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SHARING LESSONS LEARNED ABOUT DISASTER RESILIENCE FOR FIRST NATIONS COMMUNITIES: A SUMMARY REPORT

CANADIAN RISK AND HAZARDS NETWORK

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1.0 Introduction

The mission of the Canadian Risk and Hazards Network (CRHNet) is to create a safer and more resilient nation by identifying risk and hazards and to improve emergency and disaster management. CRHNet creates an environment in which researchers, academia, emergency managers and other practitioners, government and business communities can effectively share knowledge and innovative approaches to reduce disaster vulnerability, facilitate knowledge exchange, and promote best practices.

The goal of this project is to develop a summary report for First Nation communities highlighting the lessons learned about disaster resilience from two events held in November 2016 in Montreal, Quebec at the Hyatt Regency Hotel: Canada's Platform for Disaster Risk Reduction (DRR) Roundtable and the Canadian Risk and Hazards Network Annual Symposium. Given that the events highlighted both non-structural mitigation and emergency preparedness, this project contributes to both of these key Indigenous and Northern Affairs Canada (INAC) areas of focus. The report emphasizes insights that support First Nations in their efforts to mitigate risk and prepare for emergencies. This report, drawn from both plenary and breakout sessions at these events, is intended to disseminate the insights gained to participants and to a broader audience across the country.

From November 20-22, 2016 Canada's Platform hosted their 7th Annual National Roundtable on Disaster Risk Reduction, entitled "Understanding Disaster Risks", which is the first priority within the Sendai Framework for Disaster Risk Reduction (United Nations, 2015). The Roundtable included multiple plenary presentations and three breakout sessions. One of the breakout sessions, entitled "Building Resilience Through Reconciliation", was co-hosted by INAC and the Indigenous Resilience Working Group (IRWG). IRWG is a Working Group within Canada's Platform for DRR.

From November 23-25, 2016 CRHNet held its 13th Annual Symposium. The theme for this year was "Inspiring Resilience" and one of the key Symposium tracks was "Disaster Resilience in Indigenous Communities". This track, with a special focus on "Community Resilience" was managed by the IRWG co-chairs. The track ran presentations for two days highlighting disaster resilience thinking, approaches and case studies that support successful emergency management mitigation, preparedness, response and recovery in First Nation, Métis and Inuit communities.

Drawing from these two events, the next section of the report provides an overview of key insights about disaster resilience. This is followed by event highlights organized into four key themes: 1) DRR and resilience strengths and capacity development, 2) Ongoing challenges to DRR and resilience, 3) Social and technological innovation in DRR and resilience, and 4) Future opportunities in Indigenous DRR and resilience. Finally, some concluding thoughts are outlined.

2.0 Background

2.1 What is Resilience?

Presenters provided several definitions of resilience at the Roundtable and the Symposium. Several connected resilience with the ability to handle change. Goodchild (2016b) defined resilience as the ability to survive and persist within a variable environment. Dercole (2016) highlighted that resilient communities need to know how to respond no matter what the challenge. Mackinaw (2016) outlined that "over the millennia, First Nations have built resilience through traditional learning and practices handed down by the Elders".

There was strong endorsement for holistic and strategic approaches to resilience. According to Goodchild (2016a), we need to work on "counting what counts" rather than what can be easily counted. We need to hear the stories, take a holistic approach and move away from focusing only on statistics. This is the difference between "datastan" and the "republic of stories, choice, and process".

All sectors of society, including residents, governments and the private sector need to know how to self-organize to achieve DRR (Dercole 2016). Doolittle (2016) outlined that resilience can be thought of as a three-legged stool incorporating the physical, social and economic dimensions – all are needed to achieve wellness and DRR. Resilience requires strategic, long-term thinking where disasters become part of the overall understanding of risks and the causes of vulnerability. According to Williams (2016), we need to remember Chief Seattle's teaching that whatever we do to one part of the web of life, affects the other parts; all is interconnected. From the perspective of the private sector, it was asserted that community leadership must share the risks and information about DRR with all sectors, including local businesses and corporations. Especially in smaller and northern jurisdictions, the private sector is part of the community and must work along with others during a disaster response (Bellis 2016).

Resilience thinking was said to align with key concepts and ideas embedded in Traditional Knowledge (TK), (Mackinaw 2016) and Doolittle (2016) made the connection to Dene Laws. She offered that, "what we've always known is now on paper". People are aware of their changing environment and are still living on the land.

Several cautions about resilience thinking and planning were presented. While resilience is grounded in the community's inherent social fabric, there is a need for increased capacity to deal with changes. In addition, what is considered a strength in one circumstance can lead to vulnerability in another. For instance, remoteness breeds independence and self-reliance but limits response capacity and increases evacuation difficulties (Doolittle 2016).

3.0 DRR and Resilience Strengths and Capacity Development

The pride of Indigenous communities and their resilience and capacity to respond appropriately to impending threats or disasters was a recurrent theme over the course of the 2016 Roundtable and the CRHNet Symposium. What First Nations have always known with respect to DRR, through their TK, remains highly relevant today and has in many regions such as the Northwest Territories and Ontario,

been formalized through the development of local resilience plans (Doolittle 2016; Staats and Bova 2016). One of the greatest strengths of First Nations remains "their capacity to lean on each other" (Doolittle 2016).

