

CONFERENCE PROCEEDINGS

The logo for C4 2017 features the letters 'C4' in a bold, italicized font, with a stylized graphic of horizontal lines to the left. The year '2017' is written in a large, elegant serif font to the right of 'C4'.

CatIQ's Canadian Catastrophe Conference

February 1-3, 2017

Allstream Centre, Toronto ON

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Note: All speaker names are linked to their C4 biography.

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Note: When available, blog articles are linked to CatIQ’s blog.

DAY ONE

Welcome and Acknowledgements & Intro Address



Jim Abraham
C4 2017 Emcee and
Director,
Canadian Climate Forum



Carolyn Rennie
Managing Director,
CatIQ Inc.

2016 CATs in Review



Carolyn Rennie
Managing Director,
CatIQ Inc.

Carolyn Rennie

Presentation

CatIQ delivers detailed analytical and meteorological information on Canadian natural and man-made catastrophes. CatIQ declares events as catastrophes (CATs) should they impact multiple policy holders and insurers causing over \$25M of insured losses. CatIQ declared 13 Canadian catastrophic (CAT) events in 2016. Overall, 2016 was the costliest year in Canadian history; the result of one ice storm, the Fort McMurray wildfire, 9 severe storms, the Windsor flood, and the remnants of Hurricane Matthew, as well as 8 notable events (NEs, estimated between \$10M-\$25M of insured losses). The 2016 CatIQ insured loss estimate summary, which includes NEs, totals approximately \$5.2 billion, however, if you remove the losses from the Fort McMurray wildfire it is closer to \$1.4 billion. From a provincial view, Alberta events (without Fort McMurray), resulted in the largest insured losses with hail damage to personal property as the main factor.

Special Announcement: PERILS enters strategic alliance with CatIQ

Eduard Held

Press Release

A special announcement was released on February 1st, the first day of C4, regarding the partnership between CatIQ and PERILS. The two companies are similar but differ in location, where CatIQ covers Canada and PERILS covers Europe, Turkey and Australia. PERILS will distribute CatIQ data when a Canadian CAT results in industry losses greater than \$300 million and CatIQ will be including the PERILS

Industry Loss Index to be used in the global risk transfer community. This alliance is regarded as a win-win situation for the two companies and the industry.

Fort McMurray Wildfire



Moderated by:
Skip McHardy
VP Canadian Catastrophe Operations,
CRU Group Inc.



Keynote Speaker
Darby Allen
Regional Fire Chief,
Regional Municipality of Wood Buffalo

Skip McHardy and Darby Allen

Presentation - The Horse River Fire

Skip McHardy, VP Operations at Catastrophe Response Unit, provided an overview of the events in Fort McMurray. McHardy reflected how this event was defined by the positives due to the overwhelming support, rather than the negatives. McHardy acknowledged an individual that stood out and became the face of the response; a hero, Fire Chief Darby Allen.

“This fire changed my life” said Allen as he retold the story of the Fort McMurray wildfire. The spring had been hot, with low humidity, a continual changing wind, and the driest ground conditions in 50 years, yet near the end of April the number of fire occurrences were near normal. Fire #9 on “Day 1” (May 1st), became a threat to the town of Fort McMurray and, by the end of Day 2, the fire was growing and getting closer but was still expected to pass south of town. Early on Day 3, the fire was spotted on the other side of the Athabasca River. The fire jumped the river and there was a mandatory evacuation for the town at 30 minutes’ notice—an evacuation that would become the largest in Canadian history due to fire (88,000). The original plan was to send all evacuees southward, however, the highway (the only way into and out of town) became a gridlock in traffic and a decision was made to force people northbound or southbound at a particular intersection. Initially the tactic for the Fort McMurray fire was to set up defenses but this became overwhelming for some areas and had to retreat, so the tactic became *what can we save?* It was decided that saving lives and critical infrastructure were the main priorities. On Day 4, a provincial State of emergency was declared at 2:15 pm, and Allen received a call from the provincial finance office informing him that he had an unlimited spending limit, as well as unlimited resources.

Allen reflects on Day 3, the day of the evacuation, as the “best day of his career” rather than “the worst.” The fire grew to 590,000 hectares before it was declared under control on July 5th, and Allen reflected it was absolutely amazing that a fire of this size did not result in any fire-related deaths. Allen spoke of witnessing incredible compassion and efforts during the evacuation; people were safe, orderly, and helped others in need, even with fire impinging on their vehicle. To show the amazing efforts down to the smallest detail, he recalled that the pets that could not be evacuated (like aquatic creatures) were fed every day. Social media served as a way for families separated by the evacuation to communicate

and reach out to the public, where the public showed the overwhelming support for those affected by the fire. Allen performed daily video updates to the public using a live feed on twitter, the second video had 3.4 million views, and the third had “ridiculous numbers.”

