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INNOVATION

Public Safety Committee in Alberta

Getting ready for the next global health emergency

A letter from Tahltan

Water solution in Bangladesh

Solutions from Zurich Flood Resilience Alliance

Urban Resilience

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Editor's Note

There has never been a more urgent and opportune time for innovation in the field of disaster risk reduction and community resilience. As the newly released 2018 World Disasters Report by the International Federation of Red Cross and Red Crescent Societies illustrates, we live in a complex and evolving global risk landscape with ever-more protracted crises, climate change, uncontrolled urbanization, population growth, and the globalization-fuelled circulation of contagious disease. We also live in an era of deepening inequality which directly influences disaster outcomes.

At the same time, we live in era of unprecedented technological advancement and connectivity. We have more data, tools, and technology to power disaster risk solutions than we've ever had before. In Canada, we have millennia of accumulated Indigenous Knowledge and more than seventy years of dedicated disaster research to draw on in our practice. Every year, more resilience practitioners and researchers join our field. This issue is a testament to this progress and to the work remaining.

In our Solutions section, read about process innovation, product innovation, and system innovation in Bangladesh, one of most hazard-prone countries in the world. Read about the Zurich Flood Resilience Alliance's innovative projects and tools for measuring community flood resilience. These tools have been used in more than a hundred communities in nine countries.

Innovation requires a more effective research-to-practice connection, a core mission of the Canadian Risk and Hazards Network and HazNet, our signature publication. In our Research section, read how the Bushfire and Natural Hazards Cooperative Research Centre in Australia is leveraging research to foster innovation and advance emergency management and community resilience.

New solutions require new partnerships. Read about how British Columbia's health emergency management leaders joined the World Health Organization and its global partners in a planning exercise to prepare us for the next global public health emergency.

Trust remains paramount to our field of practice, especially in an increasingly information-rich and noisy environment. As a recent Canadian Red Cross survey reveals, Canadians faced with an emergency look for trusted sources, listing local or provincial governments (55%), the Red Cross (40%) and the media (40%) as the top trusted sources.

In our Feature section, we take you on a global tour that highlights some of the inspiring examples of what urban resilience looks like on the ground. Enjoy this exercise in intellectual tourism by visiting Quelimane, Mozambique; Copenhagen, Denmark; Bologna, Italy; Dakar, Senegal; and Bergen, Norway.

In our Policy Section, we explore how to build innovation momentum within a bureaucracy. Read about the Government of Alberta's strategic and collaborative Public Safety Committee which provides a regular venue for business-as-usual and emergency decision-making. By being embedded in the civil service, this committee can lessen the impact of political changes on longterm policy objectives.

Canada's diverse geographical and cultural landscape requires strong, innovative regional disaster-risk reduction systems. What works in a large urban metropolitan area may not apply in a small rural or a First Nations community. In this issue, find out how small rural Ontario communities are preparing for climate change through inter-community service collaboration.

Read a heartfelt letter by Sonia Denis, the language revitalization assistant at Tahltan, Dease Lake about the community's responses to a devastating wildfire that forced hundreds to evacuate earlier this year.

Indigenous Knowledge is Canada's unique opportunity to connect knowledge from past millennia to today's evolving challenges and emerging solutions. Our cover is a visual demonstration of this potential. This image is a collaboration between Carime Quezada, AshieleThomas and myself. Carime is a Vancouver-based Mexican-Canadian artist and HazNet's illustrator. Ashiele is a young artist from Ahousaht First Nation. The image was produced as part of HazNet's EMERGENCE program which provides support and a platform to unheard voices in the field of disaster risk reduction and risk communication. As this issue was being finalized, Ashiele's remote island community declared a state of emergency over threats to its drinking and fire-suppression water supply.

Disasters have no respect for boundaries. That's why solutions to reduce disasters should not be confined by jurisdictional, bureaucratic, disciplinary, temporal, or social exclusion boundaries. For resilience professionals, our global and local responsibility is to innovate to improve safety. Let's build unlikely partnerships. Let's engage in uncomfortable conversations. Let's plan for graceful failure by building learning organizations that adopt safe-to-fail practices rather that striving for the nearly impossible fail-safe. Let's focus on inclusive innovation that will increase quality of life, reduce disaster risk, and improve disaster outcomes for every social group in every community. No solutions are truly innovative unless they benefit those who need them most.

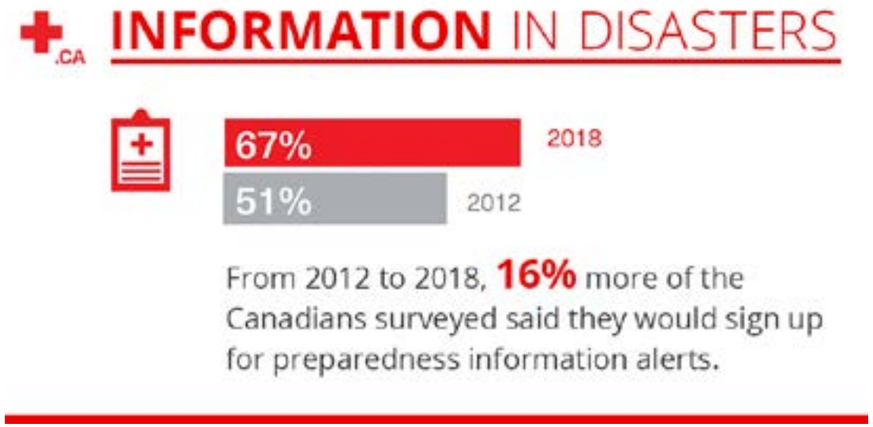
We hope you enjoy this issue as much as our HazNet team enjoyed putting it together!

Lily Yumagulova,
Editor, HazNet
www.haznet.ca

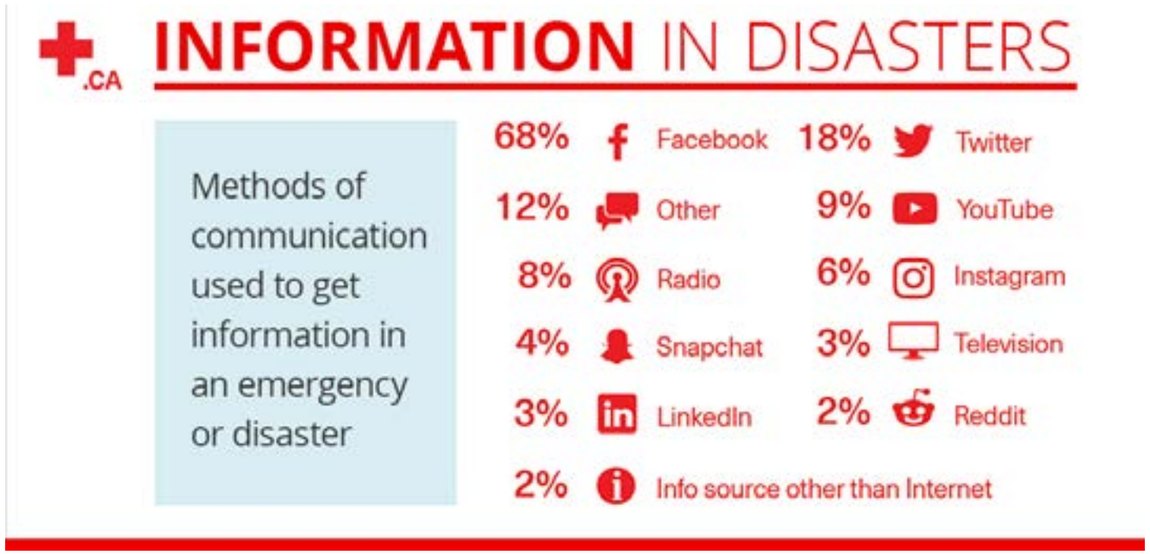
Digital solutions for emergency response and recovery

By Sarah-Maude Guindon

In May, the Canadian Red Cross released the report Information in Disasters illustrating how the digital landscape has evolved since its 2012 report Social Media in Emergencies. New survey results show that:



- Two thirds of Canadians, compare to half of them in 2012, would be likely to sign up for emails, text or apps providing information in an emergency.
- Emergency situations led nearly a third of respondents to sign up to receive information during or after an incident. Facebook was the preferred platform for such updates, followed by emails and text alerts.
- Canadians are looking for trusted sources of information, and they list Local or Provincial Government (55%), Red Cross (40%) and the Media (40%) as the top trusted sources



The second half of the report reflects on the Red Cross recent experience in disaster response. Its experience illustrates how people turn to social media to ask questions or make comments during response and recovery periods. This requires to monitor social media continuously to identify people who need help, address question in a timely manner, and discover and refute misinformation. It also shows the importance of digital technology in helping people. For example, access to online registration or electronic fund transfers can now provide essential and timely support for disaster zone evacuees, regardless of their destination.

However, even if digital technology is more present, the most vulnerable are less likely to have access to smartphone and computers, and may have challenges navigating online resources or own a bank account. Therefore, the Red Cross underlines the importance of adapting response and recovery communication and outreach tools to make sure that everyone who needs help can access it.

Learn more about the survey: http://www.redcross.ca/crc/documents/Disasters_report_2018.pdf

Sarah-Maude Guindon works in emergency management for the Canadian Red Cross. She holds a master's degree in Disaster and Emergency Management from York University and a bachelor's degree in Urban Planning from the University of Montréal. Prior to her current position, Sarah-Maude worked in urban planning, public safety and transport at the municipal, provincial and federal levels.

Getting ready for the next global health emergency

By Nicole Spence

With permission from WHO and HEMBC

British Columbia's health emergency management leaders join the World Health Organization and its global partners in planning an exercise that will prepare us for the next global public health emergency

This past September, Health Emergency Management BC (HEMBC), a program of the Provincial Health Services Authority that provides emergency management leadership and support to the health authorities in BC, co-hosted a planning meeting with the World Health Organization (WHO) to develop detailed plans for a global public health emergency exercise. Its purpose is to allow health emergency partners across the province and nation to discover planning and operational response gaps while building on strengths and opportunities, all of which have direct application to the way British Columbia ensures continuity of health services for its population during an emergency.

