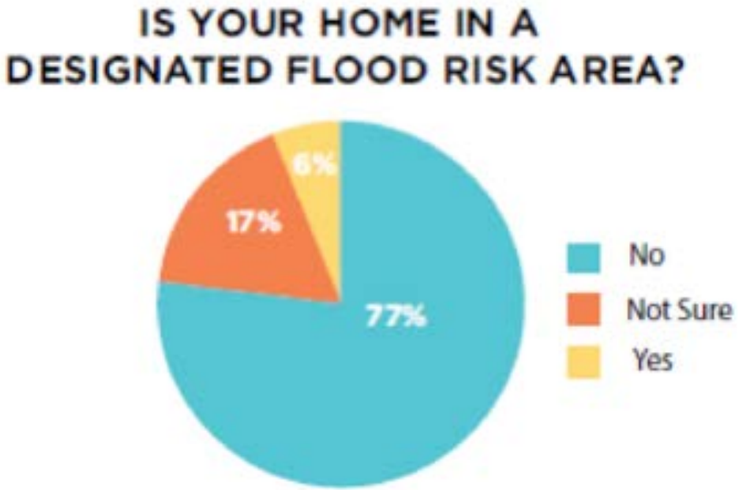
Canada's flood risk awareness gap

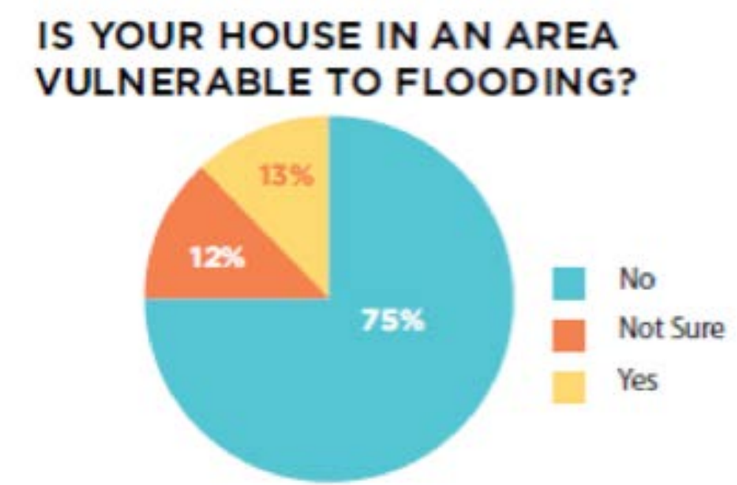
In 2016, our research team at the University of Waterloo conducted a national survey of Canadians in communities designated as "flood risk areas," meaning communities subject to recurrent and severe flooding. We asked respondents to share their perceptions of flood risk and their attitudes towards actions to protect themselves against flood damage.

More than 80% of homeowners believe they have a responsibility to protect their property from flood damage. Despite this sense of duty, however, the adoption of property-level protection measures is low: less than 30% of homeowners report actions like the use of sump pumps and water-resistant materials in basements. Insurance for overland flooding became available in Canada in 2015, but only 23% of homeowners express interest in purchasing flood insurance, and 67% want to pay less than $100 per year. Roughly half of homeowners do not know what kinds of water damage is covered in their insurance policy.

Canadians are not taking action, in part, because they lack awareness about the risks they face. *Of the 2,300 homeowners surveyed, only 6% know that their home is in a designated flood risk area. When asked how concerned they are about flood risk, half express no concern at all. And an alarmingly low number of homeowners—only 21%—believe that the risk of flooding will increase over the next 25 years.

The research evidence is clear that investing in property-level flood protection is much less expensive than restoring a property after a flood. But if we expect Canadians to play a role in flood risk management, then they must perceive flooding as a serious problem and acknowledge that they have a responsibility to protect themselves and their property. Improving public awareness of flood risk is also an important step toward meeting Canada's commitment to the Sendai Framework on Disaster Risk Reduction, which identifies "understanding disaster risk" as its first priority.





** Risk awareness alone is typically insufficient to spur protective behaviour. Also important are transparently allocating responsibilities, embedding them in decision-making and instilling a sense of personal accountability for flood risk reduction.*

Improving Flood risk awareness and encouraging responsibility

There are many ways to better engage Canadians in flood risk management, but the following are three specific mechanisms that have been the focus of our recent research.

Flood risk maps. International experience shows that flood risk maps are a crucial source of information for flood risk management. Although the primary beneficiaries of this information are professionals, they are also a valuable tool for increasing public awareness of flood risk and socializing citizens to share responsibility for risk reduction.

In a recent study, we used nine criteria to evaluate the quality of flood maps available to the public in Canadian communities located in designated flood risk areas. We found that most flood maps (62%) are low quality (meeting less than 50% of the criteria) and the highest score was 78% (seven of nine criteria met). The findings suggest that a more concerted effort to produce high-quality, publicly accessible flood maps is required to support Canada's international commitment to disaster risk reduction.

Flood risk disclosure. Property disclosure offers a potential tool by which buyers can become informed about both a home's history of flood damage and its exposure to future flood risk. Openly communicating flood risk information enables and motivates individuals to take protective action. Moreover, from an ethical standpoint, individuals should only be held responsible for managing their flood risk if they have been empowered through risk information to act in their own best interests.

Whereas property disclosure statements in some Canadian provinces, such as Manitoba, Quebec and New Brunswick, ask sellers whether the property has sustained previous damage from flooding, only Ontario's Seller Property Information Statement includes a specific question about current flood exposure: "Is the property subject to flooding?" In their current form, therefore, property disclosure statements in Canada provide inadequate information for buyers to make educated decisions about flood risk.

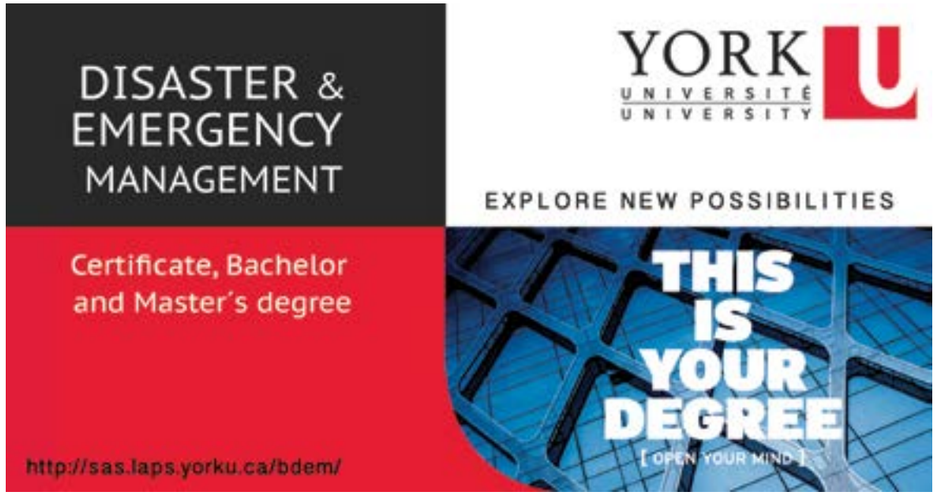
Flood insurance. Insurance is an efficient, resilient and legitimate approach to flood disaster recovery. A pool of premiums ensures no individual is unfairly burdened with the cost, premiums can be lowered or raised to influence risk behaviour and, by paying the premium, property owners accept that they are responsible for financing their recovery. The problem is that households in high-risk areas—about 8-10% of Canadians—are largely uninsurable because premiums are too high for property owners to afford.

Our review of other countries' approaches to supporting flood insurance in high-risk areas reveals two key lessons. First, publicly available flood risk maps encourage demand for insurance by promoting flood risk awareness and providing a transparent means to determine premium adjustments. Second, insurance availability and affordability hinge on the willingness of governments to support flood risk mitigation in high-risk areas. By reducing property-owners' financial burden of recovery, flood insurance can encourage more occupation of flood-prone areas, so there is a continued need for public investment in flood mitigation.

Conclusion

Effective flood risk management requires a concerted strategy to make Canadians aware of their flood risk and encourage them to take some responsibility for protecting their property from flood impacts. This article highlighted three tools that could improve flood risk management: public flood risk maps, flood risk disclosure, and flood insurance for high-risk properties. These mechanisms would contribute to fulfilling Canada's commitment to the Sendai Framework on Disaster Risk Reduction. They also reflect the priorities in the recently-released Emergency Management Strategy for Canada, which include enhancing collaboration and coordination, improving understanding of disaster risk, and preventing and mitigating disasters.

Daniel Henstra is Associate Professor of Political Science at the University of Waterloo. His research analyzes the multilevel governance of complex policy areas like emergency management and climate change adaptation.



Long-term outlook on flood losses

By Dominik Paprotny

Growth in flood losses in Europe can be explained by growing exposure, while vulnerability is shown to decline with economic development.

Lost in perception

The common perception of flood losses is that they are growing and this perceived increase is driven by a changing global climate. The absolute value of losses has indeed grown worldwide (Munich Re, 2018), however the actual source of the growth in flood risk still eludes the public consciousness. Flood risk is the interplay of three components: hazard (flood intensity and its likelihood), exposure (an inventory of things that are in harm's way) and vulnerability (how badly things get damaged if a flood strikes them). A study published last year on flood losses in Europe that have occurred since 1870 (Paprotny et al., 2018a) shows the most prominent role of exposure in driving the changes in flood risk.

The new normal

The analysis presented in Paprotny et al. (2018a) was based on two sources: a consistent and spatiallydefined catalogue of damaging floods from 1870 to 2016, and detailed information on the land use, population, assets and economic production in each affected area, both at the time of the event and at present (Paprotny et al., 2018b). This enables adjustment, or 'normalization', of reported flood losses by removing the effect of landuse change and economic growth. As a consequence, the upwards trend in the number of affected people and economic losses turned out much lower for 1870–2016 than without such adjustment. For 1950–2016, it shows that economic losses were actually declining. 'Normalized' fatalities indicated a steep decrease.

It was further discovered that the records of events and losses are biased towards modern times: information on smaller floods that have occurred deep in the past is largely missing, due to lower accessibility of primary sources and fewer mentions in historical books. If we rank the floods by the severity of (normalized) losses they have caused, the top 20% of events are evenly distributed over time, while the smaller the flood, the higher upwards trend is recorded. Considering those unknown losses based on the expected distribution of events (as for each big flood there have to be several small ones), a decline in flood losses is evident, especially since 1950.

Safer in the city

What about the remaining two factors, then? Previous research has indicated that extreme discharges in most rivers of Europe are not occurring any more frequently today than in the past, though climate data indicate some increase in heavy rainfall that leads to flash floods, while sea level rise is contributing to higher storm surges (Mudelsee et al., 2003, Kundzewicz et al., 2005,

Glaser et al., 2010, Hall et al., 2014). Notwithstanding, any increase in the hazard must be matched by an even greater decline in the vulnerability in order to explain the observed trends in flood losses (stable or declining depending on the measure).