The DRR strengths and capacity reflected in the presentations can be distilled into four distinct sub-themes: Indigenous Resilience and Self-Sufficiency, TK in DRR, the Value of Collaboration and Voice of Indigenous Youth. Together, these illustrate the desire and intent of Indigenous peoples to become full partners and leaders in protecting their communities and their members from the threat of natural and human-caused disasters

3.1 Indigenous Resilience and Self-Sufficiency

The Indigenous stream of the CRHNet Symposium began with an excellent example of Indigenous strength and resiliency to external threats. American guest and Salish leader, Shirley Williams, gave an overview of the efforts being made by her people to protect their traditional territory (Southern Vancouver Island, San Juan Islands and Gulf Islands), and in particular the waters historically known as the Salish Sea, from the ravages of international shipping. The fight is against an "industrial flood" that is planned for this ecological sensitive marine region and in particular, the anticipated increase in the number of ports and vessels required to support the transport of Canadian oil to foreign markets. The Salish are working collaboratively with the International Maritime Organization to establish the waters of their traditional territory as a "Particularly Sensitive Sea Area". This designation would continue to allow for shipping, tourism and the traditional salmon harvest and reef fishing but prohibit any industrial activity that could have a potentially catastrophic impact (Williams 2016).

In addressing the challenges of EM, the Salish have been highly proactive, passing resolutions on EM plans, successfully soliciting grants from the Federal Emergency Management Agency to build three tsunami warning towers, and create an oil response team, a flood damage plan and an emergency response team. The Salish are committed to the principle of "build back better" as a means to create a higher level of resilience within their communities.

It was clear from Ms. William's presentation that the Salish culture is undergoing a significant renaissance after decades of government policies aimed at oppressing their culture, language and way of life. Backed by their treaty rights, they are committing significant resources toward protecting the Salish Sea from oil and coal-related industrial activities that threaten to destroy both the ecology of the lands and sea and the Salish way of life. They are committed to a new era of holistic health and wellness and accept that this will require establishing a balance between traditional and western knowledge. They are committed to addressing the chronic illnesses that affect their peoples, restoring balance in all aspects of their lives, and healing from their historic losses through a return to their ancestral lands and traditional way of life.

In Northern Ontario, Indigenous communities are also taking the protection of their communities into their own hands. In the case of the Wabaseemoong Independent Nation, its efforts are directed toward protecting its people against the annual, seasonal threat of forest fires. Mash and Skead (2016) recounted the evolution of recent initiatives that have, among other successes, seen as many as 36

band members trained and certified as Type 1 and 2 firefighters. These band members are employed by the Ministry of Natural Resources (MNR) in Ontario to fight not only fires that put at risk their own Wabaseemoong territory, but those that threaten other non-Indigenous communities and regions throughout the province.

It is important to note how this Nation has turned the persistent threat of recurrent forest fires into an opportunity to build capacity and resilience within its community that in the end, has returned benefits that go well beyond the bounds of DRR. In the process it has trained and certified local band members as professional firefighters and fire masters, engaged its communities in fire prevention and mitigation programs such as FireSmart (FireSmart Canada 2017) exploited social media and other direct engagement mechanisms such as town hall meetings to build support and pride in the program, and provided youth and adults alike with opportunities for leadership, employment and wellness. Some band members, not eligible to serve as fire masters or firefighters, have been employed by Council in related community work programs – maintaining equipment, removing bio-fuel adjacent to properties and preparing firewood for Elders – creating a greater sense of purpose, responsibility and self-sufficiency throughout the community. These fire prevention and response initiatives have gone well beyond the original objective of mitigating a persistent threat to community safety by fostering broader life skills and networks, building confidence and pride, and developing individual and community competencies that have in turn opened up further employment and lifestyle opportunities (Mash and Skead 2016).

The story of the rescue of the Leviathan II off the Coast of Tofino by members of the Ahousaht First Nation represents another poignant example of the strength and resilience of Indigenous communities (Hayes et al. 2016). When local fishers working in a remote region off the coast of BC noticed a flare in the sky, indicating a vessel in danger, they had no idea a rogue wave had upended a whale-watching tour boat, tossing 27 visitors and crew into the frigid waters off the coast north of Tofino. With the closest Canadian Coast Guard (CCG) station 1500 kms away, the members of the Ahousaht band immediately rallied all available boats to execute a rescue, alerting Tofino of the emergency and shuttling all survivors to that location 45 minutes away for refuge and medical care. This was accomplished spontaneously, with no formal search and rescue (SAR) training or equipment and utilizing their own boats and resources.

On the second day, with marine support from the Royal Canadian Mounted Police or CCG still unavailable, 30 Ahousaht boats again took to the water to carry out a search and recovery mission for two victims presumed dead. One Ahousaht member, with no previous SAR training, took charge of the operation, devising a log system to track each boat, its occupants and whereabouts, thus ensuring the safety of the SAR volunteers. Although a ratio of 30 SAR boats to one "Commander" far exceeds accepted standards for SAR operations of this sort, the band was nonetheless successful in tracking and coordinating all volunteers. Since the time of the tragedy, the innate resilience and capacity of this First Nation community has been fortified by access to improved Incident Command System (ICS) training and exercises, better communications equipment and protocols, the establishment of a Canadian Coast Guard Auxiliary unit and greater involvement with regional partners and the larger Canadian DRR community (Hayes et al. 2016).