> *"It's been ten years since a global health security exercise has been conducted," said Paul Cox, team lead for the Public Health Emergency Operations Centre Network. "Since that time, we have witnessed several events, including the Ebola epidemic, and there are concerns about possible future pandemics."*

While it has been ten years since the last influenza pandemic, there have been four public health emergencies of international concern declared in that time, and over 100 years since the 1918 influenza pandemic that resulted in the death of millions around the world. *"These events occur periodically and it is a matter of a time before another global pandemic,"* elaborates Mr. Cox. *"We hope to not have to use these tools, but if an event happens, these exercises will support our readiness."*

Getty images

Framework for the global exercise

The WHO established the Public Health Emergency Operations Centre Network in 2012 to promote best practices and standards and strengthen coordination and collaboration for public health emergency operation centres (EOC). Through the network, WHO published a Framework for a Public Health Emergency Operations Centre in November 2015, providing Member States with high-level guidance for establishing or strengthening a functional public health EOC.

Aware that the next pandemic could take place at any moment, a series of simulation exercises to assess the functionality and interoperability of public health EOCs of selected Member States have been conducted in 2018. The first was conducted in Jordan in January, followed by an exercise in Senegal in May. As the third and final in the series, a Global Emergency Operations Centre Exercise (GEOCX) will be conducted December 4 to 6, 2018.

Here in British Columbia, we know that a functioning emergency operations centre is an effective means of coordinating partners responding to public health events and emergencies. The health system in BC has successfully established emergency operations centres as central locations for management of emergencies for many years.

Planning for the exercise

The approach to the planning meeting was truly collaborative. Local and national programs and agencies were able to provide local context and expertise of conducting exercises with emergency operations centres of various sizes, while participating WHO staff and consultants were able to guide the session in an efficient and innovative manner to achieve three objectives:

1. To refine and endorse exercise concept
2. To review exercise plan and other technical materials
3. To identify and assign responsibilities and critical tasks

"A common failing of exercises is a lack of documentation," said Mr. Cox. "Participants at the meeting were provided with resources for planning exercises such as implementations and communications plan templates, which allowed them to generate the documentation necessary to walk away with procedures they can apply to their centres immediately."

To prepare for the worst, we need to move away from the underlying focus of success and rather strive for failure. GEOCX is designed to practice and evaluate plans, procedures and policies through a scenario that involves the introduction of a novel virus in a cluster of disease with high mortality and significant morbidity. Participants in the EOC will respond to the simulated events in their normal roles in the centre, drawing on established plans and procedures. This allows them to practice and maintain critical skill sets, and to continuously improve the overall functioning of the EOC - based on practical information about the efficiency of procedures, discovering gaps in planning and operational responses, building on strengths and identifying opportunities for improving plans and procedures.

With permission from WHO and HEMBC

Benefits of the global exercise

A public health EOC is a hub that brings together, under the umbrella of the Ministry of Health, all relevant experts, groups and stakeholders involved in preparedness for, and response to, public health emergencies. The global exercise will test the adaptability and gaps of the Framework and other public health EOC technical guidance, and guide WHO to improve these documents. At a local level, the exercise will support participating EOCs to assess and improve their readiness for managing large scale public health emergencies; build national capacity for management of emergencies; and improve interoperability and coordination among public health EOCs and response partners for more effective operations.
The meeting was also helpful for establishing connections and networks that Canadian participants and municipal emergency managers can draw upon for future initiatives, highlighting the emergency operations network principles of collaboration, encouraging innovation, and cultivating trust.

The meeting was attended by 28 participants from 11 countries, with representation from seven national agencies (including the Public Health Agency of Canada), three provincial programs (the BC Centre for Disease Control, BC Emergency Health Services, and HEMBC), and WHO headquarters and regional and country offices. Participants were comprised of experts, temporary advisors, members of WHO working groups, observers, and staff from WHO regional and country offices and headquarters.

Nicole Spence is a Coordinator with HEMBC in Vancouver, BC. She holds a BA in Psychology and a Graduate Diploma in Public Health, with a focus on International and Global Health and Development. She is interested in the effects of globalization and climate change on global health and its link to emergency management. Nicole is of European descent residing on the unceded territories of the Musqueam, Squamish and Tsleil-Waututh First Nations. On the weekends, Nicole can be found in the local mountains sharing her favourite rosé with fellow alpinists.

CRHNet's President receives a national award

Canada's Minister of Public Safety and Emergency Preparedness, Ralph Goodale (left) and Dr. Michel C. Doré (right).

OTTAWA, 24 mai 2018 – Aujourd'hui, Sécurité publique Canada a organisé la cérémonie inaugurale de remise des prix pour reconnaître des services et réalisations exceptionnelles en matière de gestion des urgences. Le prestigieux Prix pour service exemplaire en sécurité civile (PSESC), décerné par un partenariat entre les gouvernements provinciaux, territoriaux et le gouvernement fédéral, est remis aux personnes ou aux groupes de personnes qui se sont distingués par leurs actions et leurs contributions exemplaires dans l'avancement de la gestion des urgences.

Les lauréats de cette année proviennent de l'ensemble des provinces et territoires et représentent divers métiers de la collectivité de la gestion des urgences : des professionnels et des bénévoles de la gestion des urgences à l'échelle de tous les ordres du gouvernement aux dirigeants des communautés autochtones, des organisations non gouvernementales, des jeunes, des universitaires et des associations. À titre d'exemples de contributions reconnues, mentionnons l'amélioration des communications et des interventions en cas d'urgence, l'accroissement de la résilience des collectivités, la prestation de formation en matière de recherche et de sauvetage et bien plus encore.

Le président du Réseau canadien d'étude des risques et dangers, Michel C. Doré CEM, CGU était un des récipiendaires dans la catégorie Contribution remarquable à la sécurité civile.

OTTAWA, May 24, 2018 – Today, Public Safety Canada hosted the inaugural award ceremony which recognizes exceptional service and achievement in emergency management across Canada. The prestigious Emergency Management Exemplary Service Award (EMESA), delivered collaboratively by provincial, territorial and federal governments, is awarded to individuals or groups that have distinguished themselves through exemplary actions and contributions to advancing emergency management.

This year's award recipients span every province and territory and represent the diversity of professions that contribute to emergency management: from emergency management professionals and volunteers across all levels of government to leaders from Indigenous communities, non-governmental organizations, youth, academia, and associations. Contributions being recognized range from improving communications and response in times of disaster, increasing community resilience, delivering search and rescue training, and many more.

CRHNet's President, Dr. Michel C. Doré CEM, CGU was one of the recipients in the 'Outstanding Contribution to Emergency Management' category.

Dr. Michel C. Doré CEM, CGU

Dr. Michel C. Doré, Ph. D. est actuellement le cofondateur et président du Réseau canadien d'étude des risques et dangers et coprésident de la Plateforme nationale pour la réduction des risques de catastrophe. Sa carrière dans le domaine de la gestion des urgences s'échelonne sur plus de 30 ans. En tant que sous-ministre associé de la sécurité publique au Québec,il a dirigé l'intervention de la province à la suite de plusieurs événements, comme la pandémie de grippe H1N1 en 2009. Comme sous-ministre adjoint au sein de Santé Canada, il a coordonné la mise en œuvre du Plan fédéral en cas d'urgence nucléaire en réponse à l'accident de Fukushima en 2011. Il a également enseigné la gestion des urgences à l'université et dans des collèges pendant plus de 25 ans. La carrière de Dr. Doré, démontre également sa capacité à associer recherche et pratique dans le domaine de la gestion des urgences. Il a notamment coordonné l'enquête sur la gestion de la tempête de verglas de 1998 et dirigé l'enquête ministérielle sur la préparation aux situations d'urgence dans les transports à la suite de la tempête de mars 2017. Il a également marqué de son empreinte les documents de référence utilisés dans le domaine aujourd'hui : il est l'architecte de la Politique québécoise de la sécurité civile. En tant que coprésident des CSRGU, il a joué un rôle clé dans l'élaboration de la deuxième édition du Cadre de sécurité civile pour le Canada.

Pour en savoir davantage sur ces prix consultez le site.

Dossiers de Sécurité publique Canada

Dr. Michel C. Doré CEM, CGU

Dr. Michel C. Doré, Ph.D., is currently co-founder and president of the Canadian Risk and Hazards Network and co-chair of Canada's Platform for Disaster Risk Reduction. His emergency management career spans over 30 years. As Associate Deputy Minister for Public Safety in Quebec, he led the province's response to multiple events, such as the H1N1 pandemic in 2009. As Assistant Deputy Minister at Health Canada, he coordinated the implementation of the Federal Nuclear Emergency Plan in response to the Fukushima accident in 2011. He also taught emergency management in university and at colleges for more than 25 years. Dr. Doré's career also shows his ability to combine research and practice in the field of emergency management. In particular, he coordinated the investigation into the management of the 1998 ice storm and led the departmental investigation into preparedness for emergency transportation situations following the storm of March 2017. He also left his mark on the reference documents that are used in the field today: he was the architect of the Politique québécoise de la sécurité civile (Quebec public safety policy). As co-chair of SOREM, he has played a key role in creating the second edition of the Emergency Management Framework for Canada.

To learn more about the award visit this page.

With files from Public Safety and Emergency Preparedness Canada.

Innovative solutions for building flood resilience: Insights from the Zurich Flood Resilience Alliance

By Adriana Keating and Michael Szönyi

There is an urgent need to enhance flood resilience. While we know prevention is better — and more cost-effective! — than cure, investing in pre-event resilience building is a challenge. The Zurich Flood Resilience Alliance links expertise from the humanitarian and development sectors, research, and Zurich risk management to meet this challenge. The Alliance's quest for solutions is being realized in many ways: they developed the Flood Resilience for Communities (FRMC) approach to measure community flood resilience, complete with the tools to practically apply it which has been used in over 110 communities in nine countries. Not only is it a powerful decision-support tool for at-risk communities, it is the first resilience measurement endeavour to collect the data needed to identify what pre-flood actions really make the difference when the flood comes. Now into its second phase, the Alliance hopes to work with others to share insights to motivate further investment in flood resilience.