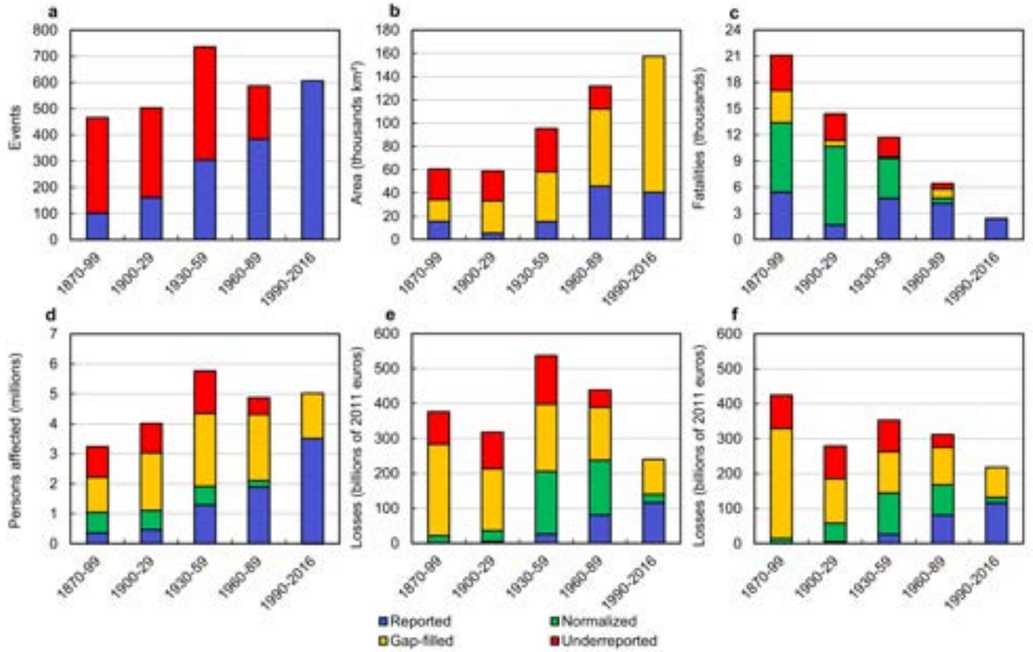
Data on land use, population, economic production and wealth in the floodplains at the time when the top 20% floods in the catalogue have taken place are revealing. The amount of losses (fatalities, persons affected, monetary value) relative to the number exposed in the hazard zone is correlated in particular with the urbanization and economic development. Lower vulnerability was particularly related to a higher percentage of the floodplain under an urban fabric; population density; GDP per capita; and percentage of assets in infrastructure. Conversely, higher vulnerability was mainly correlated with the percentage of assets belong to the agricultural sector, and to a lesser extent, to industrial share of assets or agricultural land use (Paprotny et al., 2018a).

The lower vulnerability of urban areas compared to rural areas could be to some extent explained by better structural flood protection of the former, but the percentage of the flood hazard zones actually flooded during the most extreme events is weakly related to land use or population density (Paprotny et al., 2018a). Hence, lower relative losses in Europe must be explained by lower vulnerability of residential, services and infrastructure assets compared to industrial and particularly agricultural assets. Part of the explanation could be technological development (better construction methods, early warning, evacuation), but also by evolving institutional sector (the rise of professional emergency services, flood prevention/response agencies and regulations).

Getting out of the way

The findings from Paprotny et al. (2018a) provide an insight on how flood vulnerability changes with the socioeconomic development of countries. This is relevant given that the demographic, economic and settlement structures of 'developing' countries resemble far more Western Europe in the early 20th century rather than the early 21st. Countries with more rustic and poorer populations, as well as largely agriculturebased economies, are therefore more vulnerable to floods, but the example of Europe shows that they can adapt effectively so that the losses won't grow as fast as their exposure, which at current trends will rise due to urbanization and development.

Yet the reduction of exposure is also a possibility. Preventing urban sprawl, for instance, would help; the recent rise of urban floods from extreme cloud outburst in European cities can be largely attributed to growth in soilsealing artificial surfaces (eightfold since 1870), which is far faster than the increase in urban populations. Floodplains should be less intensely used as well. Significant restrictions on construction in hazard zones could help particularly countries which have their most intense development phase still in front of them.



Flood losses aggregated to 30 year periods, reported numbers and with three types of adjustments: normalization, gapfilling of missing (normalized) loss data and estimation of underreporting of small flood events and normalized damages they caused, for (a) number of events; (b) area inundated; (c) fatalities; (d) persons affected; (e) financial value of losses with normalization by GDP; and (f) financial value of losses with normalization by wealth.

References

Glaser, R., Riemann, D., Schönbein, J., Barriendos, M., Brázdil, R., ..., and Himmelsbach, I. (2010) 'The variability of European floods since AD 1500', Climatic Change, 101, pp. 235–256 Hall, J., Arheimer, B., Borga, M., Brázdil, R., Claps, P., ..., and Blöschl, G. (2014) 'Understanding flood regime changes in Europe: a stateoftheart assessment', Hydrology and Earth System Sciences, 18, pp. 2735–2772.

Munich Re (2018) Weatherrelated loss events worldwide 1980 – 2017. Available at https://www.ifat.de/media/website/dateien/pdf/zukunftsdialog/eberhardfaustpresentation.pdf (Downloaded: 22 February 2019).

Paprotny, D., Sebastian, A., Morales Nápoles, O., and Jonkman, S.N. (2018a) 'Trends in flood losses in Europe over the past 150 years', Nature Communications, 9, 1985.

Paprotny, D., Morales Nápoles, O., and Jonkman, S.N. (2018b) 'HANZE: a panEuropean database of exposure to natural hazards and damaging historical floods since 1870', Earth System Science Data, 10, pp. 565–581.

Kundzewicz, Z. W., Graczyk, D., Maurer, T., ..., and Szwed, M. (2005) 'Trend detection in river flow series: 1. annual maximum flow', Hydrological Sciences Journal, 50, 797–810.

Mudelsee, M., Börngen, M., Tetzlaff, G., Grünewald, U. (2003) 'No upward trends in the occurrence of extreme floods in central Europe', Nature, 425, 166–169.

Dominik Paprotny is a postdoctoral researcher at the GFZ German Research Center for Geosciences. A geographer by training, he carried out highly interdisciplinary research on flood risk in Europe at Delft University of Technology, before moving to GFZ to work on modelling flood damages to residential and commercial buildings.

Diversification of flood risk management: The way forward?

By Dries Hegger

The European project STAR-FLOOD has investigated efforts to diversify flood risk management (FRM) modes in Belgium, England, France, the Netherlands, Poland, and Sweden. Findings from the project show that a range of FRM modes will be required to anticipate the consequences of urbanization and climate change.

The investigated countries are increasingly looking for approaches that are either fail-safe or safe-to-fail. Fail-safe refers to a system that decreases the probability of flooding, while safe-to-fail refers to an approach that can fail, but is likely to do so in a safe way. Fail-safe design is not always desirable, as it could invoke a safety paradox by triggering urban development in flood-prone but dike-protected areas, nor is it always possible. Therefore, both approaches are necessary.

Five modes of flood risk management

The STAR-FLOOD project identified five modes of FRM. In stakeholder workshops and during conferences, this scheme showed its practical value as a communicative tool that helps structure dialogues about flood risk governance approaches. These five modes are depicted in Table 1.

Challenges customizing the five modes

As the project revealed, countries tend to encounter specific challenges when they attempt to customize FRM modes for their particular requirements. For example, in the past, Poland and the Netherlands focused primarily on flood defenses. The Netherlands is internationally renowned for its track record in 'fighting against the water'. Likewise, in Poland, sound defense structures are seen as ideal, even though Polish water management agencies lack adequate resources to construct and maintain them. As well, in these two countries, the primary responsibility for FRM lies with water authorities, giving these authorities significant power.

MODE	CHARACTERISTICS
Flood Risk Prevention	1- Flood risk prevention • aim: decrease the consequences of flooding • decrease exposure • 'keep people away from water' • restrict building in flood-prone areas
Flood Defence	2- Flood defense • aim: decrease the probability of flooding • structural measures • 'keep water away from people' • dikes, dams, embankments, increasing the capacity of existing water channels, upstream retention
Flood Risk Mitigation	3- Flood risk mitigation • aim: decrease the consequences of floods • measures inside the vulnerable area • smart design & water retention in urban environments • smart spatial ordering inside urban areas, water retention in protected areas, or flood-proof buildings
Flood Preparation	4- Flood preparation • aim: decrease the consequences of floods • prepare for a flood event • flood forecasting and warning systems & disaster management/ evacuation plans
Flood Recovery	5- Flood recovery • aim: recovery after a flood event • freconstruction or rebuilding plans & compensation/insurance systems

Table 1. Five modes of FRM adapted from Driessen et al., 2018

As the project revealed, countries tend to encounter specific challenges when they attempt to customize FRM modes for their particular requirements. For example, in the past, Poland and the Netherlands focused primarily on flood defenses. The Netherlands is internationally renowned for its track record in 'fighting against the water'. Likewise, in Poland, sound defense structures are seen as ideal, even though Polish water management agencies lack adequate resources to construct and maintain them. As well, in these two countries, the primary responsibility for FRM lies with water authorities, giving these authorities significant power.

The leadership of water authorities explains why innovative FRM approaches in these countries mostly emerge as part of flood defense strategies (e.g. Room for the River), and only to a lesser extent in flood mitigation strategies. Providing 'Room for the River' refers to approaches that aim to give rivers more room so that they can manage higher water levels. Typical measures include river widening/deepening, dredging, creating bypass channels and dike relocations (amongst other measures). These approaches have in common that they involve management of the river system.

Experiences in these countries indicate that past investments in flood defense also tend to lead to a 'locked-in' situation. In the Netherlands, urban development in flood-prone areas remains more or less the default option, since more than half of the country's surface can potentially be flooded. Existing pathways of urban development are unlikely to be reversed. Therefore, despite the relative success of the Netherlands in reducing flood probabilities, a debate has started on approaches to better deal with the potentially disastrous effects of floods when they do occur (PBL, 2014).

England presents a different example. England has been struck by several floods in the past years, including in Somerset in 2014. One might accordingly assess England's FRM approach as less effective than that in the Netherlands, for example. However, the STAR-FLOOD project found that FRM in England has been diversified for several decades, and "that England's portfolio of management approaches can be diagnosed as balanced…showing a high degree of diversity, although the effectiveness of specific approaches was found to need improvement" (Driessen et al., 2018, p. 5). In particular, England "has a range of approaches at its disposal, each of them tailored to specific circumstances in terms of the physical characteristics of an area and the potential for damage and economic loss" (ibid). Still, claiming 'there is also something good in floods' goes against the losses and strong emotions of those who have become the flood victims.

Strengthening additional strategies

FRM approaches from Belgium, France and Swedes can be positioned between the extremes. Each country is strengthening specific additional strategies: flood prevention and mitigation in Belgium; flood prevention in France; and flood preparation in Sweden (Driessen et al., 2018).

The findings of this European project conveyed two key lessons with broad relevance (Raadgever and Hegger, 2018):

- Context-sensitive planning and implementation are necessary. Diversification of FRM modes is desirable, but the extent and ways in which diversification takes place depend strongly on legacies left by previous actors and approaches.
- Flood management cannot be left to water managers alone but requires the involvement of spatial planners, contingency agencies, insurance companies and private actors, including citizens. It is crucial to engage these actors in dialogues about desired levels of flood protection and appropriate approaches to realizing these. This requirement points to one overall governance challenge: to build "bridges over troubled waters" (Gilissen et al., 2015).

This research shows that more practical experience with diversification of FRM modes and multi-actor collaboration needs to be gained. These experiences should be closely monitored to allow for lesson drawing and inter-country learning.