Representatives from the Ontario First Nations Technical Services Corporation (OFNTSC) spoke of the value of developing DRR and EM tools and programs created by First Nations for First Nations. Anderson (as part of the Staats and Bova 2016 presentation) explained that their work has taken them to almost every reserve in Ontario, assisting communities in developing EM plans and introducing tools and programs, including a 72 hour emergency kit, that are culturally appropriate and relevant to the realities of these communities. Adaptability is key to ensuring maximum benefit for the communities they work with.

Anderson further explained that OFNTSC has likewise found success through its acceptance that First Nations communities can often relate to EM and preparedness best through experiential exercises where the incident can be visualized and the response determined through an active tabletop or live exercise. She offered as an example a successful training experience in Akwesasne in 2015 where a simulated pollutant (benign substance) was dumped into the St Lawrence River and local community members learned first-hand how to place booms and control the dispersal of the substance. These types of highly relevant, on-site opportunities for the active engagement of the community in emergency response are seen as critical to ensuring EM plans remain "living documents".

The value of adapting standard non-Indigenous DRR and EM programs in a culturally appropriate way to ensure their relevance and effectiveness for Indigenous communities was echoed by Row and Casper (2016) in their description of the approach taken through a partnership between St'at'imc Government Services and the Canadian Red Cross. This collaboration was created to help the St'at'imc develop better long-term EM planning and capacity in their vast territory north of Whistler, BC. The objective was to enhance the awareness and understanding of the hazards that might threaten the ten communities within their territory and work with each of these to mitigate risks and enhance capacity to respond to disasters. This required the adaptation of standard Red Cross programs such as "Learn to Swim", First Aid and other community health, wellness and injury prevention programs. With the community taking the lead in all initiatives, it was discovered that their greatest asset in achieving the goals of the program was the ability to work with, and through, the Elders. "Having Elders in the room brought historical context and cultural relevance – the children became invested because they understood from the Elders that it was part of who they are…" (Row and Casper 2016). First Nation culture was identified as an innate strength, explaining that the First Nation relationship framework and natural propensity to work collaboratively were important foundations upon which to build the EM program (Row and Casper 2016).

Todd Kuiack, Director of Emergency Management for INAC, in his comments at the DRR Roundtable breakout session entitled "Understanding Disaster Risk Reduction in Indigenous Communities", reflected on how the programs that INAC has supported, such as FireSmart, have come about as a result of First Nations identifying their own needs and approaching INAC for the required resources (Kuiack et al. 2016). This responsive dynamic between INAC and the First Nations it serves recognizes the fact that First Nations leaders know best what threatens their communities and what is needed to reduce those risks and to respond should disaster strike. It likewise recognizes that the management of DRR and emergency response must be shared with the community and regional First Nations leaders and responders who will be first on site, know the inherent strengths and capacities of their own

communities and are best placed to identify the resources and support they need in the face of a disaster.

3.2 Value of Collaboration

The value of collaboration between Indigenous communities and non-Indigenous DRR and EM experts and agencies was consistently identified as a positive factor by First Nations in their efforts to enhance the innate resilience and capacities of their communities. (Fernandes 2016; Hayes et al. 2016; Kent 2016; Mash and Skead 2016; Row and Casper 2016). When delivered with respect and sensitivity, the adaptation and adoption of standard response protocols such as ICS have served First Nations well and provided new opportunities to access training, participate in joint exercises, gain certification in skills such as firefighting and SAR and become integrated into larger national and regional response networks. Over multiple seasons these collaborations can result in very positive, respectful and sustainable working relationships (Hayes et al. 2016; Mash and Skead 2016). In some instances, these collaborations have led to the integration and employment of First Nations responders into larger provincial and national response organizations, as has been demonstrated by the employment of T-1 and T-2 firefighters from Wabaseemoong Independent Nation by MNR. Likewise, Mash and Skead (2016) spoke highly of their collaborations with other outside agencies such as Treaty Three Policing, Hydro One and Orange Air Ambulance and viewed their fire management program very much as a "platform to develop other products for relationship-building".

Luke Swan spoke of the value to his people of their work with Marc D'Aquino of Holistic Emergency Preparedness & Response Ltd. in providing and adapting standard EM response protocols and programs to reflect the culture and resources within their community following the Leviathan II incident (Hayes et al. 2016). This experience has also resulted in the integration of members from Ahousaht First Nation into the Canadian Coast Guard Auxiliary Pacific, greatly improved their relationship with the community of Tofino, and has inspired the community as a whole to become more involved in training and networking with other agencies, communities and the broader Canadian EM community. OFNTSC likewise spoke of the benefits of holding regional training exercise that facilitated networking among different communities in the same geographic location, particularly for remote communities where isolation is a persistent challenge in maintaining EM plans and involvement (Staats and Bova 2016).