Floods are on the rise and things must change

In August of 2018, Toronto was hit with a month's worth of rain in less than three hours, resulting in widespread flooding, power outages and economic losses. Just a week later in the Indian state of Kerala, catastrophic floods caused over a million people to be displaced and a death toll exceeding 300 people. There is an urgent need to enhance resilience to disasters. Nowhere is this more urgent than in relation to the peril of floods, which affects more people globally and causes more economic damage than any other type of natural hazard. Flood risk and the resultant loss of life and economic losses are growing as economic opportunities draw people to high risk areas, especially coastal zones. The gap between insured and uninsured losses is also growing. In 2017 alone, this gap from natural hazards amounted to a staggering USD 193 billion (Swiss Re, 2018). Zurich Insurance and the Alliance are working to close this protection gap, both in terms of increasing the proportion of insured risk as well as reducing overall risk, although the focus is mostly on remote and vulnerable areas where insurance penetration is very low.

While we know that prevention is better than cure — that investing in pre-event resilience building is more cost-effective than simply cleaning up after a disaster (Mechler, 2016) — very little is spent before an event strikes. This is because it is more politically palatable to respond to tangible impacts after the flood comes than to invest beforehand in only the possibility of a future flood. This challenge is magnified because the underlying problem of increasing flood risk is risk-insensitive development, and nobody wants to be seen to be hampering growth.

We know that flood risks and economic development are interconnected and thus cannot be tackled without innovation and cooperation of stakeholders with complementary skills. That is why Zurich Insurance has partnered with the International Federation of the Red Cross and Red Crescent Societies, five NGOs, and disaster resilience experts from academia, such as the International Institute for Applied Systems Analysis (IIASA), to form the Zurich Flood Resilience Alliance.

The Zurich Flood Resilience Alliance

The Zurich Alliance, launched in 2013, is an innovation in how investments in disaster resilience can be funded by tackling disasters and development together, in an integrated way. Working together to build resilience, each organization brings complementary skills and expertise in order to link academic insights, humanitarian and development sector capabilities, and Zurich's risk management expertise.

The Alliance realized that community flood resilience is far more than just 'bouncing back' with good relief and recovery, or building robust infrastructure. Taking a systems perspective linking disasters and development, they defined community flood resilience as "The ability of a community to pursue its development and growth objectives while managing flood risk over time in a mutually reinforcing way" (Keating et al., 2016). This means that a community can continue to develop unhampered by flooding, and efforts to manage flood risk do not get in the way of the community's development. In other words, flood resilience is living and thriving with floods.

For example, as part of their work with the Alliance and using the FRMC (see below), Concern Worldwide tackled both development needs and disaster risk together via the promotion of sustainable technologies. By promoting solar stoves community wellbeing was improved, and the need to cut down wood for fuel — which can increase flood risk — was reduced.

Working to build community flood resilience in this way means that development and disaster risk reduction (DRR) are not mutually exclusive concepts that need to compete for attention or funding — which they currently often do. Instead they go hand in hand as complementary concepts that need to work together — mainstreaming DRR into development, and ensuring that development aspects are not forgotten in DRR programs. This will help tackle the problem that development often exacerbates existing or creates entirely new risk.

One way for the Alliance to achieve large scale impact is for theoretical learnings to be turned into practical solutions and then used to inform large scale programs. The quest for implemented solutions to enhance community resilience is being realized in many different ways, with one key aspect being resilience measurement.

Case studies

In Peru, communities in the Piura region are now better able to monitor their flood hazards and activate their response plan to protect lives and belongings. This enabled communities to respond effectively to reduce the losses during the devastating El Niño floods in 2017. There was no loss of life in the program areas and in addition, communities managed to leverage additional funding of USD 1.5 million to be invested to further reduce their flood risks.

In Mexico, the need for self-action was identified and 70 community brigades were educated and equipped, serving their local population as first responders, of which 45 brigades in Tabasco were formally certified by the Mexican Civil Protection Agency. This was an unprecedented recognition which may act as nationwide best practice and is already planned to be rolled out to neighboring states.

Partnerships for innovative solutions: Measuring community flood resilience

The Zurich Alliance discovered that building community flood resilience requires an in-depth understanding of the community before implementing solutions, and a consistent impact measurement framework. The experts also found that there was no empirically verified measure of resilience available. To fill this gap, they developed the Flood Resilience Measurement for Communities (FRMC) to holistically measure community flood resilience, complete with the tools to practically apply it. At the community level the FRMC is a decision-support tool that enables organizations working with communities to understand the system driving both development and flood risk, analyze flood resilience strengths and weaknesses before a flood strikes, and helps identify solutions. The Alliance recognizes that if some solutions cannot be implemented within their program then it is essential to partner with other stakeholders.

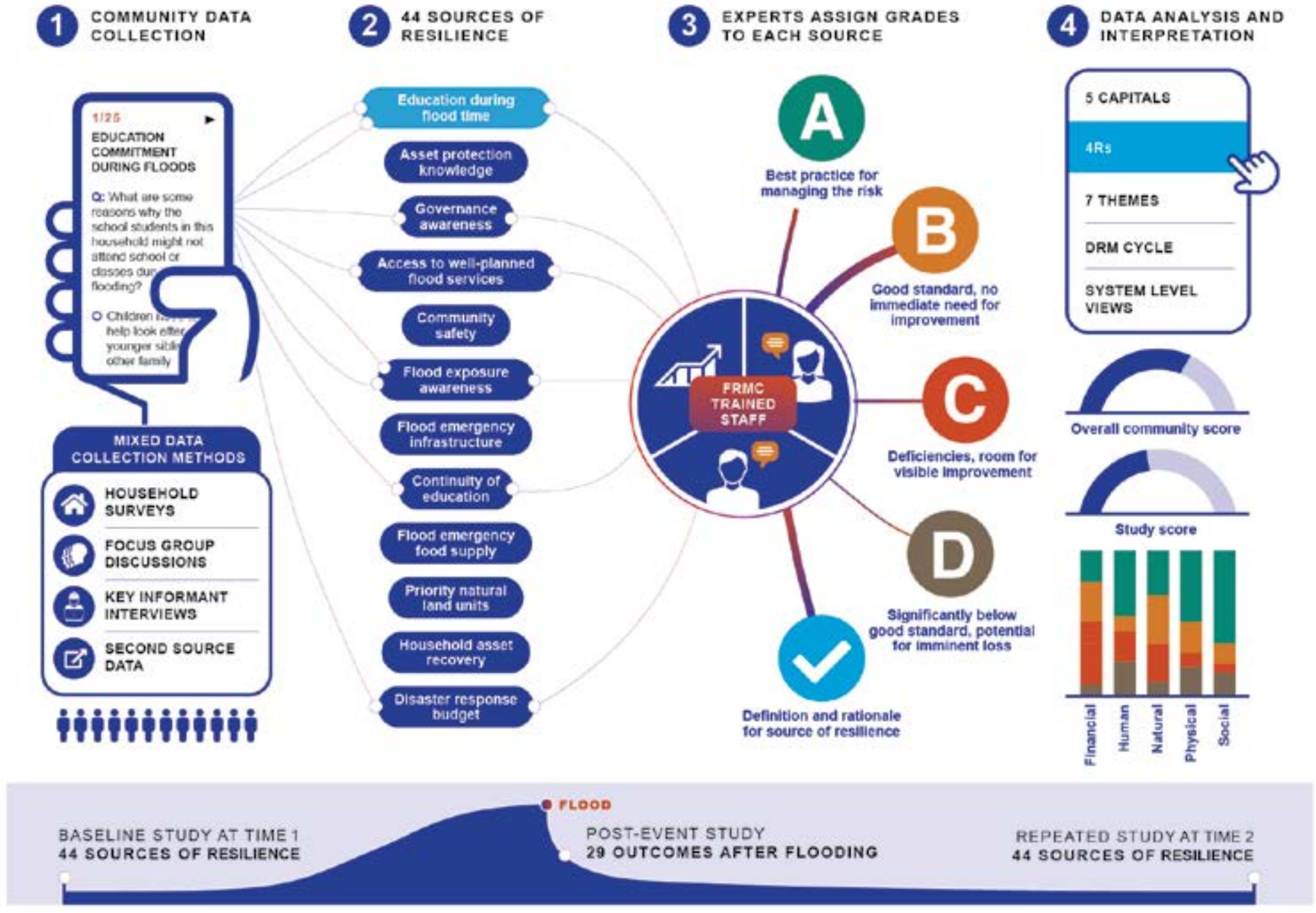


Figure 1: The FRMC process

Capturing both the community development elements so often missed in flood risk management, the FRMC is an indicator-based framework that has been built into an integrated web-based tool and mobile data collection App (Keating et al., 2017).

The first version of FRMC was used in over 110 communities in 13 programs in nine countries, generating over 1.1 million data points. This is the first resilience measurement framework to systematically collect the data needed to generate the evidence base for what pre-flood actions really make the difference when the flood comes. Because partnership is a core tenant of the Zurich Alliance, this data is available upon request so that scientists from anywhere in the world can contribute to the research effort.

Community partners have overwhelmingly reported that being part of the Alliance and using the FRMC has been a game-changer for their programs (Zurich Flood Resilience Alliance, 2018). The systems-based approach is expanding users' and community members' – understanding of the many factors that contribute to resilience. In particular, the long-term approach of the Alliance program has been a key factor in success by providing the time and resources needed to really make change happen. Community programs have been empowered to undertake in-depth cross sectoral analysis prior to designing solutions something which is bafflingly unusual.