Références

Driessen, P.P.J., Hegger, D.L.T., Kundzewicz, Z.W., van Rijswick, H.F.M.W., Crabbé, A., Larrue, C., Matczak, P., Pettersson, M., Priest, S., Suykens, C., Raadgever, G.T., Wiering, M. (2018) 'Governance strategies for improving flood resilience in the face of climate change.' Water, 10 (11), 1595. doi.org/10.3390/w10111595

Gilissen, H.K., Alexander, M., Beyers, J.-C., Chmielewski, P., Matczak, P., Schellenberger, T., Suykens, C. (2015) 'Bridges over troubled waters: An interdisciplinary framework for evaluating the interconnectedness within fragmented domestic flood risk management systems.' Journal of Water Law, 25 (1), pp. 12-26.

PBL (2014) Kleine kansen, grote gevolgen. Slachtoffers en maatschappelijke ontwrichting als focus voor het waterveiligheidsbeleid. The Hague: PBL The Netherlands Environmental Assessment Agency.

Raadgever, T., Hegger, D. (2018) Flood risk management strategies and governance. Dordrecht: Springer.

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Success Stories: Emergency management and First Nation partnership

By Mackenzie Deschambault

This article is a reflection of Mackenzie's experience as an Indigenous Masters student working with the Emergency Management Directorate in a 'First Nations First' environment; this type of environment includes full collaboration and partnership with Indigenous partners, with Indigenous concerns at the forefront of discussion. As someone who has dedicated many years of research to Indigenous legal issues, Mackenzie found it was rewarding to work within a departmental shift which has welcomed a new mandate, placing emphasis on partnership and reconciliation with Indigenous peoples. Given the increasing severity of disasters on Indigenous communities, it is crucial that individuals are made aware of Emergency Management and that its practice continues to engage and collaborate with First Nation peoples to ensure that Indigenous communities have the same access to resources and training that non-Indigenous people benefit from. Beyond that, the Emergency Management Directorate has committed to working alongside these communities to ensure not only recovery but a promise of building back better.

Firsthand experience

As an Indigenous student that has dedicated seven years to studying Indigenous Law and coming into the government with very little knowledge about Emergency Management on reserve, I am happy to say that the experience has been very uplifting, especially in regard to the progress being made to ensure Indigenous communities are facing the same protections and access to opportunities as other Canadians in times of distress. My employment opportunity with the Emergency Management Directorate allowed me to delve first hand into the emergencies which Indigenous communities are facing; such as flood and fire, severe weather, and loss of essential services. However, this opportunity has also allowed me to see the progress being made within Indigenous communities to better protect themselves from these effects by building back better and forming partnerships with the Government of Canada.

Prone to disasters

First Nation communities are 18 times more likely than their off-reserve counterparts to be evacuated due to emergencies; since 2009, over 80,000 on-reserve residents have had to leave their homes due to emergencies such as fire and flood (Emergency Management Directorate, Report Pending Publication). First Nation residents also face risks from natural/environmental and public health emergencies due to realities such as remoteness, community size, and inadequate or non-existent infrastructure.

A shift in mandate, partnership as a priority

Indigenous Services Canada (ISC) is undergoing a departmental shift and has welcomed a new mandate placing emphasis on partnership and reconciliation with Indigenous Peoples. As an Indigenous person, this shift brings comfort to me knowing that Canada's largest governance structure is working towards a partnership with Indigenous peoples and working to fix an institution that is not working in the best interest of all Canadians. Having done my master's thesis on the colonial implications of the Indian Act of 1876 which is one of the founding pieces of Indian legislation still entrenched within the government structure, it is important to see the advancement of opportunity, collaboration, and education that the Emergency Management Directorate (the Directorate) has fully integrated into the work of the Emergency Management Assistance Program (the Program).

Photos provided with permission from the Emergency Management Directorate.

Emergency management wildland fire example

An astonishing 80% of Indigenous communities in Canada are located in forested areas, prone to wildland fire (Amy Christianson, 2015, p.190). With wildland fires increasing in severity and frequency, traditional fire suppression methods involving the deployment of vast resources are decreasing in effectiveness. In an effort to alleviate pressure on fire suppression agencies, and the risk posed to First Nation communities, a proactive approach was developed to protect communities and critical infrastructure referred to as Indigenous FireSmart.

FireSmart is a multi-faceted initiative intended to reduce vulnerabilities in the wildland-urban interface; it is an all-encompassing initiative which involves community leaders, community members, firefighters, emergency personnel, industry partners, and third-party stakeholders all working together to reduce wildland fire vulnerabilities and risks in First Nation communities across Canada.

Since 2015, the Program has supported a highly successful FireSmart pilot project with the Prince Albert Grand Council which represents twelve First Nation communities in Saskatchewan's north. In more recent years, at-risk communities in Alberta, British Columbia, Ontario, and the Northwest Territories have also become part of the Indigenous FireSmart community. This pilot project has become crucial in assisting high-risk First Nation communities to mitigate the impacts of wildland fires. As someone who is new to government, it makes me proud to work within a team that is dedicated to ensuring that new program initiatives succeed and that these initiatives are ever improving the relationship between First Nation communities and the Federal Government.

References

Christianson, A. (2015) Social Science Research on Indigenous Wildfire Management in the 21st Century and Future Research Needs. International Journal of Wildland Fire. 24.2: 190-200.

All of the statistics above come from the Emergency Management Directorate and are results of data collected after emergencies; the data is accessible either through EMD databases, reports pending publication or statistics.

Please see ISC homepage: https://www.canada.ca/en/indigenous-services-canada.html

Please see official mandate: https://www.sac-isc.gc.ca/eng/1539284416739/1539284508506

Please see Departmental Plan 2018-2019: https://www.sac-isc.gc.ca/eng/1523374573623/1523904791460

Please see the Indian Act (R.S.C., 1985, c. I-5): https://laws-lois.justice.gc.ca/eng/acts/i-5/

Please see FireSmart homepage: https://www.firesmartcanada.ca/

Mackenzie Deschambault

I am an Indigenous Masters student studying at Carleton University. I am writing my thesis on the Colonial Implications of the Indian Act on Indigenous Women in Canada. I have a Bachelor of Arts Degree with Honours in Law and Human Rights and have dedicated many years to Indigenous legal issues, knowledges and histories.

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Empowering Indigenous emergency management: The Prince Albert Grand Council and the Canadian Red Cross agreement

By Simon J. Lambert, Lorne Stewart, Tina Pelletier, Dee Friday, and Pat Hassler

Flood and fire, Saskatchewan's seasonal hazards

Flood and wildfire are seasonal hazards for many northern communities in Saskatchewan, Canada, forcing many Indigenous families to evacuate their homes, often for extended periods. James Smith Cree Nation, Cumberland House, and Red Earth are evacuated to some degree most years due to flooding. A series of evacuations in the 2015 fire season raised concerns over the cultural needs of Indigenous evacuees, particularly Elders. Official Evacuation Reception Centers were established by the Canadian Red Cross in Regina, Saskatoon, Prince Albert, and North Battleford in Saskatchewan, and Cold Lake in Alberta. Several First Nations also took in evacuees, such as Ahtahkakoop Cree Nation, Beardy and Okemasis First Nation, Willow Cree Nation, James Smith Cree Nation, Muskeg Lake Cree Nation, and Meadow Lake Cree Nation. Many evacuees were out of their communities for more than a week (Northern Inter-Tribal Health Authority, 2015). It was, for many community members, a very stressful and traumatic experience.

While governance, operational capability, and capacity are fundamental to limiting the negative impacts on any community during an emergency, an awareness of stakeholder needs and expectations is also vital (McMartin et al., 2018). Indigenous cultures have always valued hospitality and communities often show sensitivity to those in need following a disaster or emergency, whether from their own community, other Indigenous Peoples, or non-Indigenous peoples. A semi-formal 'Rez Cross' grew organically from the efforts of Beardy's and Okemasis First Nation to host relatives and others evacuated from the 2015 fires, providing culturally appropriate support around those displaced from their own communities. Professor Jim Waldram of the University of Saskatchewan was among those calling for a formal acknowledgment of what Beardy's and Okemasis undertook: "It's a model that by definition is going to greatly reduce distress" (CBC News, 2015).

A report commissioned by the Northern Inter-Tribal Health Authority (NITHA) to look into the response and evacuation procedures of the 2015 Saskatchewan wildfires revealed a lack of defined roles and responsibilities that made it difficult for community representatives to address community concerns or help ensure the wellbeing of evacuees (Betancur, 2019). Conspicuously, the NITHA report noted, "a general sense that the provincial response lacked cultural awareness and sensitivity" (Northern Inter-Tribal Health Authority, 2015, p. 9). Communities were in need of a new relationship with emergency partners.

A new relationship with Canadian Red Crosss

If there is one benefit from an emergency it is the opportunity to revisit procedures. Out of this disconcerting situation came a new approach. Lorne Stewart, emergency response coordinator for Prince Albert Grand Council (PAGC), and others saw the opportunity to put in place a better way to catalyse the joint capacities of Indigenous communities and the Canadian Red Cross in evacuation planning and response. Discussions ultimately led to the signing of a historic agreement in March 2018 formalizing the relationship between PAGC (representing 12 Indigenous communities) and the Canadian Red Cross. At the official signing, the Grand Chief noted "[The] significant step forward in building a more cooperative and collaborative relationship between the Prince Albert Grand Council and the Red Cross. This agreement means, during the time of emergency, we will be able to participate and contribute in planning and working together towards our common goal, providing the best support and services to those affected by emergencies in northern communities" (Marr, 2018).

Caption: L-R Pat Hassler, Lorne Stewart, Tina Pelletier, Dee Friday, and Simon Lambert.

The CRHNet 2018 Conference

The Agreement was the subject of a panel at the 2018 CRHNet Conference in Vancouver. The panel was chaired by Dr. Simon Lambert from the University of Saskatchewan while the appropriate opening and closing of the session was undertaken by Grand Chief Brian Hardlotte. The panellists spoke personally of their experiences and aspirations for the communities of PAGC. Lorne Stewart talked humbly about his role as an on-the-ground coordinator. Tina Pelletier, also PAGC, spoke on the experiences of working in emergency management and then taking on Red Cross volunteer training. Dee Friday, who works for the Saskatchewan Red Cross, told of her delight in finding that the Red Cross could support her in helping her own community. Pat Hassler gave a little of the history of how the Agreement came about: a coincidence of the right people at the right time, exchanging insights and agreeing to formalize a better way to do things in the future.

The close-knit nature of Indigenous communities and the acknowledgement and maintenance of interconnections between different communities is in many ways a defining feature of Indigenous cultures. "Our communities are so close-knit," Hardlotte said. "When one is in need, we treat each other like an extended family" (Marr, 2018).

Empowering Indigenous emergency management

Other First Nations, in Saskatchewan and Manitoba, are looking to emulate PAGC's agreement with the Canadian Red Cross. Despite the geographical isolation, northern communities in Saskatchewan are innovating and leading the emergency management world in recognizing the strengths and capacities of Indigenous Peoples. Lorne Stewart has been particularly busy visiting northern communities and recruiting willing volunteers, recording his epic efforts by social media on PAGC's Facebook page.