Another key point emphasized in discussions on collaborations was the benefit of First Nations communities entering into formal "mutual assistance agreements" (MAAs) with neighbouring communities, both Indigenous and non-Indigenous (Kent 2016). Such formal agreements have proven to be an effective means to compensate for the lack of human resources and equipment in smaller communities. They provide an opportunity for First Nations communities to offer aid and support – shelter, food, health services – in the event of an emergency in a non-Indigenous community nearby, thereby improving relations with non-Indigenous neighbours. Richard Kent of the Prince Albert Grand Council emphasized the need for First Nations to not only integrate to a greater extent with other First Nations, but with other communities in general and referred to their positive working relationship with the Hutterites as an example of this. He noted that situational training exercises that can be conducted with the involvement of divergent groups provide an excellent opportunity to establish positive,

collaborative working relationships among the various communities (Kent 2016). Such an outcome was also clearly demonstrated through the experience and improved relationship between the Ahousaht First Nation and the community of Tofino as a result of the Leviathan II incident. MAAs also provide an excellent means to formally enhance opportunities for training and exercises that increase regional interoperability and build supportive response networks and mutually-beneficial relationships (Eustache 2016; Hayes et al. 2016).

The value of First Nations communities actively collaborating as citizen-scientists with outside government and academic research institutions was similarly highlighted and aptly demonstrated through the description of the Fort Albany project in Northern Ontario. The outcome of this technology-enhanced pilot collaboration not only resulted in better ice mapping and forecasting of damming and flooding but as importantly, enhanced local engagement and interest in this aspect of DRR. It clearly illustrated the benefits of engaging First Nations citizens, located in remote regions and equipped to provide visuals of real-time conditions and events, to work with lab-based scientists tasked with interpreting satellite data ("we are not always sure what we are looking at"), all working together toward the common goal of improving the safety and security of the community (Tolszuk-Leclerc 2016).

3.3 Voice of Indigenous Youth

One of the prevailing strengths in First Nations communities reflected in many of the presentations was the tremendous resource represented by Indigenous youth. This was highlighted in particular by Dr. Robin Cox in her presentation to the plenary DRR Roundtable on the efforts of First Nations youth on the Sunshine Coast of BC to raise awareness and protect the environment against the impacts of climate change (Cox 2016). In a video she showed, First Nations youth and climate change advocate Mike McKenzie stated "What we do to the land we do to ourselves…bullying, suicide prevention – none of it will matter if we don't stop destroying the planet."

In a similar vein, Marc D'Aquino pointed out the value of having young people as part of any DRR team and encouraged everyone to include and collaborate with students in their DRR research and exercises (Hayes et al. 2016,). Williams (2016) described how a law suit against coal developers, filed by Salish children in the San Juan Islands, resulted in a landmark decision in their favour based on the supremacy of their treaty fishing rights. This provides further evidence of the power of youth to build resilience and protect their communities, their hereditary lands and waters from threats such as shipping and coal mining. In her description of this legal action, Williams emphasized how important it was for these young people "to know the power of who they are". The Salish have established many initiatives to involve youth in DRR, addressing risk reduction issues at both the local and international level. In so doing, they hope to ensure the next generation will be grounded by the stories and teachings of their forefathers and confident in their rights and responsibilities as Salish people (Williams 2016).

Again echoing the value of youth engagement in DRR initiatives, Anderson stated that the OFNTSC discovered that one of the most effective methods to engage communities in Ontario in DRR was to train the children through the school system (Staats and Bova 2016). In a similar experience, St'at'imc

Government Services and the Red Cross found the schools to be a "great entry point' into the community when introducing DRR planning and programs into their communities in British Columbia (Row and Casper 2016); again reinforcing the value in involving all generations in ensuring the safety and security of communities.

Youth can also play an important role in addressing the psycho-social issues that arise following disasters, as was illustrated by an initiative undertaken with the Siksika Nation following the Alberta floods (Munro 2016). In this instance Save the Children trained youth to identify mental health issues within their own families, some of which had been overlooked by professionals, and then worked with these families to help them deal with these issues. These youth workers were described as "dynamic" and a valuable resource in dealing with the many stresses and psychological implications of long-term dislocation (Munro 2016).

3.4 Traditional Knowledge

Throughout the Indigenous presentations, it was apparent the innate resilience and strength of First Nations communities is supported by a deep and abiding respect for their own TK and culture. Despite efforts over many decades by colonial governments to discredit, suppress and destroy Indigenous practices, beliefs and ways of knowing, this historic wisdom has provided guidance and protection for First Nation communities and continues to support and inform what is now recognized in non-Indigenous circles as DDR (Doolittle 2016; Mackinaw 2016; Williams 2016).

Murphy et al. (2016) pointed out that TK contributes to the identification of hazards and identifies these in terms of what is at risk, for example, culturally sensitive areas. This knowledge informs the discussion of current threats through accounts of past events passed down through oral tradition. By way of example, Murphy et al. pointed to historic accounts of past tsunamis shared by west coast Elders that have been subsequently verified through western science (Murphy et al. 2016).