Allen’s advice was to convey your trust in people, do the little things right, be flexible after a plan is established, the importance of positive reinforcement, and lastly, to *believe*.

Societal Impacts



Rebecca Wagner
Associate Director,
Prediction Services
Operations - Central
Region, Meteorological
Service of Canada,
Environment and Climate
Change Canada



Dr. David Laplante
Research Associate,
Douglas Mental
Health,
University
Institute



Bill Tibbo
President & CEO,
Bill Tibbo &
Associates



Dr. Liette Vasseur
UNESCO Chair in
Community
Sustainability and
Professor,
Brock University

[CatIQ Blog - The importance of providing psychosocial aid and not just physical aid following a disaster by Jean-Philippe Tizi \(Canadian Red Cross\)](#)

[CatIQ Blog - Looking at Natural Ecosystems for Disaster Risk Reduction by Dr. Liette Vasseur \(Brock University\)](#)

Moderator: Rebecca Wagner

Madeleine Lyons, Senior Advisor, Canadian Red Cross

Delivering psychological support following a disaster

Madeleine Lyons of Emergency Management at the Canadian Red Cross (CRC), spoke of the psychological impacts of Alberta fires and how the CRC responds in disaster situations. The Fort McMurray fire challenged the CRC in different ways than they were used to, knowing that many people would be traumatized for many years due to the quick escalation of events. During the event, there were many calls from individuals who had evacuated from Fort McMurray, and returned to their family and friends from coast-to-coast. The CRC opened a registration portal online to identify affected people, map them, survey them, and provide financial assistance through e-mail cash transfer to limit the psycho-social effects and ensure people knew they had not been forgotten.

The CRC distributed more than \$185 million in financial assistance to affected households, the first wave of which formed the largest cash transfer humanitarian effort globally. Today, the support continues, there is a safety and well-being team available for those who need assistance, wellness workshops and

groups for communities. The CRC partnered with local and provincial agencies, such as with Alberta Health Services, while taking a community resilience approach and addressing the priorities of the community. This work will continue to take place over the coming months and years ahead.

Dr. David Laplante

Presentation - Disaster-Related Prenatal Maternal Stress is Associated with Increased Body Mass Index and Central Adiposity: Findings from Project Ice Storm

Dr. David Laplante, a researcher at Douglas Mental Health University Institute, studies the long-term effects of maternal stress on children. In this case, his research team studied the impacts of the 1998 Quebec ice storm. This storm was of interest since expecting mothers were without power for up to 44 days (14 days on average). In these types of long-term studies, the factors of interest lie in the cognitive, behavioral, motor and physical development of the child from birth through the age of 19 years, with 9 assessments occurring through their youth. The research results were categorized into either objective hardship or subjective distress.

The results of the ice storm study were compelling; however, the sample size was small (initially 174; 70 remain) and thus the results may not be representative of the entire population. Physically, Laplante found that the higher the objective hardship, the higher the levels of DNA methylation (at age 13), which then related to a higher body mass index (BMI) of the children throughout their youth. The objective hardship was also found to be related to cognitive and language delays, memory and motor skill problems, autistic-like symptoms, immune and insulin issues, and eating disorders. Subjective distress was found relating to their behavior problems, temperament, and autistic-like symptoms.

Future research plans for Laplante's group include performing a population-based comparison for two regions of Quebec. They will then look to make connections between power outages to birth, health and prescription drug records, as well as school performance. This study is a representation of something that is thought of as minor but can lead to long-term effects.

Bill Tibbo

Presentation

Following a catastrophe, Tibbo & Associates is hired by organizations or insurance companies to get business operations running again in a respectful and retainable way. The draw for insurance stakeholders is that the cost in catastrophic events can result in increased payouts due to sick leave, long-term and short-term disability, in addition to production and efficiency decreases.

After the Istanbul earthquake, a company's production line went down completely, so Tibbo & Associates came in to work with senior management, and provide a psychosocial team for the families. Production was back at 100% within 14 days, where a competitor that did not seek psychosocial assistance took 13 months to rebound.

Hurricane Ivan resulted in temporary homelessness for 220 employees and their families. Tibbo & Associates helped to get the employees back to work, and provided psychosocial assistance to them and their families.