Call to action

Not only is the Alliance helping to better understand and measure community flood resilience, more importantly it has actively built resilience in over 110 communities in Latin America, Asia, the US, and Europe. The total number of direct beneficiaries of the Alliance to-date is approximately 225,000.

Figure 2: Where we work as an Alliance

Now into its second phase, the Zurich Flood Resilience Alliance has reconvened for a further five years with Zurich Insurance, Concern Worldwide, International Federation of Red Cross and Red Crescent Societies, Mercy Corps, Plan International, Practical Action, International Institute for Applied Systems Analysis, London School of Economics, and ISET International. The aim is to leverage investments by others of USD 1 billion into the flood resilience space to achieve improved policy and practice the world over.

For communities in Canada facing flood risk, there is much knowledge to be shared regarding building community flood resilience. The Zurich Alliance has demonstrated the enormous value of taking a holistic approach to disaster risk management and the critical importance of linking this with a community's development and growth goals. They have learned that building flood resilience cannot be achieved in the short-term, and instead requires long-term and flexible funding. The FRMC is available for non-commercial use with any flood-prone community worldwide. Having already been applied in many contexts, including two locations in the United States, it is applicable in both more developing rural as well as developed urban contexts.

With the knowledge and experience honed over the first five-year phase, the Zurich Alliance hopes to work with others to share insights to motivate even more investment in flood resilience — because prevention is always better than cure.

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Adriana Keating isis a researcher with the International Institute of Applied System Analysis (IIASA) where her research focuses on the human dimensions of disasters and climate change adaptation. Dr. Keating is an expert in disaster resilience, and has worked with the Zurich Flood Resilience Alliance since its inception in 2013.

Michael Szönyi is member of executive staff in the Sustainability function with Zurich Insurance Company. He leads Zurich's Flood Resilience Program, including the multi-sector alliance with academia, humanitarian organizations and the private sector, aiming to enhance community flood resilience. The alliance was recently extended to run in a second phase from 2018-2023. He has 12 years of insurance industry experience. He has Master Degrees in Natural Hazards Management and in Geophysics, both from ETH Zurich.

Smart and participatory water solution in Bangladesh

By Rajib Shaw

Introduction

Bangladesh's geographical location and land characteristics make it one of most hazard-prone countries in the world. Primarily consisting of low and flat land, with some hilly areas in the northeast and southeast, the country is one of the most climate vulnerable countries in the world. It has been frequently visited by a range of natural hazards throughout its history, including cyclones, floods, droughts, tornadoes, river bank erosion, high arsenic contents in ground water, waterlogging and salinity.

In Bangladesh, government, international agencies and NGOs are the primary actors in disaster management. While the responsibility for providing a framework of legal and institutional structures remains the government's, over the years the roles of NGOs and donor communities have increased significantly. In addition, the private sector has potential to undertake activities that combine business interests with broader social concerns and needs.

Innovation has been part of community life in Bangladesh from its very inception, to help cope with daily hazards like water stress, slow-onset hazards like sea level rises and droughts, as well as fast-onset disasters like cyclones and floods. This article provides a specific example of community-driven innovation that also exemplifies the importance of multi-stakeholder partnerships.

Problem

The South western part of Bangladesh is prone to chronic arsenic contamination of ground water due to sub-surface geological conditions; excess salinity in ground water is thought to be widespread and generally attributed to land-use change, rising sea levels, and droughts due to changes in rainfall patterns. Thus, although the region is filled with water, there is a perpetual lack of safe drinking water (Figure1).

During the past several cyclones, huge storm surges have also affected the surface water quality by making them saline, thereby posing additional stress. It is argued that high salinity in water has also been contributed by the sustained use of aquaculture, the pumping of a huge amount of ground water, and by the depletion of the water table. Scarcity of fresh water and saline inundation in coastal areas have severely impacted primary sources of livelihoods and supplementary incomes for rural households, including homestead gardening, poultry and animal husbandry.

Figure 1. Landscape of coastal Bangladesh

Approach / Stakeholder participation

Concern Worldwide initiated a rainwater harvesting project in collaboration with a private company called Gazi Tank Company (GTC) to reduce risks from natural disasters and climate change. Activities include providing vulnerable households with storm-resilient houses, rainwater harvesting systems, and vegetable cultivation approaches to maintain livelihoods by reducing food insecurity. Rainwater harvesting systems were introduced under various government and non-government programs in order to provide arsenic-safe drinking water for the affected populations. Within a short period of time, water systems failed in many communities due to lack of proper maintenance and management. However, under the renewed rainwater-harvesting model, in collaboration between private companies and non-government partners, the technology has been identified as a potentially effective mode to maintain freshwater supply for drinking and homestead vegetable gardening based on the meteorological data in the areas. Bangladesh has a relatively high amount of monsoon rainfall, with an annual average close to 2,000 mm per year. While most of the rainfall is concentrated during the months of May to September, rainwater availability in the months of April, May, September and October is also sufficient for cultivation and other needs. However, farmers are in dire need of water for cultivation for the months of November to March. Soil moisture in November is sufficient for cultivation and hence less additional water is needed. But unmet water requirements for vegetable cultivation in December and January are high.

The model has been designed to store rainwater during the crisis period that can permit a crop cycle. There are three key components:

1. A rainwater harvesting system (Figure 2) allowing families to store water for the dry season and promoting drip irrigation for homestead vegetable cultivation (Figure 3);
2. Improved access to safe drinking water providing enhanced nutritional security, especially for women and children;
3. Salt-tolerant cultivation on poly-beds with moisture retention capacity increasing vegetable yields.

Figure 2. Water tank to collect rainwater

Figure 3. Vegetable cultivation using rainwater

Innovation

Three specific innovations are exemplified in the project:

1. Process Innovation: The establishment of a win-win partnership among the county's biggest private conglomerate—the Gazi group, INGO (Concern Worldwide), local communities, and research institutes—represents a significant process innovation. This is one of the most successful and sustainable examples globally of private sector involvement in rural resilience building that is linked to the company's core business rather than being a corporate social responsibility (CSR) activity. The partnership has helped GTC expand its rural market, which has now passed its gross sales in urban areas.

2. Product innovation: GTC and its research partners developed specific materials used as a thin layer in the tank. These materials allow air flow, thereby protecting water in the tank from the growth of microbial organizations. Eventually, the stored water could be used for an even longer period to meet the needs in the dry months of the year.

3. System innovation: To facilitate water contamination mapping and engage communities in the mapping process, Keio University developed a web based application (Figure 4) called Smartwater solutions.

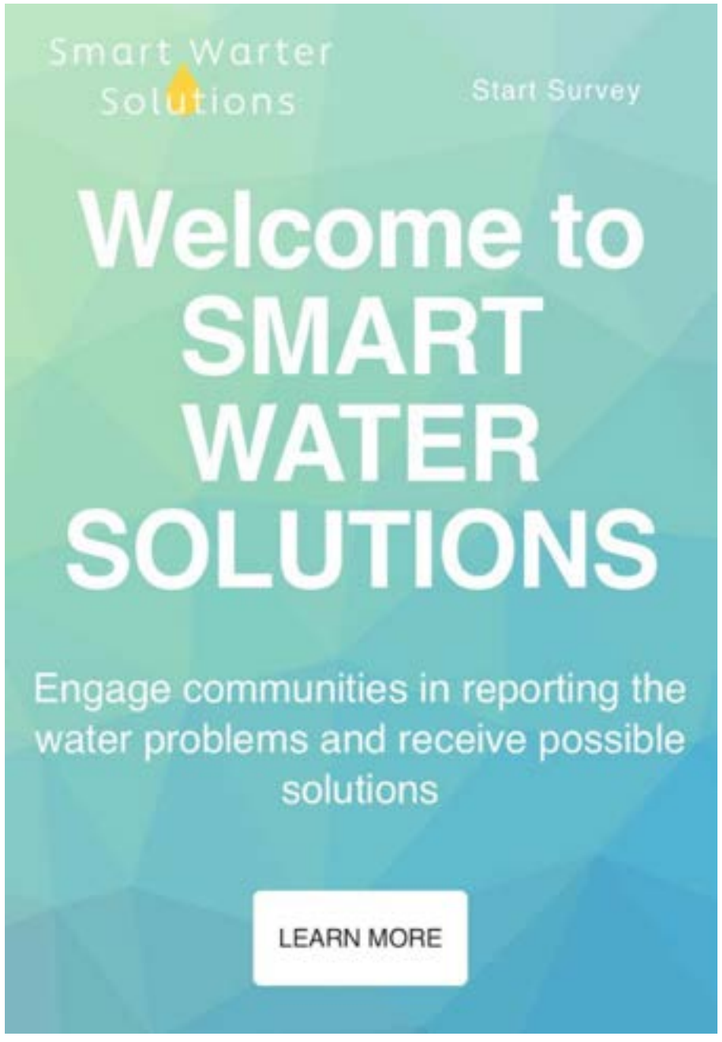

Figure 4. Smart water solution web application

Conclusion

This project can be considered as a successful model of creating business opportunities for the private sector and contributing to establishing community resilience. The project demonstrated the investment made by GTC in this project can be returned in three years. However, GTC had to compromise some of its profits in subsidies, offering a reduced price for tanks sold to NGOs and communities. Two major reasons GTC accepted this compromise were: 1) a strong intention and aspiration to contribute to changing local situations and improving living standards of local and vulnerable citizens; and 2) the opportunity to obtain greater publicity and visibility for their name and brand associated with the contribution.

Concern Worldwide considers the private sector an important partner in project planning and implementation, with the private sector additionally having the potential to gain benefits by participating in projects. Keio University also contributed to resolving water issues in Bangladesh by developing the mapping process and linking it to the local governments. With its strong community basis, this innovation has been successful due to the "win-win partnership" of different stakeholders. Continuous monitoring of the water-supply systems and training would be highly necessary to sustain this alternative, freshwater supply in coastal Bangladesh and other locations where communities are facing similar environmental issues.

https://smartwatersolution.org

The application, which has been tested in the field, provides information on contamination as well as solutions to water issues. The data can be looked using Google Maps, allowing it to be used as a decision making tool for local governments seeking to better understand the needs and priorities of local communities on water issues.