Ahousaht band members recounted the wisdom of their forefathers in locating their village in a safe inlet further inland that would be protected from the waters in the event of a Tsunami. (Hayes et al. 2016). Doolittle (2016) commented that the sensitivity of the land keepers to the slightest alterations in the environment – water levels, permafrost or migration patterns, and so on – make it possible for these communities to anticipate potential threats well in advance of their occurrence and proactively engage with experts and others in the private sector to prevent and mitigate these issues before they lead to an emergency.

The Salish people on both sides of the border are relying on the stories and teachings of their rich cultural heritage to identify what measures are needed to protect their treaty-protected right to continue to harvest food through reef-net fishing and to protect their lands and waters from ecological threats such as oil spills (Williams 2016). Tribal fishers are reviving their traditional reef-netting method of harvesting ocean salmon, in the hope of returning their people to the days of food security and abundance, pointing out that in their Salish language, there was no word for "famine". Prior to the arrival of the settlers, one was never needed.

One special tribute to the value of TK was expressed in a keynote address. Boucher (2016) recounted how scientists and ornithologists in the southwestern US spent twenty years researching the ideal location to rehabilitate peregrine falcons, only to speak with a local band member who identified that the site eventually chosen by scientists was known as "Peregrine Ridge" in the local Indigenous language. Information related to ideal peregrine habitat that had eluded western scientists for decades could have been easily obtained if local knowledge keepers had only been consulted (Boucher 2016).

4.0 Ongoing Challenges to DRR and Resilience

While the inherent resilience of Indigenous communities is very real, there remain challenges, many not exclusive to Indigenous populations, that are worthy of note. The DRR session entitled "Understanding the Risk of Post-Disaster Violence Across Generations, Gender and Relationships" was highly instructive in drawing attention to the phenomena of increased family violence following emergencies (Fairholm et al. 2016). This included both interpersonal and self-directed violence and was attributed to several factors: the loss of established protection systems; increase in community and individual stress (financial, interpersonal, etc.); increase in alcohol, drug abuse and harmful ways of dealing with stress; dislocation and crowded living conditions (friends, family, shelters, camps, etc.) and; pre-existing patterns of violence (Fairholm et al. 2016). Children are consistently found to be at risk for greater corporal punishment during and following an emergency. "Violence (in and after emergencies) can be predicted, therefore it can be prevented" was the critical message shared, emphasizing the need for leaders to understand the vulnerabilities to violence that arise in a crisis situation and to prioritize family protection and safety (Fairholm et al. 2016).

In recounting some of the challenges experienced by First Nations during the fires and evacuation of Fort McMurray, Alberta, in 2015, First Nations communities face all the same vulnerabilities related to stress and dislocation as those experienced by the general population in a disaster but are often coping in greater isolation and with fewer and/or less appropriate outreach resources (Fairholm et al. 2016). In the case study on the impact of the Calgary floods on the Blackfoot people of the Siksika Nation in Alberta (population 6000) Munro (2016) identified several factors of particular importance to Indigenous communities, including the need to include those who can speak the local language on respite teams along with non-Indigenous experts. It was noted that Elders have a different way of explaining disasters to others when speaking in their own language and that this can be of great value to the affected community (Munro 2016). She noted that many of the support services initially offered, such as crisis and trauma counselling expired, even though the need for those services continued to be extensive. (Fairholm et al. 2016) noted that disasters can also impact support structures (clinics, care centres, etc.) and interrupt services and there is a risk of support workers themselves not returning to the community after a major incident or suffering from post-traumatic stress disorder (PTSD) or burnout.

Several presenters explained that First Nations peoples' experience in the residential school system and/or the removal and adoption of Indigenous children by non-Indigenous parents in other parts of Canada (often referred to as the "Sixties Scoop") instilled a great deal of distrust of non-Indigenous

professionals; this remains a factor in efforts to provide appropriate services by authorities during an emergency (Mackinaw 2016). Kent (2016) stated that residential school survivors found the evacuation experience often replicated conditions from their earlier trauma: forcible separation from their families, dependence on authorities, communal living, assignment of a cot among strangers, sense of powerlessness, etc. This historic memory can exacerbate the distress normally experienced by victims in these emergency situations

Other challenges experienced through evacuations arose in providing evacuees with an appropriate diet as the country foods to which they are accustomed may not be as readily available in the refuge location (Eustache 2016). Kent (2016) pointed to the risks of evacuating children from the community with only one parent, a situation that often resulted in families being geographically separated for the period of the evacuation, causing great stress and social disruption. He observed that although the priority in an emergency is to keep people safe, a great deal of psycho-social damage can be imposed by EM authorities, including First Nations authorities, in not allowing the community and its leaders to be directly involved in the decision-making surrounding an evacuation (Kent, 2016). He also noted that the evacuation itself can cause more psycho-social damage than the incident itself (Kent, 2016). These lessons learned from past evacuations have lead the Prince Alberta Grand Council to make significant efforts to build greater resilience to smoke within the communities by adapting buildings with air scrubbers so vulnerable populations (children, those with chronic obstructive pulmonary disease, asthma, the elderly, etc.) can shelter in place, when the risk from fire is low.