Canadian Red Cross are willing and able to help. What communities bring are desire (for greater self-sufficiency), skills (as first responders, as people of the land), and their indigenous knowledges that provide locally-specific information grounded in ancient philosophy. With the increasing frequency and intensity of flood and wildfire events, training, resourcing and collaborating with new partners, and old partners in new ways are fundamental to improving the resilience of Indigenous communities.

References

Betancur, S. 2019. Inside the Rez Cross: An assessment of hosting evacuees during a wildfire disaster in Beardy's and Okemasis First Nation. Masater of Arts Masters, University of Saskatchewan.

CBC News. 2015. Saskatchewan First Nation sets up 'Rez Cross' wildfire evacuation centre [Online]. Toronto: CBC/Radio-Canada. Available: http://www.cbc.ca/news/canada/saskatchewan/saskatchewan-first-nation-sets-up-rez-cross-wildfire-evacuation-centre-1.3143017 [Accessed].

Marr, T. 2018. Red Cross, PAGC formalize collaboration agreements for disaster assistance. PA Now, March 2, 2018.

McMartin, D. W., Sammel, A. J. & Arbuthnott, K. 2018. Community Response and Engagement During Extreme Water Events in Saskatchewan, Canada and Queensland, Australia. Environmental Management, 61, 34-45.

Northern Inter-Tribal Health Authority. 2015. 2015 Saskatchewan Wildfire Study. Prince Albert: NITHA.

Simon J Lambert is from Aotearoa New Zealand, a member of Tuhoe and Ngāti Ruapani mai ki Waikaremoana tribes. He is an Associate Professor in Indigenous Studies at the University of Saskatchewan.

Lorne Stewart is from Cumberland House and is the Emergency Response Plan Coordinator for Prince Albert Grand Council.

Tina is a member of the Canadian Red Cross' Emergency Response Team, the Prince Albert Grand Council (PAGC) Search and Rescue Team, and the PAGC Cultural Wellness (Crisis) Team. Prior to moving to Prince Albert, Saskatchewan, she worked for the United Nation's Interagency Rehabilitation Programme (UNIRP) for former child soldiers in Kathmandu, Nepal.

Dee Friday is a Saulteaux from Cote First Nation in Saskatchewan and is an Indigenous Peoples Community Officer in Emergency Management for the Canadian Red Cross. Throughout her 13 years with the Red Cross, she has worked tirelessly to build partnerships between the Red Cross, Indigenous Communities, and Tribal Councils.

Pat Hassler is an Advanced Care Paramedic for the Northern Inter-Tribal Health Authority.

Float when it floods: Amphibious architecture as an alternative flood risk reduction strategy

By Michelle Castro Bullough, Shabaan Khokhar, and

Elizabeth C. English

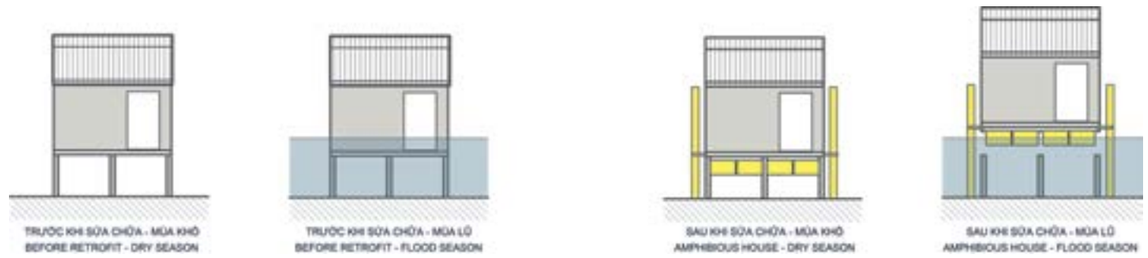


Figure 1: Response to flooding of a building retrofitted with a buoyant foundation

Louisiana origins

In late August 2005, storm surges from Hurricane Katrina swept into canals, broke through the levees, and pushed homes off their foundations. Much of New Orleans was steeped in brackish water for weeks. Elizabeth English, who was at Louisiana State University's Hurricane Center at the time, witnessed the devastation first-hand. In the aftermath, the US Federal Emergency Management Agency (FEMA) recommended that homes be elevated. Concerned that lifting homes would diminish community cohesion and create difficult access for residents, English sought alternative solutions.

In 2006, she founded the Buoyant Foundation Project (BFP) and began developing strategies to retrofit homes with amphibious foundations. The concept allowed otherwise-ordinary structures to float in place temporarily when flooding occurred. The first full-scale prototype, representing a typical New Orleans shotgun-style house, had a steel frame affixed beneath the floor, to which buoyant foam blocks could be attached. Vertical guidance posts inserted into the ground near the corners were then connected to the frame (Figure 1).

Fast forward to today and the BFP has two more recent prototype projects—one in rural Vietnam and another in Ontario. Located in vastly different contexts, both projects are teaching us more about best practices for designing buoyant foundations.

Figure 2: Retrofit of a new house with a buoyant foundation, An Giang Province, Vietnam

Figure 3: Retrofit of a traditional house with a buoyant foundation, An Giang Province, Vietnam

Designing for the Mekong Delta

The Mekong Delta is Vietnam's heart, both for its role in food supply and its rhythmic flood pulse. Flooding is an annual occurrence that, when allowed to flow naturally, replenishes the land. Farmers' homes are traditionally raised above ground to reduce damage from flooding; however, with flood events increasing in intensity, such static elevation is not always sufficient. Supported by the Global Resilience Partnership and the Z Zurich Foundation, the BFP and its local Vietnamese partners implemented four amphibious retrofit prototypes on two houses in An Giang Province and two in Long An Province.

The team constructed the amphibious retrofits in the summer of 2018. Monitoring equipment was installed to collect wind and motion data for calibrating buoyant stability. In the process, BFP taught local carpenters the basics of amphibious retrofits for existing houses using familiar carpentry skills, construction techniques and building materials. This training will position communities to expand this work on their own, initiating a scalable community-based bottom-up approach to flood risk reduction and climate change adaptation.

During the 2018 monsoon season, the floodscape surrounding the retrofitted homes was dotted with the tips of submerged rice stalks and partially submerged homes. In post-flood interviews, the beneficiaries expressed delight with the results. The retrofits enhance community resilience by allowing at-risk households to remain safely in place during flood events, providing them with greater opportunity to pursue their daily economic activities without social and physical disruption or the cost of repairs (Figures 2 and 3).

Ontario prototypes and design guidelines

Under a grant received from the National Research Council of Canada (NRC), the BFP is developing prototypes for retrofitting existing Canadian homes to become amphibious, with the goal of exploring buoyant foundation retrofits as a potential climate change adaptation strategy for First Nations communities.

To initiate the project, the BFP team has designed and constructed in Waterloo, ON, a wood frame pavilion prototype fitted with a buoyant foundation. Sited on a pond at the University of Waterloo (UW), the prototype provides a means of monitoring and analyzing the response of a buoyant foundation as it undergoes the freeze-thaw cycles typical of the Canadian climate. The pavilion was constructed at the UW School of Architecture satellite campus in Cambridge by graduate and undergraduate architecture students working with the BFP. The installation of the pavilion on the pond in early October 2018 and further monitoring in 2019 represent the first phase of the larger NRC project (Figure 4).

In fall 2018, the BFP team began a collaboration with the owner of a flood-vulnerable cottage in Minden, ON. The team is moving forward to design an amphibious retrofit solution for this cottage. The circumstances of the cottage provide a perfect opportunity to develop the second phase of the NRC project with the intent not only to demonstrate the appropriateness of amphibious retrofits for cottages, but also to provide an example of amphibious retrofit construction that can be visited and observed by leaders of flood-prone First Nations communities that might be considering adopting this approach.

The project will conclude in Phase 3 with a proposal for preliminary design guidelines, as a first step toward the future codification of amphibious construction.

Figure 4: A-frame pavilion prototype as constructed at the University of Waterloo School of Architecture (left) and as installed on site at the UW north campus (right).

Sustainability for the vulnerable

Amphibious retrofits have dramatically improved the lives of GRP's beneficiaries in Vietnam and have the potential to help other flood-prone, low-income communities. After our NRC prototype testing, we hope it will be only a matter of time before amphibious construction is introduced into the Canadian NationalBuilding Code. 'Building back better' with this technology can preserve valuable structures and maintain social cohesion, enabling communities to become more resilient against climate threats.

Michelle Castro Bullough and **Shabaan Khokhar** are masters students at the University of Waterloo School of Architecture and Graduate Research Assistants working with the Buoyant Foundation Project.

Elizabeth English is Associate Professor at the University of Waterloo School of Architecture. She is the founder and director of the Buoyant Foundation Project.

Bushfires in Australia: There is a bit of complacency in all of us

By Dr Richard Thornton, Bushfire and Natural Hazards Cooperative Research Centre

February 7, 2019, marked the tenth anniversary of the devastating bushfires that struck Victoria, Australia, killing 173 people, and damaging thousands of homes and businesses. What was a calamitous day for many is now viewed as a watershed moment in the way such emergencies are handled, not just in Australia, but around the world. The Bushfire and Natural Hazards Cooperative Research Centre extends its deepest condolences to all those communities impacted by these fires.

Looking back at 2009, there was widespread disbelief at how such a major catastrophe could have hit Victoria, arguably one of the leading Australian states for bushfire community engagement and safety. There were many areas that were part of the Country Fire Authority (Victoria's rural fire agency) Community Fireguard program, which in itself was seen as best practice for community engagement and safety, and the Australian model of 'Stay or Go' as it had been dubbed, was showcased and had started to take a foothold in parts of the United States. Black Saturday put a serious halt to all that, and wide-reaching community pain and hurt were felt throughout Australia. But the extraordinary thing about this summer day that turned bad was that the weather and fire conditions were inevitable, and they could happen again.

Researchers working with fire agencies in the aftermath of the fires, where over 2,000 houses were destroyed.
David Bruce, Bushfire and Natural Hazards CRC

Comprehensive changes for a better tomorrow

Valid questions for 2019 include what has changed since this devastating day and the lead-up to it? What do we know now that we didn't then; how has extensive research changed our approach; and what role does personal behaviour play in survival? In short, the changes have been comprehensive – in policy, operations, community engagement, and in the way we have invested in learning.

Firstly, changes to the Victorian fire services now make it very clear who is accountable. The position of the Fire Services Commissioner was created and has since broadened in scope to be the Emergency Management Commissioner. This was not just simply a change in titles, but a fundamental shift in the approach to critical decisions in complex and highly-stressful situations.

Secondly, community information and warnings are now significantly different in both content and tone to ensure that they are heard and – more importantly – acted upon. Immediately following the fires, Bushfire Cooperative Research Centre researchers surveyed several thousand community members to understand what they did and didn't do, and why. It was a revelation to fire agencies to learn that many people neither heard or understood their fire warnings and information. Our research identified something in the psyche of many people under threat of fire – either actual or potential – that makes them process that information in unexpected ways. Despite the stated intention to either 'Stay or Go', many people did not do this, for various reasons, or misunderstood what it meant to either stay or to go.

Fire agencies across Australia have learned from this and have adopted stronger and more specific community messaging, which has undoubtedly resulted in a reduction in loss of life in subsequent bushfires. This has been a long and difficult task and the role of research has been not just to identify the limitations of current warnings and emergency information, but to help construct a new language that has an impact. These insights into human behaviour have been supplemented through surveys conducted by CRC researchers following major bushfires across Australia over the last decade.