Rajib Shaw is a professor in Keio University in Japan. He is also the Chair of the United Nations Science Technology Advisory Group on disaster risk reduction.

Urban resilience

By Lilia Yumagulova

Sasso Barisano, Matera, Italy - Copyright Fiona McLean.
Instagram: @fionamcleanphoto.

We live on an increasingly urbanizing planet. Research suggests that there is a direct connection between urbanization and growing disaster risk. Climate change places more demands on cities' abilities to manage existing hazards and prepare for new risks.

Urban resilience has emerged as a promising approach in responding to the existing stressors and shocks while transforming management practices in a way that can increase cities' capacity to respond to changing risk landscape.

In this feature, we take you on a global tour that highlights some of the inspiring examples of what urban resilience looks like on the ground.

Lessons from ICLEI Resilient Cities forum

By Matteo Bizzotto

Copenhagen cloudburst management plan

Copenhagen Cloudburst proposal - Copyright Atelier Dreiseitl

Copenhagen, Sankt Annæ Plads - Copyright Ramblersen

Person of reference at RC2017: Lykke Leonardsen, Head of Program, Resilient and Sustainable City Solutions, City of Copenhagen, Denmark

With a population of over 783,000, Copenhagen is the most populated city in Denmark. In 2011 the city was hit by a severe cloudburst - 150 mm of torrential rain in two hours - causing damages exceeding USD one billion and a steep rise in insurances claims and payouts for cloudburst-related damages, which in turn augmented the prices of insurance coverage for similar assets from one year to another.

Following the 2011 wakeup call, Copenhagen developed a specific Cloudburst Management Plan, firstly presenting at Resilient Cities 2012. The city returned five years later to track the progresses and challenges of its implementation: stormwater-protection measures combined green and gray infrastructure, smartly exploiting the topography and tunnels to divert water from high-risk to low-risk areas (e.g. the harbour, lakes). For instance, Sankt Annae Square, one of Copenhagen's first cloudburst streets, was transformed into a recreational area that can serve as a large stormwater retention basin. Such methods of managing rainwater on the surface, rather than only through traditional drainage, also allowed the city to save money while providing green, multifunctional spaces. In effect, the Plan's cost-efficiency and socio-economic benefits ultimately helped it to win the City Council's and national government's approval.

Further projects are currently being promoted or implemented, establishing new partnerships and expanding to the private sector as well to overcome financial constraints.

Sharing and openness is really important. Get over the fear of working with the private sector that is looking for a profit, stop being afraid! - Lykke Leonardsen, Head of Program, Resilient and Sustainable City Solutions, City of Copenhagen, Denmark.

Bologna, Italy: ROCKing resilience while protecting heritage

Bologna, Giovanni Fini at RC2018

Person of reference at RC2018: Giovanni Fini, Coordinator, Environmental Quality Unit, City of Bologna, Italy

Cultural and natural heritage is our legacy from the past, what we live in today and what we will pass to future generations. At Resilient Cities 2018, the city Bologna, Italy presented its approach to advance urban resilience while preserving its legacy.

Through the EU-funded ROCK project, Bologna transformed the 350,000 m2 university area (ZONA-U) of its historical centre with a dual objective: reinforcing the recognition of the existing cultural heritage, and stimulating the daily formation of a new heritage, a product of contemporary urban cultures. The area was indeed chosen due to the diversity of its residents, such as students, elderly and families.

Bologna co-designed cultural and sustainable initiatives (living labs, green mobility); it increased pedestrian flows and slow mobility with new cultural routes; and it enhanced porticoes as a unique gathering points. Temporary physical measures, such as flower pots and overhead gardens, were elaborated in close consultation with the population, which in turn felt a sense of ownership on the project. Once such installations were removed, the city – and the community – started to look for more permanent solutions and new partnerships, particularly with the private sector.

The versatility – and success – of ROCK lied within the continuous comparison between different cultural, social and economic identities in local, national and international perspectives. This catalyzed shared actions between those who live, frequent and animate ZONE-U by mixing visions, knowledge and skills. In turn, the project benefited the city as a whole by improving safety, mitigating social conflicts, and attracting tourists, entrepreneurs and private investments.

Last resort: community resettlement

Louisiana, Isle de Jean Charles - copyright Karen Apricot New Orleans

Person of reference at RC2018: Dakota Fisher, Resilience Program Analyst, State of Louisiana's Office of Community Development, New Orleans, USA.

The coastal area of the state of Louisiana, USA is increasingly giving way to water due to a combination of factors, such as land subsidence in the Mississippi River Delta, rising sea levels, and hurricanes. This undoubted fact of annual land loss, including the majority of Isle de Jean, and sinking has led to economic, social, and cultural concerns about the future of a vibrant area.

"It's like a family member having cancer: he's been eaten away … little bit by little bit, getting destroyed. The only [different] thing is the piece of land is lasting longer than human body can." - Albert Naquin, Chief of the Isle de Jean Charles Band of Biloxi-Chitimacha-Choctaw Indians[1]

With a grant of USD 48 million awarded by the US Department of Housing and Urban Development, the Louisiana Office of Community Development – Disaster Recovery Unit (OCD-DRU) started a resettlement plan for the island. This was the first publicly-funded, climate change-induced resettlement project in US American history.

Centred on citizen participation, open meetings, constant engagement, and consultation with local communities have been crucial to the adaptation efforts. Such an approach ensures that plans for integrated water management or relocation and redefinition of a community's new home are viable and sustainable practices.

Despite the success of the operation, resettlement should always be regarded as a last resort, especially in cases where it divides communities as it can disrupt cultures and traditions.

[1] NOT present at Resilient Cities 2018. Quote from min. 2:59. http://www.thisisplace.org/i/?id=79ce1749-6b84-4818-a283-0dc88bb3ead5

Advancing resilience in face of limited resources: the case of Quelimane, Mozambique

Person of reference at RC2018: Manuel Araujo, Mayor of Quelimane Municipality, Mozambique

a coastal city situated predominantly below sea level, the city of Quelimane, Mozambique is heavily exposed to marine floods and tides. Its 450,000 inhabitants are therefore extremely vulnerable to climate risk.

With the support of the United States Agency for International Development (USAID), Quelimane municipal leaders and the community worked together to address the challenges through the Coastal City Adaptation Project (CCAP), a climate change adaptation initiative that focused on two main elements: ecosystem-based adaptation; and smart and resilient housing. In the first case, the city restored the original mangrove line, which is now the prime line of defense against flooding and helps against soil erosion. Mangrove restoration measures leveraged the active involvement and participation of the community, which in turn empowered community associations, promoted restoration methodologies and ecosystem services, and saw political buy-in and mobilization of different age and gender groups.

Quelimane, Manuel Araujo at RC2018

“There is a political buy-in given that community members and leaders are involved in all stages of the restoration process … This is very important as it brings ownership to the people.” - Manuel Araujo, Mayor of Quelimane Municipality, Mozambique

With regard to housing, Quelimane promoted the construction of buildings that intentionally incorporate resilience in their design, such as elements that aid in withstanding disaster and disruption of normal life. Examples of such buildings’ characteristics point to their low-risk locations, secured and stable roofs, higher foundations, and rainfall-water storage. All these innovative techniques are linked through a silver thread: cost-affordability, which empowered the local community to build cheap but disaster-proof houses.

Matteo Bizzottoa is part of ICLEI Resilient Cities Team in Bonn, Germany, where he co-organizes a yearly global forum on urban resilience and adaptation to climate change. He also authored and co-edited the Resilient Cities Report 2018.

Before ICLEI, Matteo briefly worked at the press office of the Permanent Mission of Italy to the United Nations in New York. He holds a Master’s Degree in International and European Relations and a Bachelor’s in Business and Management.

He loves travel and photography, in that order.

La presqu'île de Dakar face aux catastrophes : cas des inondations.

L'agglomération de Dakar

By Moussa Mahamat Moussa Dicker

Centre politique et économique du Sénégal et lieu de résidence de 3.6 millions de personnes (ANSD, 2015), l'agglomération de Dakar est vulnérable aux inondations, aux accidents industriels, aux enjeux liés à la pollution (air, sol, eau) ainsi qu'aux épidémies. Ses principaux défis en lien avec la résilience sont liés à une urbanisation diffuse, une rapide croissance démographique, la pauvreté, la pollution et la densification. En effet, l'agglomération est située sur une presqu'île rendant impossible son étalement et pouvant ainsi placer davantage de personnes dans des zones à risques.

Face à ces défis, l'élaboration et surtout le respect des documents de planification de l'aménagement du territoire, la sensibilisation et le renforcement des capacités des acteurs municipaux sur les méthodes de prévention des risques sont des solutions pour réduire la vulnérabilité du territoire. La portée de ces solutions est cependant limitée en raison du grand écart entre la recherche et la pratique du fait que, dans la pratique, les conclusions issues de projets de recherche ne sont pas prises en compte.

En 2009, l'urbanisation diffuse et incontrôlée de l'agglomération dakaroise a montré ses limites lorsque les villes de Guédiawaye et Pikine (carte n°2), situées en périphérie de Dakar, ont été fortement touchées par des inondations. L'eau atteignait 1.50 mètre (zones en bleues sur la carte ci-dessous) et environ 30 000 maisons et 130 écoles ont été touchées. Le coût total du sinistre s'est élevé à environ 42 milliards de FCFA (NICOD, 2016). En 2012, de nouvelles inondations affectant les mêmes zones ont porté le nombre de sinistrés à plus de 300 000.