Beyond issues of evacuation, there are other DRR challenges confronting Indigenous communities. Indigenous peoples' traditional closeness and dependence on the land leave them much more vulnerable to the negative impacts of climate change. These impacts are introducing previously unheard of threats to various communities – fires to reserves located in rain forests, tornadoes in communities in Northern Ontario, and melting permafrost and storm surges to Inuit in Arctic coastal communities (Benoit 2016; Boucher 2016; Doolittle 2016; Garland 2016; Hayes et al. 2016; Staats and Bova 2016).

Other DRR risks are more closely associated with local capacity and resources. Indigenous communities are constantly challenged by the high rate of turn-over in staff, disrupting or eliminating existing DRR programs and reducing a community's overall capacity to prepare for, and respond appropriately to, emergencies. Likewise, those responsible for DRR in a community often wear multiple hats, with the demands of each position competing for that individual's time and attention (Staats and Bova 2016). This burden of diverse responsibility makes it difficult to provide the necessary leadership required to maintain and exercise emergency plans or conduct prevention campaigns and pro-active mitigation efforts, often resulting in a diminished response capacity in the face of a real emergency.

The integration of Indigenous communities into the larger regional or national EM response structure can prove to be challenging as a direct result of the many geographic, jurisdictional, linguistic and cultural barriers that exist. While many examples of successful collaborations and working relationships have been cited, there often remain significant hurdles to fully involving remote Indigenous communities in the larger provincial or national frameworks (Canadian Coast Guard Auxiliary, provincial

volunteer emergency response networks, CASARA, etc.). Among these are many provincial or national EM organizations' emphasis on certain standards, equipment and credentials as a requirement for inclusion (Benoit 2016) and the challenges of implementing standard DRR programs and training in communities that rely heavily on oral tradition (Staats and Bova 2016). In some instances it requires a crisis such as the sinking of the Leviathan II or the Fort McMurray fires to catalyse the inclusion and integration of First Nations responders into the larger national framework (Hayes et al. 2016). The remoteness of many Indigenous communities makes access to formal training difficult while in others, it remains a challenge to get young people interested in engaging in a field where certain educational levels and certifications are required (Mash and Skead 2016).

In many communities where isolation represents a significant risk to safety and security, there remains a constant tension among members over whether to continue to deal with the challenges that result from, or are exacerbated by, such remoteness or to build roads to increase connectedness but be forced to adapt to the social implications that would accompany such a change (Doolittle 2016). While this critical dilemma encompasses matters well beyond the scope of DRR, it presents a fundamental challenge to many Indigenous communities who must weigh the inarguable benefits of greater access and integration against the inevitable dilution of their culture and community and the many unwanted outcomes that such connectedness would facilitate.

5.0 Social and Technological Innovation in DRR and Resilience

Drawing from the SiG Knowledge Hub (Social Innovation Generation 2013), Goodchild (2016b) defines social innovation as a response to problems that develop in changing, dynamic systems. Social innovation can include a range of initiatives such as new products, processes, programs and projects or platforms challenging and contributing to long-term transformation. "Successful social innovation reduces vulnerability and enhances resilience".

Several examples of innovation were presented at the Roundtable and Symposium. These have been divided into three subsections: Conceptual, Planning/Education and Technological.

5.1 Conceptual Innovation

According to Goodchild (2016a), most Indigenous peoples and scholars are working within PWIs – primarily white institutions. These are not designed by First Nation, Metis or Inuit peoples and the concepts, rules and processes do not necessarily align with Indigenous needs and ways of knowing. Predominant understandings of EM, resilience and DRR are examples of PWI thinking that needs to be re-imagined from Indigenous perspectives. She suggested that Sendai provides an important context within which to think about DRR in indigenous communities. We need to work with indigenous peoples, we need to consult and we need to incorporate TK.

Goodchild (2016a) maintains that EM, resilience or DRR can be thought of as ecosystems with a set system dynamics and feedback loops that can be studied. System thinking provides several insights that are a useful starting point. First, for ecological systems to survive they need to be flexible;

constancy and rigidness leads to fragility. Many DRR organizations are quite rigid and rule-bound, this decreases resilience. Second, it is important to think about risk events as disruptions in the continuum of processes that unfold across space and time rather than as distinct, stand-alone events. In other words, change, including disaster will always occur; it's up to us to be ready for whatever happens.

One example of systems thinking is the UNESCO (2017) "Local and Indigenous Knowledge System (LINKS)" model that provides a matrix for recognizing what is sacred and part of the local protective factors contributing to resilience. For instance, staying together and sharing stories in a crisis are some of the system's protective factors.

Using Indigenous ways of knowing informed by systems thinking, Goodchild argues that her goal is to search out key opportunities that leverage transformative changes to increase DRR and resilience. The first step is to undertake a "systems mapping" exercise to understand all the components, interconnections and interactions in the EM, resilience or DRR system. Once the current system is well understood, it is then possible to question the PWI framework, processes and values upon which the system is developed and re-imagine it with an Indigenous lens. In addition, leverage points can be sought out; opportunities where even small changes can lead to positive transformations and improvements to DRR, EM or resilience.