Thirdly, the extensive investment in science has led to a better understanding of the fire behaviour that occurred on that day – how fire moves across different types of land and how fire interacts with the atmosphere to create its own weather. These new insights are embedded in training packages for fire behaviour analysts to provide more accurate warnings to the community. We now have fire simulation tools used routinely in control rooms throughout the country. The residents of Gracemere, Queensland were the most recent beneficiaries of these simulations in November last year as the predicted path of a fast-moving fire placed them in great potential danger – specific warnings were enacted, firefighting resources were redirected, and the safety of the town and its residents was ensured. These tools did not exist in Australian control centres in 2009 and would not have existed without the boost in research effort after these fires.

Finally, following the extensive examination of the houses that were lost and, equally importantly, those that survived, CRC researchers provided expert advice on the building standards to ensure that new buildings are safer and more likely to survive to provide resident protection during bushfires.

Ensure resiliency for an inevitable outcome

What remains is the troubling thought that even with all these major changes in community engagement, fire agency operations, decision support tools, building codes, and weather and fire behaviour forecasts, days like February 7, 2009, are not just possible again in Australia, but could remain inevitable.

However, if Black Saturday taught us anything, it is that on these days our fire agencies could not stop these fires any more than they can stop a cyclone or volcano. What we can do is ensure that communities, businesses, and governments are resilient to disasters. It is clear we still need to have a stronger investment focus on mitigation, and we need to be clear that this is mainly about mitigating the impacts of hazards, and not the hazard itself. We need to be investing in reducing the risk posed by vegetation in both regional areas as well as on the urban fringe, especially around the places we live and work, in training and resourcing our agencies, and importantly in further research to provide the ongoing evidence for the development of policies and practice to deal with the increasingly hotter and drier climate.

We need to know more about what fires do in various types of vegetation under extreme weather conditions. We need to understand how the raised temperatures and reduced rainfall expected under climate change will change vegetation and flammability across the country, the impacts of climate change at the extreme end of fire weather and how communities, government, and businesses need to adapt to ensure they are as protected as possible against those impacts. There is still a lot of work to do in understanding how communities understand and interpret risk, and how that perception can be changed.

Plan to fight the next big one

At the time, Black Saturday conditions were beyond the imagination of many of in Australia. But they will happen again, as they have happened in the past with the 1939 Black Friday bushfires, and Ash Wednesday in 1983, just to mention a few of Australia's devastating fires. What does the next bushfire that we think is beyond our imagination look like? What will its impacts be? Next time we will be more resilient because of what we have learned from our past, but we need to be ready not just for what we expect to happen.

To paraphrase the Special Investigator of the 2016 Yarloop fires in Western Australia – we need to be planning to fight the next big fire not the one we have just fought.

Dr Richard Thornton is the CEO of the Bushfire and Natural Hazards CRC in Australia. Directly after the Black Saturday bushfires in 2009, he led the research task force investigating the bushfires and how people behaved when under threat.

The Jorvik Viking Center: Rising above the flood

Interview by Lilia Yumagulova; Story by Jonathon Reynolds

A cultural centre takes a devastating blow, but bounces back better, under effective leadership and innovative thinking. Read on to learn how the Jorvik Viking Centre not only reopened in just 16 months after a flood, but it was completely rebuilt, renovated, and reimagined in a better way.

The Jorvik Viking Centre is an experience which takes you back in time to a Viking village, a village which was on this exact place on the banks of the Foss River in York, England a thousand years ago. There are homes, people, animals, talking, movement and stories all experienced while travelling through the village. There is even a Viking ship – not a warship but more of a fishing or merchant ship. Looking at the ship which seems to appear from the walls, you realize that you are seeing all this from within a concrete ship. Since the whole experience is below the water level of the nearby Foss River, the walls, floors, and doors are all waterproof and flood-proofed. But they were not always.

The flood

On December 27, 2015, Sarah Maltby, Director of Attractions for the York Archaeological Trust, received a phone call that would change her Christmas holidays, as well as the next 16 months for her and every other employee at the Jorvik Viking Centre. The River Foss had overflowed and flooded out the Jorvik Viking Centre.

With up to nine metres of archaeology layers in York, there is a rich history to be shared with the public at the Jorvik Viking Centre. Not just a museum, the Jorvik Viking Centre is an experience where a Viking village has been recreated where it was centuries ago. In order to build the centre in this way, it was necessary to build it below the level of the River Foss – a river which rarely floods.

By the end of the day on December 28, there was up to a metre of water through the entire exhibit floor. Due to fast thinking and action on part of the team at Jorvik, the artifacts were fortunately saved and moved out on December 27 and very quickly the question became 'what now?'

Despite this devastation, the Jorvik Viking Centre kept every staff member on the payroll and working for the entire time the museum was closed and had three smaller exhibits around York throughout that period of time. The Jorvik Viking Centre not only reopened in just 16 months, but it was completely rebuilt, renovated, and reimagined in a better way - with an improved experience for both the public and the staff. Sarah described how all of this was accomplished in the 16 months after the flood to Lily Yumagulova, Editor of HazNet.

Viking children Pre-Flood and Post-Flood

The next 16 months: Building back better

Sarah said the first point was having good insurance - and moreso insurers they could talk to and convince that the exhibition needed to be completely rebuilt - not just the same, but truly a real case of build back better. They also had insurance to keep the staff working and she said perhaps most important they had lots of friends and partners in York. Other attractions and organizations in York helped out with locations for temporary exhibits where Jorvik could stay in front of the public. Having local connections, working with local insurance representatives, and being able to work with the same company that built the original exhibitions was very important. Having the ability to design, build, negotiate, and carry on with business in new locations and fundraise all at the same time was made easier by having full staff being paid, having a great volunteer network and by being more locally based for all of these activities.

Of course, the insurance would only cover the cost of what was there before so they had to raise money to cover the difference – £1.5 million of difference. The fund-raising campaign was named #CampaignCanute after a "fierce warrior" Viking king, who ascended the throne 1000 years ago, the year the flood hit. "Whilst we could simply replicate the pre-flood displays, our mission to educate in an accessible way drives us to plan how we can do it even better than before – and to do this, we will need to raise a significant sum of money," said chief executive, David Jennings in a media interview.

Explore the legacy of the Vikings in the JORVIK Artefact Gallery

Unanticipated challenges

When asked about the unanticipated challenges, Sarah responded, "I suppose one of the big challenges was getting the building watertight in the first place and then actually installing systems that would enable us to get insurance again because, you know, we had to mitigate against any future flooding…our insurance paid out a lot of money and they didn't want to be in that position again. One of the opportunities was that we totally redid our galleries and in doing so we specified very high spec cases which allows us to bring in collections from other museums."

Based on this, Sarah recommends "Getting decent insurance! Be prepared to argue your corner because insurers will only pay out what the minimum is if you don't ask for it. We made our case. We made a strong case. And it was important to get people onside very early, you know people in the city, we got in touch with them, they got in touch with us and we replied several times so we established a very firm, wide partnership base very early on because we were friends in the city. I always advocate working with other people because you never know when you are going to need them."

A happy outcome

The ability of the Jorvik Viking Centre to come back from such a devastating flood in just 16 months, to come back bigger and better, and to do so without losing any employees and to raise a huge amount of money in that same time period is truly a testament to the organization, the preparedness, and the commitment of the entire York Archaeological Trust.

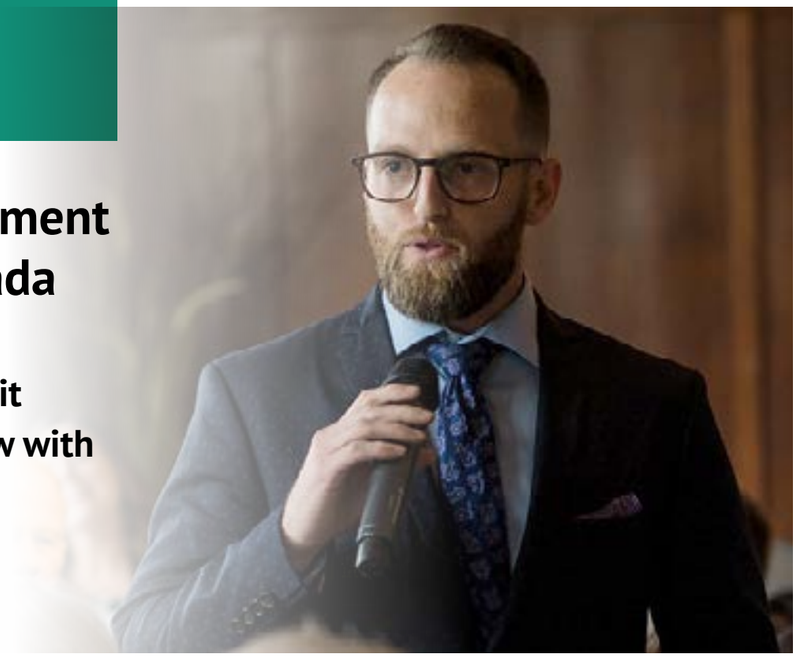
Want to learn more? Listen to the complete interview with Sarah Maltby on the HazNet website.

Jonathon Reynolds is an internationally published author who runs a foundation focused on sustainability and education.

Emergency Management Strategy for Canada

The relentless pursuit of resilience: An interview with Matthew Godsoe

By Lilia Yumagulova



This interview with Matt Godsoe, DSocSci, Director, Emergency Management Strategy Implementation Office provides insights into Canada's recently released Emergency Management Strategy.

In early 2019, the Government of Canada released its new Emergency Management Strategy for Canada: Toward a Resilient 2030. The strategy charts "a collaborative, whole-of-society roadmap to strengthening Canada's ability to assess risks, prevent/mitigate, prepare for, respond to, and recover from disasters". For this HazNet issue, we sat down with Dr. Matthew Godsoe, Director of the Emergency Management Strategy Implementation Office, who led the development of the strategy.

* Interview transcription by Shaun Koopman. Edits by Suzanne Waldman and Nicole Spence.

Matt Godsoe's interest in emergency management was sparked by a personal experience when his brother went missing on a kayaking trip. The brother turned out fine, never even realizing that he was "missing." But the incident had an impact on Matt, as he witnessed the large search and rescue, police, and military teams that came in to help.

At 18, Matt trained as a technical rescue instructor, followed by graduate school at Royal Roads University for a Master's in Disaster and Emergency Management. His graduate work led to an interest in heavy urban search and rescue as well as counter-terrorism, which he studied in Israel. He also taught as a technical rescue instructor for the British Military and for Parks Services across Canada.

Upon looking for a job more conducive to graduate studies, he found one at Public Safety Canada. He has been working there for over ten years, with a short interlude at Defence Research and Development Canada. In 2018, he graduated with a Doctorate in emergency management from Royal Roads University.

A different way forward

LY: **Please tell us about the process behind the strategy.**

MG: There is an acute recognition now at all levels of government in Canada of the growing severity and frequency of disasters in Canada. We're certainly seeing that in the federal government, and the provinces and territories and many municipalities are also recognizing we have to think differently about how we deal with these events.

In light of this realization, the Minister of Public Safety in his 2015 mandate letter received direction to work with provinces, territories, Indigenous Peoples, municipalities and other stakeholders to find a different way forward for addressing disaster risks in Canada. That kicked off two years of consultations with a wide range of entities, including non-governmental organizations such as the Red Cross and first response organizations, both professional and volunteer, such as the Canadian Association of Chiefs of Police, fire and paramedic chiefs, and volunteer search and rescue community—anybody who could help us think through how we could do things differently domestically in Canada. We also reached out to strategic allies around the world and our partners within Canada to see what they were doing and if there were lessons we could learn.