Carte 1 :
les zones inondées en octobre 2009

Face à ce sinistre, le gouvernement du Sénégal a initié, en 2012, le Projet de gestion des eaux pluviales et d'adaptation aux changements climatiques (PROGEP) avec le concours de la Banque Mondiale et du Fonds Nordique de Développement. D'ici au 31 décembre 2019, avec un coût total de 72.90 millions USD (Banque Mondiale, 2018), ce projet a pour but le "renforcement de capacités, la construction d'ouvrages prioritaires de drainage, la gestion des zones humides, la promotion de l'engagement communautaire dans la réduction des risques d'inondation". (Banque Mondiale, 2016)

À ce jour, 137 500 personnes touchées par les inondations ou en situation de risque face aux inondations ont bénéficié du projet (contre 90 000 initialement prévus) et 571 ha de terres ont été protégés (contre 343 initialement ciblés) (Banque Mondiale, 2018). Malgré ce projet, le problème de l'urbanisation incontrôlée reste majeur et fait en sorte que des personnes continuent à s'établir dans des zones à risque.

Carte n°2 :
Situation géographique de l'agglomération de Dakar

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Urban resilience in action:

Innovation through cooperation in Bergen, Norway

By Lilia Yumagulova, Editor, HazNet

Innovating through cooperation: Bergen's Samvirke Centre

"Samvirke" is a Norwegian word that means working together towards a shared goal. City of Bergen's Samvirkesenter brings key actors to cooperate together on enhanced regional emergency management capability.

Bjørgvin means 'the greenmeadow among the mountains'

Population: second largest city in Norway at 280,000; 420,000 in the wider Bergen metropolitan region.

Climate: Temperate oceanic climate with abundant precipitation (2,250 mm on average a year)

Geography: A mountainous region with steep slopes location on the Bergenshalvøyen peninsula on the western coast of Norway and sheltered from the North Sea by the surrounding islands.

Key hazards: transportation accidents, landslides, flooding, sea level rise, storms.

Key industries: shipping, energy, transportation, offshore petroleum industry, education, tourism and finance.

It all started with thousands of bicycles that hit the streets of Bergen as part of the 90th Union Cycliste Internationale Road World Championships in September 2017. The event brought the city to a nine-day lock-down with extensive road closures. A spectacle for 700,000 cycling enthusiasts, an event of this scale required a meticulous emergency management planning process. Road and business closures posed challenges not only to visitors and participants, but also to the citizens of Bergen.

With the city in an international spotlight, public safety provided the overriding priority. The complexity of the event caused Bergen to implement an intensive inter agency collaboration effort to mitigate additional risk. This work started two years before the event.

Innovating in real time, the municipality of Bergen brought together nearly 130 people from 31 different organizations as an emergency management team during the event. Core municipal staff were joined by the fire department, road administration, public transportation, the police, the military, civil defense, health, telecommunications and volunteer organizations from early morning to late night. During the event, the centre monitored the operation of the municipal assets and infrastructure through 24/7 surveillance systems tied to GIS maps with multiple layers for social and physical infrastructure. The goal of this surveillance was to address small events before they escalated.

The Samvirkesenter is the first of its kind in Norway and has garnered national attention and awards. It allowed key emergency management players to interact before and troubleshoot during and after emergency events. The centre was designed based on the core principles of emergency management in Norway which include responsibility, proximity, equality and collaboration. It introduced an innovative cross-organizational structure and an operational environment that fosters culture built on cooperation, coordination and collaboration. By having key public, private, volunteer and non-profit charity agencies in one room during the event, information could be shared immediately, establishing a shared situational awareness that led to efficient decision-making and implementation. The long-lasting legacy of this organizational innovation is increased efficiency: "What could take four days before, can now be fix in four minutes," says Snorre Halvorsen, Bergen municipality's project manager for the Samvirkesenter. During the event, incidents ranged from a water/hydrant leakage, stolen cars and traffic accidents to missing children.

The Samvirkesenter has continued its operation after the championship. The Municipality of Bergen has big plans for this continued operation with a focus on increased crisis management competencies and interorganizational learning.

Next steps: A focus on learning through partnerships

Moving forward, the Regional Civil Protection Centre and Emergency Management Cluster will continue to collect and share information through joint mapping and based on the resource needs, ensuring communication and coordination between actors. The centre will also focus on clarifying and recommending common guidelines for involved actors.

"There is an increasing need for interaction between the various players in the region, to meet the challenges of changing risk landscape. We need to bridge the gap between those who prevent emergencies, those who respond to emergencies, and those who study emergencies. Our vision for the emergency preparedness and management community is to create a single Civil Protection Region in Western Norway, which brings together practitioners and researchers to use their shared skills more effectively," said Halvorsen.

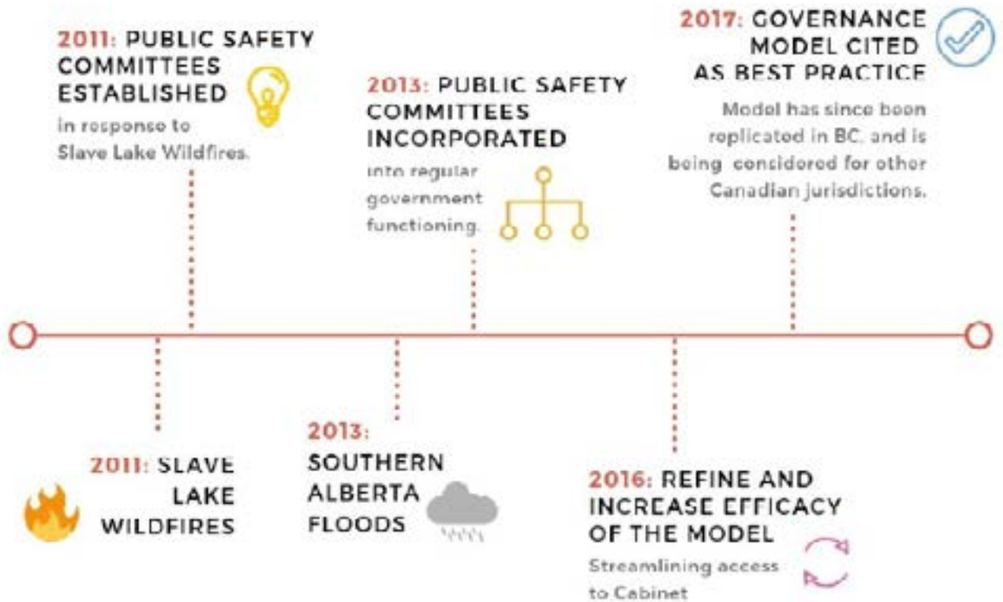
The centre will serve as an enabling environment for developing crisis and emergency management competencies by fostering close connections between practitioners and researchers. A special emphasis on ensuring that this knowledge is accessible for the smaller, less resourced municipalities in the region will be placed. "The key is to keep this initiative organized from the ground level, bottom-up," said Halvorsen.

The importance of partnerships with research institutions was recognized from the very early stages of the project. "The city of Bergen has a long history of very good collaboration with academic partners," explained Halvorsen.

The Civil Protection Centre builds on the previous collaborative projects and brings practitioners and researchers for more effective mutual learning. Academic partners were embedded throughout the functioning of the Centre to ensure real-time and long-term organizational learning. For the example, the research conducted during the UCI World Championships by the "Høgskulen på Vestlandet" (Western Norway University of Applied Sciences) led to a significant improvement on the issues of information sharing, situational awareness, and situation handling when collaborating real-time in the same room. These research results informed the direction for the subsequent development of the Civil Protection Centre.

Bigger, Better, Faster Decisions … Through Committee

By Trish McOrmond and Esther Burkard



THE BEGINNING … Again

In moments of crisis, making decisions on how to recover and direct resources becomes a rapid, highly scrutinized activity, required to be done in a measured and informed way. Decision-making in a crisis also is a game of chance with unintended outcomes. In June 2013, Alberta experienced what was, at the time, the largest disaster due to an extreme weather event in Canada's history. The Government of Alberta (GoA) had commitments, and was now faced with needing to recover from the largest uninsured disaster in Canada's history requiring decisions at an unprecedented speed.

The history of this physical event is well-documented; the decision-making approach used to support better decision-making has had less focus. The GoA took a targeted approach; meetings focused on decisions required to support recovery in both the short and long term. A core group of Assistant Deputy Ministers (ADMs) was struck to coordinate activities through targeted discussions outside their continued support to business-as-usual. Discussions were then compiled into decision documents for a targeted cabinet committee who met weekly, for the first ten months, to make actionable decisions and develop meaningful models for long-term program implementation.

This model revealed two critical factors; with targeted deliberate action the machinery of government works very well; and we replicate a lot of activities across government in times of stress that can, and should, be better coordinated. An evaluation conducted by McKinsey & Co. one year out from the event supported these conclusions.

The decision-making process addressed some of the challenges inherent in government bureaucracy, while maintaining the integrity of the system it was put in place to circumvent. The targeted approach has been subsequently embedded as the internal support structure for the public safety system by reinvigorating the Deputy Ministers' and Assistant Deputy Ministers' Public Safety Committee (Committees).

The Committees, focused on strategic and collaborative decisions, provide a regular venue for business-as-usual and emergency decision-making with a coordinated approach. They also allow the system to mature and be embedded in the civil service, lessening the impact of political changes.

THE WORK

The Committees focus on coordinating overarching objectives related to public safety and emergency management governance in Alberta, in order to achieve streamlined program delivery. This dedicated cabinet committee has been critical to streamlining policy and program decisions for Cabinet during major events. It now also facilitates significant coordination for business-as-usual decisions and identifies focus areas, proactively increasing Alberta's preparedness.

For example, Alberta is one of the few jurisdictions in North America that tests the robustness of IT systems recovery through annual disaster recovery exercises targeting our IT infrastructure. The Committees also serve an oversight mechanism for Facility Emergency Preparedness Program and business continuity, moving these once side-of-desk initiatives to fully engaged programs with dedicated resources. Emergency management and preparedness are built into the infrastructure of government and both encourages and requires on-going discussion at the executive level.