5.2 Planning and Education Innovation

One example of planning innovation was identified by Murphy et al. (2016) who described the Aboriginal Disaster Resilience Planning (ADRP) website as providing Indigenous communities with a comprehensive set of steps to assess their hazards and resilience and develop a plan to address identified challenges. The website blends Western and Indigenous ways of knowing, with the content explicitly designed to address the contexts of First Nations, Metis and Inuit communities. An additional toolkit was recently added to facilitate the sharing and incorporation of TK into the assessment and planning process. The toolkit includes a written document focusing on using talking circles and storytelling as information gathering techniques and 30 videos demonstrating the toolkit in action as well as examples of community strengths, innovations and vulnerability.

In the area of emergency preparedness, Save the Children has developed a new emergency training and response program focused on schools and the needs of the child (Fernandes 2016) and piloted it in two communities. Tangible results include the fueling of a school generator and the organizing of a school's first fire drill. In developing such programs, the following lessons learned were provided: 1) make sure the program is flexible and has cultural relevance, 2) ensure the community has sufficient capacity to participate, 3) children can provide input into community plans and 4) Elders need to be actively incorporated to bring cultural relevance and knowledge.

Williams (2016) stated that pre-contact, Indigenous peoples had their own way of life, culture and language, freedom, and ecological health. All of this has deteriorated post-contact. For example, the Salish peoples were displaced from their longhouses 100 years ago. In more recent times, the potential for a catastrophic oil spill has increased by 375% in the Salish Seaand today there are multiple risks including pressures on their fishing, food, medicine, spiritual and cultural practices as well as increasing

numbers of endangered, threatened or animal species of concern. To address these various losses, their vision for revitalization is to develop the Coast Salish Tribal Heritage Institute and Interpretive Center to serve as an Indigenous education network across the Canada/USA border and to improve human and ecological health for the next seven generations.

5.3 Technological Innovation

Boucher (2016) is undertaking some innovative work to understand past climate change as a way to project potential changes in the future. He does this using dendrochronology, which is the study of dating tree rings and the analysis of the changing atmospheric conditions that contributed to tree growth over time. By using very old living trees and ancient trees preserved at the bottom of lakes, he can look back at the historical record for 1000+ years as an analogue to predict future climate. For a northern region where ice jams were causing ongoing flooding, he was able to show that ice jam floods have been occurring in this area for hundreds of years and projected that given current atmospheric conditions will likely intensify in the future.

It can be argued that this innovative approach is important for Indigenous communities for two key reasons. First, even over much more recent time periods, far less data about historical climate patterns is available for rural and remote locations, since most weather stations were, and are, located near urban centres. Where TK is lacking, this scientific method could help fill the gap and where TK is available, it could be used to complement the knowledge passed down through Elders. Second, since dendrochronology highlights location-specific data, it appears to synchronize well with Indigenous ways of knowing and can support the ability to project and visualize likely future risks.

In another example, Tolszuk-Leclerc (2016) explained that one of the roles of Natural Resources Canada is to provide "emergency geomatics" which is the mapping of unfolding disaster events such as ice jams to improve situational awareness and inform decision-making. However, the available satellite data does not always provide the information needed to produce high quality images. So over a short three month period, his project developed a mobile phone application (still at the beta stage) focused on using volunteer geographic information provided by community members who can record their visual observations and upload their pictures. The app can also be used in conjunction with images taken by drones and works in off-line mode where cell reception is poor. This type of citizen-science could be a great way of increasing community awareness about, and engagement with, local hazards while making real-time contributions to situational awareness. He identified two challenges: community buy-in and the need to filter uploaded pictures to protect privacy and address other ethical issues.

6.0 Future Opportunities in Indigenous DRR and Resilience

The engagement of Public Safety Canada and INAC in the Sendai framework and the subsequent establishment of the four working groups under the Canadian Platform has significantly raised the profile of Indigenous issues in DRR. In her opening remarks, Stéphanie Durand, Director General, Policy and Outreach Directorate, Public Safety Canada, commented on the extent of Indigenous participation in the Annual DRR Roundtable, noting there was "lots to learn from Indigenous Knowledge and the

transfer of their wisdom" and that this was essential to meeting the objectives of the Sendai Framework (Durand 2016).

This increasing acknowledgment and respect for Indigenous participation and knowledge suggests future opportunities to engage with the broader DRR community and to expand INAC's jurisdiction and responsibility in EM beyond the confines of the Indian Act. Further engagement of Indigenous communities in Sendai-related activities could include, for example, the inclusion of an Indigenous community in efforts such as the Rockefeller Foundation's initiative in establishing 100 Resilient Cities (Bradette 2016; Bellis 2016; Dercole 2016; Doolittle 2016), not one of which is currently recognized as predominantly Indigenous.

The Assembly of First Nations offered several guidelines to ensure that the health and safety of its members is ensured during emergency events (Mackinaw 2016). These included having culturally appropriate responders and response mechanisms; assuring that support is comparable to neighboring municipalities; involving the leadership in all response and recovery activities; supporting First Nation leadership in the development of research, studies and policies; and the broader recognition of First Nations capacity and experiences.