Then, about 18 months ago, we sat down with the provincial and territorial senior officials responsible for emergency management and began co-drafting a strategy, with the intent of building off of existing legislative and policy foundations, such as the federal Emergency Management Act and Emergency Management Framework for Canada.

Nothing in the new strategy undoes any existing work. It's designed for us to think differently about the way we are planning disaster risk reduction, and gives us an opportunity to think longer-term about our work, aligning our priorities out to the year 2030.

LY: **What sets the strategy apart from the previous Emergency Management documents?**

MG: The Emergency Management Framework for Canada gives the overall structure of how we think about emergency management: how the federal, provincial and territorial governments collaborate, as emergency management in Canada is a shared. responsibility. What the framework doesn't talk about is how to stimulate the engagement of broader elements of society in Canada: how to work with communities with a focus on 'resilience', which is broader than what we've traditionally thought about in emergency management.

A novel feature of the strategy is that in its objectives it adopts the '4 Es' model of building community resiliency—Educating, Empowering, Encouraging and Engaging all elements of society. It recognizes the roles segments of society have to play, aligning us with the Sendai Framework for Disaster Risk Reduction (DRR), which Canada along with 187 other countries around the world signed on to in 2015, and which also has a timeline to the year 2030. One big emphasis in Sendai is a whole-of-society approach to DRR. So, the strategy takes us further down the road of having a national plan to implement DRR.

Not just government partners, a whole society

LY: **Given that "resiliency" is a key word of the strategy, what do you see as the most promising elements of this strategy for building resiliency in Canada?**

MG: Formally recognizing the role that all sectors of society already play in emergency management is important. Often times the way we think is restricted to the partners we engage and collaborate with regularly. But when we step back, we remember that the whole of Canadian society responds to events: other groups always play an important role.

Another element involves better integrating Indigenous voices in governance in emergency management. We have seen in after-action reports—such as from after the British Columbia fires—that there is an opportunity to better recognize Indigenous voices in formal governance processes. There is a commitment in this strategy to make that recognition more explicit.

LY: **Given the strategy's alignment with Sendai, where are we as a country in Sendai's progress monitor and other public accountability processes?**

MG: It's a good question. At the time Sendai got signed off on in 2015, there was a commitment for an open-ended working group to be stood up to develop indicators of progress. I was part of that work, leading the Canadian delegation in negotiations. In 2017, we got to a methodology with a staged rollout process that would allow us to track progress against disaster risk reduction.

An advantage we've had in Canada is for some time we've been tracking disaster related impacts equivalent to the monitoring indicators through the Canadian Disaster Database, which captures almost 100 years of disaster impacts retrospectively and concurrently. Now we are working to mine and validate that data before we put it into the Sendai monitoring tool, to ensure it's as consistent and rigorous as possible. We're optimistic we are going to be on track with the monitoring. Certainly, we have lots more data than other countries to draw upon for reporting.

Building on Indigenous knowledges

LY: **While federally we have supporting frameworks and governance structures, many resilience activities happen at the local level. Do you think this strategy could help stimulate better feedback loops between provinces and local governments, as well as First Nations governments?**

MG: Local governments and First Nations governments are on two separate tracks. With First Nation communities, there is a more direct line with Indigenous Services Canada. Whereas local governments are entities of the provinces and territories. But overall the strategy commits to moving beyond the federal, provincial and territorial tables as we shape incentive structures, and sharing relevant information not just with each other at the federal, provincial and territorial level, but with communities and with individual citizens as well

LY: **Could you highlight some work happening through the Indigenous portfolio— such as the Inventory—to give our readers a context of that work?**

MG: Most of the work happening with First Nations goes through Indigenous Services Canada, so they are the best ones to speak to it. But Public Safety Canada is working with the national Indigenous organizations to inventory Indigenous capabilities, leveraging language and activities they feel are most impactful for emergency management readiness and capabilities on Indigenous communities.

We are developing a data collection tool to collect this information, and consolidate it into actionable intelligence to share with municipalities, provinces and territories. This tool—piloted over the last year—allows us to get a picture of what these emergency management capabilities look like in aggregate across Canada, and also make that available to Indigenous communities. Dozens of communities have already undergone the pilot, and national Indigenous organizations are indicating it would be good to roll it out on a broader scale. So, we will continue to move that forward.

Rethinking redevelopment in high-risk zones

LY: **How will 'Build Back Better' be supported over the next 20 years?**

MG: That is one of the major pillars of the Sendai Framework that everyone is trying to implement. We have been going down that road in Disaster Financial Assistance Arrangements (DFAA), with 15% added to the terms and conditions of that program in 2008 to allow provinces and territories to not just build back to previous standards, but to build resilience into infrastructure above and beyond, or try to pool those costs to implement innovate mitigation measures. Building from those successes is important.

We've also seen messaging coming out recently from different levels of government about the need to think about redevelopment in high-risk hazard zones. I think that will be a key part of the conversation moving forward. While we can't foresee the kind of decisions future governments will make, there are successes we've already seen, and we can envision a future where those continue to be built upon.

LY: **Another commonly mentioned issue is appropriate levels of mapping. How do you see Pillar #1 of Sendai 'understanding risk' moving forward in Canada, with the National Disaster Mitigation Program (NDMP) sunsetting?**

MG: In federal, provincial and territorial governments, we have been acutely aware of the importance of a standardized approach to flood mapping. From a federal perspective, we see ourselves having the biggest impact by ensuring that when folks do flood mapping across Canada, those maps speak to one another.

Through the NDMP we funded a collaborative effort between Public Safety Canada and Natural Resources Canada to develop national guidelines on flood mapping. Documents we built as part of the guideline series have been published over the last 12 months. Now the hydrologic and hydraulic data, or at least the metadata in those maps, will be consistent. We know there will be continuity wherever flood mapping is occurring across the country.

Another area we are monitoring is how the insurance industry and other private sector organizations are taking different approaches to remote sensing and flood mapping. Experts have been collaborating with Natural Resources and Public Safety Canada's work on a Flood Symposium to see if there are opportunities as technology advances for us to adopt different approaches beyond the current flood mapping guidelines.

Building an inventory of pieces at play

LY: **You are the director of implementation. What are some plans—broad pathways and also specific things—people can get excited about?**

MG: The Emergency Management Strategy was approved at the federal, provincial and territorial meeting of Ministers responsible for emergency management in January of 2019. The conversation at that meeting was very positive with respect to progress developing the strategy.

But there was also a desire to take it a step further, and think about implementation. A tasking came out of that meeting for federal, provincial and territorial senior officials to reconstitute the working group who had developed the action plan and the strategy, and develop an implementation plan.

Now we are working with our provincial and territorial colleagues to take things further in terms of granularity; starting to document programmatic and policy elements across Canada. This work is going to support implementation of the Emergency Management Strategy, with a view to the whole of Canadian society. We also looking to engage with the partners that built the strategy to get a sense of other programmatic and policy elements sectors can incorporate, or at least give a nod to. The next year is about building an inventory of pieces at play. We hope to make everyone aware of what already exists, and to look for opportunities to improve collaborative efforts to coordinate those instruments.

A fundamental tipping point

LY: **How do you see this strategy breaking the cycle of investing in response and recovery, and to move into supporting mitigation and preparedness that builds resilience?**

MG: As you know, a large-scale disaster can act as a "focusing event," where the dialogue switches and everyone looks to ensure how this kind of thing doesn't continue to happen. In recent years, with the increasing frequency and severity of events, those conversations are also happening more frequently.

Our disaster risk profile hit a fundamental tipping point in the mid 1990s and has been continuing to escalate. As those conversations happen more frequently, they are allowing us to direct concerted attention to these questions. Plus, we are accumulating better research and evidence to support decisions, so some of it is contextual.

The strategy goes a long way helping to articulate the importance of prevention and mitigation. For example, it highlights recent findings from the National Institute of Building Science in the United States, which increased the assessment of the Return on Investment for grant and contributions that go towards mitigation measures.

By incorporating the element of 'Building Back Better' formally in the structure of the strategy, we hope first response organizations and community partners, who might not see disaster events happen as regularly, will better understand Sendai's four pillars.

I think some people have been conceptualizing the pillars as independent of the full cycle of emergency management. Now, when you're doing response and recovery, to the extent you can, you're also hopefully thinking about how you're going to build back in ways that increase resilience, and you're also doing prevention and mitigation in ways that support subsequence preparedness and response efforts. You're trying to think across those traditional, stand-alone pillars.

Quantifying socioeconomic impacts and financing DRR

LY: **To have a more appropriate level of investment, what mechanisms are, or could be, financing the resilience deficit in Canada?**

MG: The Disaster Financial Assistance Arrangements (DFAA) program has a set formula for response and recovery costs, based on per capita disaster losses in provinces and territories. So, we know roughly what those disasters have been costing us retrospectively. The provinces and territories likewise have visibility into that.

But there are large portions of the overall socioeconomic impacts that we don't have great visibility on, because they are captured through the private sector or they get eaten by individual Canadians or communities. That makes it hard to quantify what the overall costs of disaster in Canada have been. The Sendai monitoring tool allows us to get a better sense of that picture, to quantify overall impacts.

Now we see organizations like the Insurance Bureau of Canada looking to play a greater role, standing up Canada's first-ever private residential overland flood

insurance market, and also advocating for us to think about how we finance disaster response and recovery costs. They are also playing a bigger role thinking about disaster risk reduction, particularly as it relates to flooding, but also to seismic scenarios we've seen across the country. As we spread the message about all of us having some element of responsibility to play in disaster risk reduction, more innovative finance mechanisms will continue to come to the surface.

The traditional approach we have towards funding emergency management reactively—such as through the DFAA—is expensive, given the increasing frequency and severity of events. We know the National Disaster Mitigation Program and the Disaster Mitigation and Adaptation Fund have a higher return on investment. As more non-traditional stakeholders come to the table offering different ways to help, we're hoping we can get into a more resilient position.

Integrating existing capabilities into emergency management

LY: **Who is currently missing at the table in the emergency management forum?**

MG: That's a challenging question, because the more people you talk, to the more people you realize you need to be engaging. There's always a balancing act between ensuring you're engaging with as many partners as you can, while empowering partners you haven't had an opportunity to engage with yet—to ensure their voices are not lost but rather heard, either through engagement operating federally, or at other levels of government.

There are latent capabilities that exist within the country we know we'd like to know how better to organize. The volunteer sector is a perfect example. Two years ago, we co-sponsored research about with Defence Research and Development Canada to look at how volunteer sector capacity across Canada mapped out against emergency management core capabilities. What they found was there were a number of capabilities—I believe four—where they identified 50,000 trained volunteers ready to support those capabilities. There were another 11 capabilities, if memory serves me correctly, where there were at least 10,000 organized volunteers who were ready to assist.

Part of the work we have to do is to identify those capabilities, to ensure they have an adequate voice at the table. Part of it is also to think through how we integrate those capabilities into our formal process. So the first strategic objective in the Emergency Management Strategy is to think through whole-of-society governance: how do we do a better job of identifying those capabilities?

Some of that comes down to outreach, and some comes down to research. Once those capabilities are identified, how do we incorporate them into our work in a way that's meaningful, effective, and as seamless as possible?