There is enhanced coordination amongst individuals beyond the standing members, used to develop the whole-of-society approach and, knowing 'what gets measured, gets done' the Committees are accountable to Executive Council for the annual work plan. Including external members such as the Alberta Energy Regulator, and increasing collaboration with groups such as the Canadian Red Cross Society and the Insurance Bureau of Canada is supported and coordinated as critical to all pillars of emergency management. This structure has increased the trust between stakeholders, internally and externally by creating on-going opportunities to discuss items that impact players across the system.

CHALLENGES

The governance model has proven to increase trust and the speed of decisions during major events and in peacetime coordination. However, consensus on the strategic direction and agenda, and accountability for agreed upon tasks and deliverables is more feasible in the immediate aftermath of a major response and in the initial stages of recovery. Ensuring multi-departmental and multi-disciplinary collaboration without significant events driving it is challenging due to competing priorities. Overcoming these challenges requires commitment to the creation and execution of deliverables that are representative of government's strategic goals and incorporate the collective input of Committee members. The development of Alberta's Resilience Strategy – recommended after the 2016 Regional Municipality of Wood Buffalo Wildfires – is a tool to focus strategic objectives on the prevention and preparedness pillars of emergency management. The objective is to embed the principles of sound emergency management and Disaster Risk Reduction in our quotidian planning and decisions.

SUCCESSES AND NEXT STEPS

The Committees' work increased coordination in the province's public safety system, especially the ability of government to move rapidly from a long-term strategic agenda to an event-specific focus. This agility is rooted in the trust and subject-matter understanding facilitated by regular meetings, an increasingly shared vocabulary, and a deepened understanding of the system impact of decisions over both the immediate and long term.

We are learning that multiple wicked problems are deeply entwined. For example, adaptation to climate change is required, beyond reducing emissions, to minimize the net impact of severe weather events on our built environments. Resilient communities that can recover from shocks more quickly and effectively need to be supported through effective urban planning. Revisiting the Sendai Framework and its relationship with the Sustainable Development Goals is one starting point; increasing focus on multiple orders of government entering mutually supporting partnerships such as through the forthcoming Emergency Management Strategy for Canada is another.

Government continues to incorporate hard-won lessons, and the Committees encourage discussions at the intersection of departmental responsibilities. How we build these considerations and complexities into decision-making discussions and processes matters. We need to determine how to leverage these interconnections effectively, gaining traction at nexus points, generating multiple impacts. Emergency management is a dynamic, quickly-maturing discipline best advanced by sharing information early and often. The Public Safety Committees allow Alberta to do this in a proactive and action-oriented way, building trust and understanding across the system. And there is always room for improvement. Fortunately, since identifying the need for an integrated system seven years ago during the Slave Lake Fires, we have committed to learning and improving not only in the midst of disaster, but during business-as-usual, to build a culture of preparedness.

Trish McOrmond joined Alberta Emergency Management Agency in 2014, after working on the 2013 Flood Recovery Task Force. During the day, she works in strategic policy and partnerships building a prepared and disaster-resilient Alberta. Her time off involves living room dance parties with her kids and good food.

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A letter from Tahltan

By Sonia Dennis

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My heart aches, for all that once was, has now been changed forever. A life we called normal is now anything but…

I cry for my people who have been left with nothing but rubble. The children that are displaced and sleeping in unfamiliar beds.

I try to imagine what it would be like to look upon this place we call God's country. I find myself asking "Why?" like I expect an answer back.

Is this Mother Nature's way of cleansing the earth, renewing the land? Questions that have no comfort.

Hours on hours we sit and wonder, hours to hours our people cry.

Hours on hours our men and women, out there in the ash stricken land working to save what little is left.

Exhaustion and fatigue is noticeable on their faces, but yet they work. Some can barely breathe but yet they try.

Their lungs burn and crave for just a little fresh air, as the sky around them is engulfed in grey.

When will this nightmare end? We don't know. The many difficult nights of being away from home, without knowing the days to the months that it will take.

And through all this we still can find a little light of hope, strength, support, and resilience.

Through all this I see people gathering together. Holding each other up like we've never done before. Putting all shit aside and joining together. People who never talked before have found a friendship. Nations helping nations.

So many have banned together to help, so many strangers have now become our allies, our family.

Tahltan Strong is the slogan used, but this action of hope is much more than that, it is nations united. So many people from so many walks of life have come together. It is so overwhelming to know that they are here to help, from bake sales to hampers to flats of water. This is what life and love is about. Holding each other up when we are at our weakest, no matter who we are we can't forget who is there. Let us always remember the stranger that walked into our offices saying "I'm here to help".

You will forever be etched in my heart.

You, me, them is no more. It is now "US".

From the north, to the south, east and west. We are of the 4 directions, 4 elements, 4 colours.

I am no greater than you, you are no greater than me. In times of devastation we tend to see this greatness bloom with in us. A strength that will tell us: We are greater TOGETHER than we are as "one".

Money can't buy the richness of unconditional love, and compassion.

From the firefighters who shared a meal, to the Mexican and Australians who have flown for days, to the ladies and gentlemen who sit for hours peeling and cutting to make sure there is a meal. You have all been god sent.

Some may wonder how a person can find such hope through this darkness, and I will tell you sometimes when you are in your darkest moments you will look to any good there may be, because giving up is not the answer.

There is a lesson to be learned. A chance to rebuild. Humankind sometimes lose their way and get lost in the chaos of materialistic ways. Our land is a gift and as humans we sometimes forget that and take it for granted. We all have choices, we all have chances to be a better WE. I find blessings every day, some days bigger than others but it still is there to be found.

Dahdene daga dadenesgāk, łige dene dah khūni ja'

Sonia Dennis is the Language revitalization assistant at Tahltan, Dease Lake, British Columbia, Canada.

A devastating wildfire burning in Tahltan territory in northern B.C. burnt down dozens of structures in its path forcing the residents to evacuate. Hundreds of people were forced to evacuate, including firefighters that initially stayed to fight the fires.

The community has set up a Facebook page to give regular updates about the fires around Telegraph Creek and area.

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Research making a difference in Australia

By Nathan Maddock

Five years into its tenure, the research of the Bushfire and Natural Hazards Cooperative Research Centre (Bushfire and Natural Hazards CRC) is being practically applied by its partners across Australia. This research impact highlights the vision of the CRC: trusted research and knowledge across all hazards, developed for the benefit of the community. This research is making a difference, saving lives, and reducing disaster-related costs. Read on to learn more about the impact of research in the specific areas of fire modelling, emergency warnings, youth-led disaster risk reduction, policy development, community engagement and volunteering, and emergency planning for animals.

Research by the Bushfire and Natural Hazards CRC in Australia has been integral to the development of a new system for predicting bushfire danger. by Mick Reynolds, NSW Rural Fire Service

Better fire danger ratings

The latest fire science, including CRC research, has been used to develop the pilot Australian National Fire Danger Rating System. Underway is the first major update to the system since it was devised in the 1960s.

The new National Fire Danger Rating System prototype was trialled by the New South Wales Rural Fire Service over summer 2017/2018 to better incorporate extreme fire behaviour. In coming years when the revised system is in operation around Australia, all fire agencies are expected to better predict bushfire danger, leading to better warnings and increasing the safety of the community. The CRC has contributed contemporary science on fire weather, vegetation conditions (fuel), fire behaviour, ignition likelihood, fire suppression, fire impact, communicating risk, urban planning, decision making, and mitigation.

The trial of the prototype is a significant demonstration of the successful utilisation of CRC research into the sector: CRC partners AFAC and the New South Wales (NSW) Rural Fire Service now own the ongoing use of the research outputs. As the new system is piloted and integrated into the sector, the CRC will continue to play a critical role, providing vital science and evidence that underpins the new system.

Improved warnings to ensure action

Aspects of the CRC research are shaping Australian public warnings and information campaigns that prepare and protect communities from flood, fire, heatwave and other natural hazards. Insights have combined to equip emergency service agencies around Australia with better targeted long term public safety campaigns, as well as urgent warning messages delivered to at-risk populations in the face of imminent emergencies.

Australian emergency service agencies have drawn from the CRC research, led by Professor Vivienne Tippett at the Queensland University of Technology. These agencies have collaborated at the national level on their insights and experiences in their testing phases to determine a style and structure for their official public messages and information campaigns.

The investigation of flood fatalities to inform community safety campaigns has seen close collaboration between CRC researchers headed up by Macquarie University's Dr Katharine Haynes and operational emergency services staff. This has helped the NSW State Emergency Service to develop statewide education campaigns on flood warnings, with the findings enabling agencies to better target their warning messages to high-risk groups and high-risk behaviours based on the evidence from over a century of fatalities, injuries, and building losses. Findings have enhanced public information campaigns.

Disaster resilience education for young people

The importance of educating children and youth about disaster risk reduction and resilience is now front and centre around Australia, based on the CRC research led by Professor Kevin Ronan (Central Queensland University) and Dr Briony Towers (RMIT University). This new focus is based on research that identified the valuable role that children play in the safety of their household and their community. Ronan and Towers evaluated disaster risk reduction and resilience programs in Australian primary and secondary schools to find out how these programs contribute to the mitigation and prevention of disaster impacts. Alongside this, the project team has also been co-evaluating disaster resilience education programs, both for reliability, as well as their outcomes. This development and evaluation is intended to ensure that intended outcomes are being achieved.

'What if?' questions drive future policy

What if an earthquake hit central Adelaide? A major flood on the Yarra River through Melbourne? A bushfire on the slopes of Mount Wellington over Hobart? 'What if?' scenario modelling by the CRC is helping government, planning authorities and emergency service agencies think through the costs and consequences of various options on preparing for major disasters on their urban infrastructure and natural environments and how these might change into the future.