The presentation by American Anne Garland on her work with the North Slope in Alaska served to demonstrate how new pedagogical approaches are engaging Indigenous communities in DRR through the arts, and in particular, applied theatre or story-telling scenarios (Garland 2016). According to Garland this approach has been highly successful in improving risk mitigation in a culturally appropriate and experiential manner. She states that for many Indigenous communities DRR is related to their TK derived from oral history, storytelling, legends, dance, games and music. Garland contends that the improved "messaging" that emanates from these applied theatre exercises helps to better prepare all levels of the community to relocate or "build back better" when faced with disaster and can help to effectively build resilience through the experience of "living" applied theatre scenarios (Garland 2016).

The challenges posed by evacuations due to recurrent flooding, particularly in highly prone areas, has been addressed by English (2016) through a design of amphibious housing for Indigenous communities that would allow these communities to shelter-in-place. English sees this design, which allows the main body of the residence to rise on stilts with the aid of a buoyancy system, as a strategy to mitigate against the worst impacts by working "with the natural cycles of flooding rather than attempting to obstruct them".

Technology holds great promise for many improvements in Indigenous DRR. The development of new software applications to allow scientists to work with communities in remote locations to better track and predict ice and flooding conditions, among other threats, was aptly demonstrated by the Fort Albany Volunteer Geographic Information project (Tolszuk-Leclerc 2016). Murphy et al. (2016) outlined the value of using web-based planning tools. Anderson explained that their organization reviews the social media output of the communities they work with to get a sense of their primary concerns (Staats and Bova 2016). Social media in general has been adopted by many communities as a means to follow what is happening in the community during an emergency and can provide an efficient mechanism to

get information out to the community in a crisis. In the North, Facebook is rapidly replacing community radio as the predominant means of communication (Benoit 2016). Given the high percentage of youth (normally early adopters) in Indigenous communities and the improvements to cell reception, even in many isolated areas, the opportunities for technology to enhance communications, support science and monitoring and contribute to the safety and security of Indigenous communities is likely to continue to increase.

Technology also affords the opportunity for greater connectivity between DRR and EM specialists working remotely throughout the Arctic (Benoit 2016). Isolation remains their biggest challenge. The Arctic Risk Management Network (ARMNet), an initiative driven by the Emergency Management Office of the North Slope in Alaska and a program of CRHNet in Canada, intends to exploit the capacity of remote access to the internet by linking the Emergency Management Offices and many responders and volunteers throughout the Yukon, Northwest Territories, Nunavut, Nunavik and Alaska through a virtual network dedicated to their specific needs. The Network will support a database of research and articles relevant to DRR and EM in the Arctic, inform Northern offices of DRR opportunities and events, connect practitioners and experts and facilitate the mobilization of knowledge unique to this discipline and region, with the objective of enhancing the resilience and response capacity of the many isolated Arctic communities throughout the far North of Canada and the United States (Benoit 2016).

7.0 Conclusion

This report has summarized key insights drawn from the DRR Roundtable and CHRNet Symposium. Several cross-cutting themes emerged. First, the innate resilience and capacities in Indigenous communities serves as an important foundation for all DRR and EM initiatives. The robust approaches of the Salish people to ongoing threats (Williams 2016) and the spontaneous and organized Ahousaht response to the sinking of the Leviathan ll (Hayes et al. 2016) are both emblematic examples. The increasingly active involvement of youth in DRR work is another growing area of strength (Cox 2016; Row and Casper 2016). Further, the contribution of TK to innovative ways of thinking about resilience, DRR and EM offers the opportunity for social innovation and re-imagining these systems (Doolittle 2016; Goodchild 2016a & 2016b). Despite these strengths, ongoing challenges remain to be addressed including the colonial legacy (Mackinaw 2016), residential school historical trauma (Kent 2016), the continued impacts from evacuations such as family violence (Fairholm et al. 2016), and climate change (Benoit 2016).

Second, in developing culturally appropriate DRR and EM initiatives with Indigenous communities, designing programs that honour local ways of knowing tend to be more successful. For instance, incorporating Elders into the program (Row and Casper 2016), working with oral traditions (Staats and Bova 2016) and incorporating experiential learning (Garland 2016) were all cited as successful approaches. Third, when Indigenous DRR and EM Indigenous initiatives can be integrated into broader frameworks and mandates, relationships flourish and disaster resilience increases for everyone – Indigenous and non-Indigenous. For instance, Mask and Skead (2016) highlighted the First Nation and broader benefits from training local fire fighters, joint training efforts were said to contribute to

building deeper regional relationships (Kent 2016), and it was outlined that the extra training provided to the Ahousaht benefit all nearby BC coast communities (Hayes et al. 2016). That said, the difficulties of such integration must also be addressed including the problems of requiring credentials (Benoit 2016) and building interest in DRR and EM undertakings (Mash and Skead 2016).

Finally, several promising opportunities suggest that if the proper financial and structural supports are in place and initiatives incorporate appropriate Indigenous ways of knowing, First Nations, Metis and Inuit communities can continue to build on their innate resilience and address ongoing challenges. These opportunities will include the role of technology and social media (Benoit 2016; English 2016; Murphy et al. 2016; Tolszuk-Leclerc 2016); new networks and ways of thinking (Benoit 2016; Goodchild 2016; Williams); and tapping into the broader framework and activities being supported through the response to the Sendai Framework.

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