The evolving field of emergency management

LY: **Could you offer a personal perspective on the evolving nature of emergency management—as a practitioner but also as a researcher in this field?**

MG: Regarding the discipline of emergency management, the most important perspective in my view is from systems thinking: how the emergency management environment we are operating in now is a complex adaptive system. Once you chew on that assumption, the menu of what we can do to change the situation on a national scale becomes more tangible and also more conducive to scaling up to what we're going to need in the coming decade, to keep pace with our disaster risk profile.

That ties in to my second perspective, about youth, and the need for an education system more geared towards providing specialized advice, training and education in emergency management. If we emphasize educational for youth and in complexity sciences, that will help us devise solutions that will work at scale in a dynamic operating environment.

LY: **What do you have to say to young people entering the profession?**

MG: It's important for young people to be relentless in pursuing their career advancement, their education, and their mastery of the subject matter area. The emergency management discipline is not fully mature at this point, but there a lot of networks and academic and other credentials and accreditations that can be pursued. It's ripe for people who want to specialize and master it.

I've encountered people quite a bit younger than myself who have tons of volunteering experience and significant education—both domestically and internationally—and a real stake in moving us forward. It's important that young people chase after that relentlessly, because there's lots for them to get out of the discipline, and lots to contribute back.

Recovering from the worst BC flooding in modern history: A story of teamwork and cooperation

by Lilia Yumagulova

An aerial photo that shows the scale of the flood at Manly Meadows

In 2018, intense rain combined with snowmelt in the mountains caused the Kettle and Granby Rivers to overflow their banks, leading to the worst flooding the Regional District of Kootenay Boundary (RDKB) in British Columbia has seen in 70 years — and 60 cm higher than ever recorded. Across the region, homes, trailers, and farms were submerged in dark flood waters, forcing thousands of people from their homes and requiring 30 rescue evacuations in the immediate aftermath.

The recovery process in the region has made national news, as the City of Grand Forks has voted to buy out an entire neighbourhood affected by the floods, contingent on the funding from the province and the federal government. The bought-out houses will be salvaged and the area will be returned to the floodplain.

To write this feature, HazNet connected with staff at the RDKB who have been leading the response and recovery process:

Chris Marsh, EOC Director; Deputy recovery manager – Boundary flood recovery team

In 2017, Chris started as the Manager of Emergency Programs, RDKB. Six month later, he oversaw the May 2018 flood response as the EOC director. His previous experience was at the provincial government as a Ministry of Environment Air Quality Technician and an Emergency Management BC Temporary Emergency Assignment Management System (TEAMS) member. He is also a paid-on-call firefighter with Kootenay Boundary Regional Fire Rescue (KBRFR). Chris is a graduate of the emergency management certificate program with the Justice Institute of British Columbia.

Dan Derby, ECFO, Regional fire chief, Kootenay Boundary regional fire rescue

Dan started in the fire service at 17 as a volunteer firefighter, ultimately becoming a volunteer Fire Chief in Chemainus on Vancouver Island. In 2004, Dan transitioned into a public safety career. While deployed to events across the province, Dan saw the importance of bridging fire services and emergency management. In 2010, Dan became KBRFR Deputy Chief and Emergency Program Coordinator. Dan was promoted to Regional Fire Chief when Chief Martin retired. Dan is a lifetime learner and a graduate of numerous professional certification programs.

Roly Russell, PhD, Chair of the Kootenay Boundary regional board

Roly is the Chair of the Kootenay Boundary Regional Board and policy lead in the Emergency Operations Centre. After studies at University of British Columbia, University of Melbourne, Oregon State University as a Fulbright Scholar, and the Columbia University Earth Institute, Roly returned to the Boundary to raise a family, farm, and develop an independent research institute with a focus on sustainability, ethics, happiness and well-being, archaeological ecology, and complex adaptive systems.

As I walked into Chief Derby's office, my eyes were drawn to an elaborate diagram on the whiteboard that depicts the scope of ongoing work and future trajectory for development of emergency management in the RDKB. The diagram captures an evolving and ever-expanding field that includes hazard-specific planning, asset management, elected officials training, livestock management, search and rescue, FireSmart activities, and public engagement and education. On the top right corner, a small heart and a note says "I love you Dad."

The whiteboard shows key goals and "I love you dad."

The whiteboard shows key goals and work plans but also "how hard it is to catch up, get your breath, take care of your people" and also make progress on new deliverables. In the words of Chief Derby, "Expectations have gone from not being able to reach some stakeholders to 'Where the hell have you been?' due to changing trends in emergency management and event activations."

Flood impact at Almond Garden East

"Game day"

As we settle in, Chris and Dan take me back to the early days of the flood. Both of them are exceptional storytellers. Both of them seem to understand each other's thoughts without speaking.

As Chris remembered: "At the beginning of May, we had indications we were at high risk. The snowpack in the Boundary was at 238% - a provincial record - and was saturated and ready to melt. We had had an active April, lots of issues in places we had never seen problems before.

Then we had seven days of plus 30 degrees C, followed by two inches of rain. And it all came down at the same time."

Dan added: "It was the perfect storm for the confluence of those two rivers—water-damming each other simultaneously. It's hard to hydrologically predict that."

The District activated the Emergency Operations Centre (EOC) on Monday, May 7, 2018. As Chris recalls, "Between Monday to Tuesday we started to see some very concerning off-the-charts predictions for rivers in the Boundary from the River Forecast Centre. The predictions are based on volumes and cubic meters per second. It's hard to know how that will look on the landscape. So we undertook some urgent mitigation works through Emergency Management British Columbia (EMBC), building some dikes and making some repairs to the river banks."

Dan picked it up from there: "The next morning, we got another phone call from the Flood Assessment Team at the Provincial Regional Emergency Operation Centre (PREOC) in Nelson, asking us 'Can you phone us from a place where you can talk?'. They told us that the previous predictions were significantly lower than what we were going to get—two or three times, based on their assessment of the weather system, and that we had eight hours before the event hits, instead of the previously anticipated 16-18 hours.

We decided we needed to evacuate everybody under the 200-year floodplain. This was game day—that [day] you read about, trained for, exercised for, developed plans for your whole life, a day that you hope you never have to be a part of. And we were leading it."

The evacuation

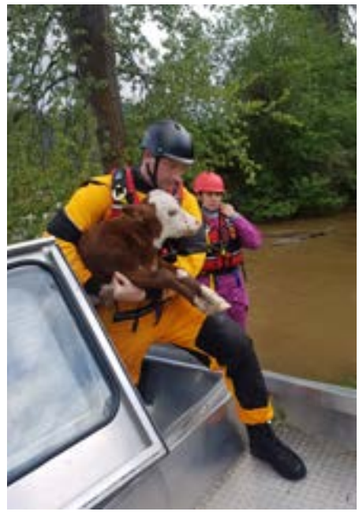
Chris added, "While the report was dispiriting, it's a credit to the EOC team that they rallied quickly. Under the leadership of our amazing Planning Section Chief Donna Dean, they spent the evening making floodplain evacuation maps, preparing lists and organizing with Search and Rescue teams, firefighters and other volunteers. They consulted with the RCMP about how they were going to subdivide the evacuation orders, then started to deliver them early the next morning. About 3,000 people had to be notified about evacuation orders over a period of eight hours."

As Chris noted, "We had to do about thirty rescues the first day that the rivers flooded. People in the region generally tend to be independent and don't like to leave—they feel better staying to try to save their property. But Dan's crew with their river rescue boat came over, Grand Forks Fire and Rescue had a boat, and our Search and Rescue partners deployed boats. Helicopters were used to extract families in the West Boundary. They rescued over 100 people that first day that likely wouldn't have been able to leave under their own power."

EOC coordination call

The size of the response zone was another challenge: "We had an active emergency event along 300 km of riverfront at the same time. When we look at the population distribution in the RDKB, there is a higher population density around Trail and Fruitvale, of about 22,000 people. Whereas the other 10,000 people in the regional district are spread across 6,000 square kilometres from Christina Lake to Beaverdell, and we had incident sites and people to evacuate all throughout that whole area," explained Chris.

Dan recalled a particular incident, one that wasn't exactly "textbook," in North Fork: "People had to 'evacuate in place' because the road north of them was flooded and the road south of them was washed out. It wasn't safe to send responders in, nor was it safe for residents to leave. We did our best to give them notice about what was going on, and we had a plan to use a grader in a case of medical emergency. We had conversations with fire, police and those who owned the resources to get us in there if we had to… It was a day I trained my whole career for," said Dan, adding "I hope I never have to do that again but I'm very proud to have been part of that."



At the time of the interview, the EOC had been activated for 295 days. I asked Dan and Chris to distill their life-changing response experience into key lessons for other communities. They boiled it down to 1) the right people in the right leadership positions; 2) the power of pre-existing relationships; and 3) having a plan.

Key response lessons learned

1 The people

In Dan's words, "Chris in his job as the EOC Director was a rock. His understanding of what we needed to do to lead the organization through that event was what we needed."

Chris added, "It was great that I had six months before the event, getting to learn from Dan as mentor and how to support him in his multiple roles. I don't think either of us would have been as strong without each other."

To Chris, "Having Mark Andison, our CAO, in the room to listen from a risk management and business continuity perspective was also critical. Our Section Chiefs (Planning, Operations, Logistics, Communications) were all exceptional. They built their teams in a way that made them very successful and it took a lot of pressure off of us. If we asked David Reid, the Manager of Public Works in Grand Forks, "We need to put in temporary flood protection works. Do you have that under control? and he said 'Yes', and that was the last time we talked about it.

"I'd also like to mention those who were managing calls from the public, who took thousands of calls from residents who were losing everything, and took calls for days on end and did an amazing job of providing information and reassuring everyone who phoned in."

Dan expanded on this: "Our EOC policy lead, Regional District Board Chair Roly Russell, understood his role so well, we included him more than we normally would an elected official. He let us do what we needed to do, then steered tougher conversations about policy direction, especially as we started to think about and construct our recovery team."

2 The relationships

Good pre-existing relationships was another key to success, including those with local agencies: "We were able to have conversations and put plans in place quickly because of those relationships," said Chris.

As Dan explained, "We have an Emergency Services Committee and we try to meet twice a year. Its' representatives from police, fire, ambulance, the military, our utility partners, our health care providers, our local non-profits like the Red Cross. We try to bring everyone together and this investment really paid off. We also engaged numerous agencies in the stage of planning, training, and tabletop exercises."

Chris added, "We had a precursor flood in 2017 so there was an EOC activation which was much more minor. A lot of those relationships were already pre-built. When we had to go to someone and say 'We may need a grader,' they respected us—primarily Dan, because he had been working on these relationships for years. They knew if a request was coming it, it was a real need."

"While we were planning the response, we had agencies that would come in and they would check the org chart and where they were. They wanted to be in the loop and a part of the chain of command. In the end there were 65 agencies either embedded in the EOC or available very quickly by phone. The operation section of the org chart alone was eight feet long."

Relationships with people from different layers of the provincial government was also essential. "We had Regional Managers at EMBC up in helicopters so they could see what was going on. Their first-hand knowledge of what was going on and what we were going through made it easier when we made big requests of them."

"Chris Johnson, our Regional Manager, we brought him in, and he was amazingly supportive. He also worked with the City of Calgary during the floods there. Within 30 seconds of lifting off in the helicopter, he said 'You guys are going to be dealing with this for years.'"