The research, headed up by Professor Holger Maier at the University of Adelaide, is based on the premise that to reduce both the risk and cost of disasters, an integrated approach is needed that considers multiple hazards and a range of mitigation options. Taking into account future changes in demographics, land use, economics, and climate, the modelling analyses areas of risk both now and into the future; tests risk reduction options; identifies mitigation portfolios that provide the best outcomes for a given budget; and considers single or multiple types of risk reduction options, such as land use planning, structural measures, and community education. Case studies have been undertaken in Adelaide, Melbourne, and Tasmania that model the expected impacts of hazards from 2015 to 2050, with an annual time step under different plausible future scenarios, showing the change in risks in different localities. Agencies will be able to use the system to help allocate budgets, demonstrating that they are using the best available science to inform decision making.

A new model for helping

A highlight of the CRC research is that the nature of volunteering and community involvement in disaster management is fundamentally changing. The research led by Dr Blythe McLennan at RMIT University has provided strategies that emergency service agencies can employ to help adapt to this change, developing guides and advice that has informed policies around volunteering and spontaneous volunteering.

Key national programs have been influenced, with findings from the study used extensively for the development of the National Spontaneous Volunteer Strategy by the Australia–New Zealand Emergency Management Committee. The strategy provides advice to emergency service agencies on what they need to be aware of and what they need to consider and plan for when working with spontaneous volunteers. Important issues such as legal obligations and social media are also covered.

Building on this, the Australian Institute for Disaster Resilience drew directly on the research when developing the 2017 handbook on spontaneous volunteer management. The handbook provides important guidance for organisations on how to incorporate the principles of the National Spontaneous Volunteer Strategy, and the most recent research on spontaneous volunteering, into their own plans and procedures.

Emergency services are also using the research, with the New South Wales State Emergency Service using the findings to shape how the organisation will recruit volunteers. Their latest volunteering strategy was informed extensively by research findings from the CRC.

Emergency service volunteering is changing, and research by the Bushfire and Natural Hazards CRC in Australia is helping emergency services adjust. By Ben Shepherd, NSW Rural Fire Service

Emergency planning for animals

Australians, like many societies, love their pets – and this influences how people behave during an emergency, with emergency services incorporating findings from research to influence their plans and policies during disasters.

Under the direction of Dr Mel Taylor at Macquarie University, this research identified best practice approaches to animal emergency management, giving emergency management agencies the data they need to make better informed decisions on planning and targeting of resources.

Nationally, the Australian Institute for Disaster Resilience has drawn on the research to develop a section on animal management in their updated evacuation planning handbook, published in 2017, while animal emergency management has been strengthened in New South Wales, Tasmania, Queensland, Victoria, South Australia, and Western Australia.

Nathan Maddock is the Communications Manager at the Bushfire and Natural Hazards CRC. He has a communications background in research and emergency management, having worked in the area for ten years .

Research is involving emergency warnings and flood education campaigns. NSW State Emergency Service

Inter-Community Service Collaboration: Innovation for a Changing Climate?

By Bryce Gunson and Brenda Murphy

Rural communities are able to draw on strong social networks, histories of doing more with less, and intimate relationships with their natural environments to achieve economic innovation, positive social capacity development and environmental sustainability (Pearson and Burton, 2009). Yet, rural spaces face extra challenges in preparing for the impacts of climate change. Ontario communities are already feeling these impacts, which have led to millions of dollars of damage to the province's infrastructure (Ministry of the Environment and Climate Change, 2015). Exacerbated by aging infrastructure built according to outdated assumptions, vulnerability to climate change is increasing, with the built-in coping range inadequate to handle future climate extremes (see Table 1) (Pearson and Burton, 2009; Canadian Council of Professional Engineers, 2008).

Table 1: Municipal-controlled infrastructure and services impacted by climate change (Adapted from: Canadian Council of Professional Engineers, 2008)

Municipal-Controlled Infrastructure Impacted	CC Hazard Vulnerability	Service Interrupted
Public Works		
Dams	Flood, ice jam, drought	Water management, potable water
Reservoirs, potable water intake and delivery structures	Drought (low water levels), heat waves, flood, ice jam, intense cold, algae blooms	Drinking water quantity/quality, industrial water supply
Sanitary and storm water systems	Intense rain events, wind	Sewage management, water drainage
Bridges, roads and sidewalks	Freeze-thaw cycle, ice accretion, wind, heat wave, flood, winter storm	Transportation
Emergency Management		
Fire, emergency medical services, police, search and rescue, emergency social services	All extreme weather events where inadequate mitigation and preparedness leads to increased costs of response and recovery	Could impact multiple services Could lead to cascading impacts across services

The purpose of this study was to 1) assess the potential of inter-community service collaboration (ICSC) as a tool for addressing the impacts of climate change in small (500-7500 pop.) Ontario rural communities south of the Sudbury region; and 2) understand the extent to which such collaboration and the impacts of climate change are—or could be—embedded within the community's infrastructure asset management processes (AMP).

ICSC is defined as the provision, sharing, or procurement of infrastructure and services between two or more communities. An ICSC response to threats from extreme weather events could include upgrading water management systems, rerouting transportation, harmonizing building codes and coordinating emergency services and response (Black, Bruce, and Egener, 2010). Although ICSC holds great potential (see Table 2), a research gap currently exists about how ICSC can boost preparedness in rural Ontario communities facing both climate change threats and scarce resources.

Table 2: Strengths and challenges of municipal inter-community service cooperation for climate change preparedness.

Strengths	Challenges
- Economic savings (e.g. on bridge construction or road maintenance contracts) heighten economies of scale - Bolsters pre-existing relations with neighbouring communities, with potential to create new relationships - Potential to reduce regional vulnerability to climate change (e.g. by coordinating emergency services and response) - Increased funding available to build climate resiliency into infrastructure projects	- Capacity (financial and personnel) - Political support required to form and maintain partnerships - Set-up time requirements - Fears of loss of control, authority or identity - Concerns about amalgamation - Limited knowledge of climate change impacts and/or of viable solutions - Labour relations issues - Service quality losses (e.g. winter road maintenance) - Distances between rural communities inhibits sharing of fixed infrastructures (e.g. water systems)

Key Informant Interview Findings

We interviewed 10 key informants drawn from Canadian universities, industry, government and local communities. Respondents emphasized that most municipalities in Ontario are small and that many of them face AMP challenges, including geographic impediments (large areas, rivers, etc.), limited tax bases (due to farmland, Crown land, etc.), high infrastructure needs to tax-base ratios, limited full-time staff constraining capacity to work independently and with consultants, and inadequate analytical capacity.

Another prominent theme was the importance of community capacity for undertaking AMP's, with the size and location of communities influencing what services are shared. Respondents noted that municipalities sometimes do not want to work together to share services, due to interpersonal conflicts and old feuds.

Several respondents additionally observed widespread uncertainty about how to adapt to climate change, with much infrastructure (e.g. storm water systems) already in the ground. Even when new infrastructure is built, information is lacking on how to address likely climate change impacts. Respondents also expressed concern about potential liabilities, such as people suing municipalities after flash floods.

Provincial Survey Results

In June 2018, an online survey on the impacts of climate change was distributed to Ontario public works and community emergency management coordinator staff in 163 communities. Results indicated that rural communities are experiencing impacts on their infrastructure from extreme weather events including flooding, wind events, freeze-thaw cycles and ice damage to dams. Additional impacts included damage to buildings by flooding and high winds, damage to ditches and culverts from washouts, reduced tourism, and a general strain on all levels of municipal government (staff, public works employees, fire/emergency services and general administration).

Comments indicated that although rural communities normally experience extreme weather, impacts from singular events (e.g. culvert washouts) as well as regional impacts (such as reduced winter tourism due to erratic freeze-thaw cycles) appear to be growing. Extreme weather in the past 10 years had an impact on municipal roads and bridges in 99% of responding communities, and 94% of communities expect moderate to extensive impact in the next 10 years. Survey feedback was summed-up by one respondent's statement that "the problem is in the day to day management. Climate change is not an item that is in the forefront".

Notably, 70% of communities indicated they undertake some form of ICSC, with 68% relating to fire or emergency services. This was expected, as much work has been done to promote sharing of emergency services in rural Ontario. It was interesting to note that 56% of communities consider ICSC as a potential solution to address impacts of extreme weather or climate change on infrastructure. 73% of AMP's had been in place for more than one year, with only one community indicating they had not completed an AMP.

The three main reasons communities cited for not engaging in ICSC were lack of personnel capacity, lack of political support and distance between communities. Lack of financial capacity was the most-cited reason for communities not currently planning to engage in further ICSC. Several other respondents noted that although their municipalities do have plans, they lack capacity to fund them. They noted that needs identified in the AMP were considered loose guidelines to what had to be done that unfortunately got pushed back after each extreme weather event. Communities also noted that planning and other expertise were not readily available to them, making it hard to incorporate climate change impacts and plan expenditures for future extreme weather events.

Going Forward

The research suggests that rural communities in Ontario are facing increasing impacts from climate change and do not typically have the resources to cope effectively. While current ICSC and AMP strategies have been somewhat effective, there is a need to identify and showcase innovative strategies that align with communities' goals and activities, to address challenges and to capitalize on strengths. Accordingly, in phase three of this project, we will be highlighting ten case studies that outline potential best practices.

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Bryce Gunson is a project manager for the Resilient Communities Research Collaborative (led by Dr. Brenda Murphy) and a Ph.D. student and lecturer in geography at Wilfrid Laurier University. Specific research foci have included nuclear fuel waste management, maple syrup and non-timber forest products, community well-being and rural and municipal-scale climate change adaptation.

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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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- Create a Canadian annual Symposium for dialogue focusing on disaster risk reduction and facilitate policy formulation and the adoption of best practices in Canada;
- Provide a Canadian venue to learn from the experiences of other countries by inviting internationally reputed scholars, practitioners, and participants to the annual Symposium and to share Canadian experience and efforts in disaster reduction;
- Publish a bi-annual magazine, HazNet, comprised of articles on a wide range of topics within the emergency management and disaster risk reduction sectors.

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