Dan added, "Dennis Rexin at BC Wildfire also came down. He slept in his truck for a few days, helping me build out the organizational structure. We put all the teams we had in the field, from Beaverdell out to Christina Lake, into the org chart. That way we could disseminate information about what we wanted them to do, and also get them to bring information back to have real-time situational awareness in the EOC. It was a bit of a struggle, because we were trying to make something that works for wildfire work for a different hazard."

"That is one of the things our flood response plan is looking at for 2019—how do we appropriately manage human resources? Technology is obviously a solution that we want because we had something paper-based, and that became a bottleneck."

Dan recalled an example of how relationships also lubricated recovery efforts. "The City of Grand Forks owns their own electrical grid and substation and Fortis also has a substation. At one point, one of the substations was overwhelmed by flood water and was severely damaged. We had an estimate it was going to take three months to get the electrical grid back up and running. By working together, they had it back on in eight hours. Getting that power back on as quickly as it was, was key to managing the severity of the damage by getting pump stations and sanitary systems back running."

The EOC org chart

3 The plan

In 2012 the District rewrote their emergency plan with two key changes: 1) Realign the plan so it wasn't compartmentalized into sections but flowed as an unfolding event, and 2) Ensure the plan is rural-based rather than based on urban plans, taking into consideration the social context of rural BC, where residents tend to highly value their privacy and independence.

Dan explained, "Our plan is built on a foundation of partnership with our municipalities, so it is truly regional. We depend on staff from our eight local government partners. They all have a mix of ability to contribute. Some of them have three staff. So that was the foundation of the rewrite going from that more corporate metro-based plan to a rural based plan."

Yet as Dan reflected, "We also had a conversation around whether to update our hazard, risk and vulnerability analysis, but after reviewing with a consultant, we decided the risks hadn't changed. There hadn't been substantial growth and changes in industry as in the Okanagan or the Lower Mainland. Though I would look at that a little differently today, because even if the types of risks haven't changed, the severity needs to be reassessed."

The District's emergency communications plan is also a work in progress. "An emergency communications plan is not just communications to the public, it's how we communicate to our elected officials—how we share the message that we want them to share. It's communicating with other agencies. We were better in 2018 than we were in the 2015 wildfires, though we still have lots of work to do."

In the end Chris added, "We struggled a bit with staffing logistics, but the rest of it was a fairly good news story. Often there can be interpersonal issues or leadership issues, but our team was solid, we're lucky to work with those folks."

From response to recovery: "The maiden voyage"

"You hear it said that recovery should start on Day One of response," Chris reflected, "but when dealing with the emergency, it's hard to dedicate the resources. It was something we struggled with when letting people go back into their homes we knew would be damaged. We started having discussions about how we could support recovery. Looking back, it's hilarious because we thought 'Wow, we are going to need a Recovery Manager,' and now we have full-time recovery staff of 14 people."

A recovery team at work with BC Parliamentary Secretary Jennifer Rice as a guest

Dan said, "An emergency plan usually has one or two pages dedicated to recovery and one of them is a title page, right? I think most local governments see it like 'one day we will look at that'. Even given what we know today, though, I don't know that a scripted recovery plan is the right thing. I think a recovery concept is what's needed: a conversation around lead recovery versus functional recovery."

Early on in the recovery, they were faced with a critical decision: Do they hire consultants who had prepared recovery plans for other locations or go with a community-led recovery process?

Chris said, "We made a conscious decision we wanted to build on the strengths of the community. We knew it would be hard because we would be asking the community to come again to the plate and volunteer time and offer resources and that sort of thing. It meant it took a little while for things to speed up, because we had to build the airplane while it was in the air. But I think in smaller communities a community-led recovery is the answer. I don't know whether a community led recovery would work in a metro environment.

The next step was to build their team. "The people you need on your recovery team are very different from the people you need in the EOC," said Chris. In response you need people to do things or get things—decision makers. In recovery you need people with mental and social support skills, who can support people in organizations like the Red Cross and family service organizations. You also need people who are skilled in economic development." We had a lot of amazing organizations step up and say 'We'll assist with this' but having our roles pre-defined before you ask agencies to step into recovery is important.

"We didn't have those connections before the event, but being a small community, we had people who knew who we should talk to. We were lucky the people we did talk to were took a risk in being part of the recovery, because recovery doesn't always work well from the perspective of the public."

Dan agreed, noting that provincial support from Emergency Management BC was critical for this route. "It took us months to have a comprehensive structure in place that captured the completeness of what we are doing. We had to build a management committee and a leadership team that involves our policy group, develop Terms of Reference, strategic objectives, and an org chart. All of those things are now tools that we can share with our peers to give them a running start."

Dan added, "We pulled together a Fire Chief in Nelson who had been a Deputy Chief in Calgary as well as Chris Johnson. They had worked together on the floods there. One of our first real meetings around recovery, we invited them over and they helped steer the maiden voyage to get us going."

"We have monthly management committee meetings that I chair in my role. If the Management Committee can't provide the direction needed for the Recovery Managers, we escalate it to the CAOs. If the CAOs can't make that decision within their authority, it's escalated to our Policy Group. Then we have a recovery team of 14 people doing the work on the ground--that is a story in itself."

The effect of the event on staff across the local governments in the region is still present: "The Village of Midway and the City of Greenwood, are very involved in ongoing response and mitigation work, as is the Regional District and the City of Grand Forks. Figuring all that out has taken a ton of time and some pretty exhausting conversations."

Tough decisions

Dan said, "Nine months later, we have one recovery staff person assigned to dealing with nine files. That's nine homes, and everyone's home is their castle and we are trying to figure out how do we deal with that. We're dealing with tough decisions right now: property acquisition and demolition of structures (a polite way of saying people's homes). But we knew which structures would need to be demolished the morning after the flood—or maybe the day before."

"The Recovery Team is trying to come up with solutions that fit the community, not one property. That is very challenging, because Joe thinks that you need to save Joe's house where the engineers are saying 'No we actually need to sacrifice those 60 houses for the betterment of all'. That's a very challenging discussion, even in a community-lead recovery process in a small community. You put that into a Metro environment and I'm not sure how that works."

"There is no right or wrong answer, but we are running out of time to decide, because the tide is coming in on the 2019 freshet. We need to figure it out sooner rather than later."

Regarding the City of Grand Forks' vote to buy up properties, Chris said, "It was a business decision by the Mayor and Council. The leadership and some of the senior staff in the City of Grand Forks deserve credit."

"It looked like it happened quickly, but the Boundary Area had been working on a Kettle River watershed plan for years. Last fall it was voted on and established, so now it's going to be a foundational service of the Regional District. The Recovery Manager was previously hired to be in that Boundary Kettle River Watershed position, so he is very knowledgeable. He and the Head of Planning for the City and Public Works knew what needed to happen, based on funding. So they made a decision and now we're waiting on the province and the federal government to support that."

Chris added: "One of the first things we knew that we needed to do after the event was get a sense of the hydrological risk, especially in the Grand Forks area. What were we facing? Was this an isolated event? What's the likelihood this could happen again?"

"When we started talking to hydrologists and engineers, we knew we had had a flood that exceeded the 1948 record flood by 60 centimeters. When we started talking to people, we heard about homes that had been wet three times in ten years and had received Disaster Financial Assistance three or four times. It starts to seem like an unacceptable number of times that people have to recover from these events."

"Hydrologists and the River Forecast Centre are seeing progressively worse floods every time they happen. People are saying 'based on the way that the climate is

Highway 3 interchange

changing, and the snowpack melts, and the way weather systems come into the Interior and Boundary region, it's safe to assume that this will not be the last catastrophic event we see in these areas'. We can't say this will not happen for another 50 years. The hydrologist said: 'take everything you think you knew before the year 2000 and throw it away. That dataset isn't applicable anymore.'"

"The challenging part for local governments is to take a climate change lens, and make decisions based on how things are changing—not based on what has happened in the past. Everything is very random now, and it's changing very quickly."

"I understand these decisions are incredibly hard on people facing losing their houses, but the idea of having another flood or a worse flood two or three years from now is also unacceptable. These decisions aren't made lightly, they came from a place 'we do not feel that it is acceptable for people to face this over and over again.'"

Moving beyond recovery

Roly Russell, the Chair of the Regional board, said looking into the future the region faces both opportunities and significant challenges, noting anxiety from the public: "They worry about what's coming—could it happen again. They worry about why recovery is taking so long. While we tell people to be prepared to look after yourself for 72 hours after an emergency, the reality is when you go through something like this, you can be on your own for much longer. Especially if insurance and Disaster Financial Assistance don't help, you have to find ways to make it work on your own.

Dan added, "We have affected people in the community who have attached themselves to support being provided through the Recovery Team. We started talking in the fall about how do we transition people out of recovery. It's a huge challenge for the local government and community to transition people back to life as normal as it can be and to normal services."

Managing expectations continues to be a challenge, said Chris. "We need people to stop looking at that recovery team for answers, and start going back and looking to the places they would have looked previously. At the community meetings last night, people were asking the recovery team questions about things like logging practices, you name it. Figuring out how to transition out in a gentle way is going to be a challenge for people."

Dan added, "I also think there is a huge challenge ahead for our elected officials to lead a conversation on which services local government can provide and which the provincial government needs to be provide—of 'Yes, we are in this conversation and no, we are not in that conversation.' I think where that goes to is some people have lost sight of what is their personal responsibility—for example, what is my own personal responsibility to look after my wife and my daughter before, during and after an event."

Chair Russell stressed the importance of starting conversations about flooding before a crisis is upon you. "We have FireSmart practices for engagement and preparedness for wildfire—what role individuals can play in

Grand Forks Community meeting

preparing their homes against floods is another conversation to start early. I was happy last night to hear people understanding more about their responsibility to get drain covers and avoid groundwater infiltration—that it's not the job of the local government or provincial government to flood protect their home."

He also pointed to the responsibility of the real estate industry. "It'd be awesome if they would play a bigger role in disclosing risks and hazards. Even if they have certain expectations they meet, it's not sufficient. A lot of people who recently purchased homes that have since flooded said they were told prior to purchase the house never flooded—even when it's in a place we know it's flooded before."

Self-care

When asked about self-care during this incredibly demanding time, Chris reflected "We're small organizations constrained by human resources—there are never enough people to do the work that we want to do. We got support from other communities, but due to high snowpack right across BC last year, everybody was very careful to retain their resources —which made sense."

"A lot of people carrying heavy loads, over long days and long activations did not feel like they could step away. Once their EOC role was finished, those people went back to jobs they hadn't been working in for four-to-five weeks expected to catch up on a backlog of work."

"So our debrief for the Response Team this year included a check-in half-day session, where we sat down and talked about the experience. It speaks to the strength of our team that we all felt comfortable sharing, and there were linkages for people to get the support they need.

"We've decided to do the same thing with the Recovery Team—even though it's not over. These folks are dealing with incredibly challenging situations and hearing very sad stories, so we want to make sure they are supported."

All photos supplied by Chris Marsh.

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Lily Yumagulova is the Editor for HazNet

HazNet is a bi-annual magazine of the Canadian Risk and Hazards Network (CRHNet) that brings together the latest in research and practice to enhance resilience in Canada.

HazNet aims to facilitate public, professional and scholarly discussion through analysis, views, lessons learned, and insights into current and future issues of disaster risk reduction in Canada and internationally.

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