Dr. Liette Vasseur

Presentation - Community sustainability and social structure in coastal communities off the Gulf of St. Lawrence

Climate change impacts coastal-rural communities through their demographic and socio-economic conditions as well as reliance on natural resources. Dr. Liette Vasseur has been part of a project on the vulnerability to sea level rise and extreme events in coastal-rural communities. In December 2010, a series of severe storms hit Quebec, New Brunswick, and Prince Edward Island and resulted in social impacts for the affected communities. For example, Ste. Flavie experienced erosion that caused many homes to fall into the St. Lawrence river, the province condemned many homes and moved the families. This community has reported high levels of psychological stress and anxiety, and social conflicts can still be seen. From a gender perspective during the events, men were more prepared and logical than women; women were open with their emotions, and their perceptions of impacts were closer to home. This shows how women and men perceive their losses differently. Extreme events and their impacts expose the need to promote sustainability from local to national strategies and create a mixed disaster risk reduction and ecosystem based adaptation to ensure that communities are more socially prepared as well as their infrastructure.

Terrorism Risk: International & Canadian Perspectives



Moderator
Mazdak Moini
VP Commercial
Lines,
Aviva Canada



Charlene Chia
Senior Risk
Consultant,
AIR Worldwide



Scott Bolton
Director, Business
Development &
Network Relations,
Aon Risk Solutions



Terry Chowanec
VP, National
Security Operations,
The Cadillac Fairview
Corporation Ltd.



Harris Silver
Manager High Risk
Deployment, Operations &
Contingency Planning,
Production Solutions,
CBC Radio Canada

[CatIQ Blog - How to Assess Terrorism Risk Quantitatively and Qualitatively by Virág Fórizs \(AIR Worldwide\)](#)

Moderator: Mazdak Moini

Charlene Chia, Scott Bolton, Terry Chowenac, Harris Silver

Although in Canada, natural disasters occur more frequently than man-made disasters, terrorism risk is a significant threat that many do not consider. Terrorism risk is evolving and forces many to evolve with it from the private, public, insurance, and modelling sectors.

In Europe, the recovery period for businesses to return to work after an attack can be long, up to 10 days, which can signal failures in relationships and networks. Terry Chowenac described the importance of determining where the attack vectors are for a large corporation which can be related to physical or cyber threats. Security is expected by visitors, and this can be a challenge when all devices are connected to the internet. He suggested that firewalls should be in place and that one must engage larger organizations like Microsoft and Dell to aid adaptation. The evolution of terrorism risk has come a long way from only protecting the building so keeping a good relationship with law enforcement is vital. It is important to plan ahead with law enforcement so they can quickly determine where to deploy people in an emergency.

For journalists, although they may not be able to mitigate against terrorism risk, they can enforce training courses to become more resilient in an evolving situation that requires crisis management. Harris Silver detailed how CBC is changing over to an integrated solution since every risk is tied. They conduct a full risk assessment of the location they are sending their people and ask the questions; What is the property near? What is the local history? They are now only placing their people for short periods of time to keep infrastructure small so they do not become a target. They have decided that reducing the attack surface area and lowering their profile is the best way to reduce exposure— using the rule “only gather the information that you need and no more.”

On the insurance side, Scott Bolton outlined how terrorism has evolved in recent years from significant property damage to mass casualty attacks. Security forces are tracking high explosives and making it harder for terrorists to plan, but they can much more easily go buy a gun and kill people. An example would be in Nice, France, where the terrorist only had a truck and ran it into a crowd of people; this resulted in mass casualty but little property damage, and insurance innovation is recognizing that impact on life is increasing, rather than business interruption or property damage. Bolton also described the importance of helping clients to understand their exposure and minimize their gaps to terrorism risk are the way to a more articulate solution.

When modelling terrorism risk, there are 3 main methods: ring accumulation, deterministic, and probabilistic loss analysis. Ring accumulation involves placing rings around specific locations, like landmarks, schools etc. and then accumulate exposures on the insurance industry. Overlaying shapefiles of historical events can help show hot spots of risky terrorism areas. Deterministic modelling physically simulates a bomb blast at a specific location, which has large impact differences due to location, building vulnerability, and population density. The probabilistic method is the most skeptical; where a series of events is simulated, and then creating a probability matrix involving the type of attack and locations that organizations may target over the years. Charlene Chia stated that with respect to the

evolution of models, they will follow the needs of the client. Currently, models are focused on massive property losses, so even though terrorism risk is evolving to impact life more than property damage, the modelers are not hearing from clients to change the models.

Student Delegate Presentations



Jennifer Bruneau
University of Manitoba



Natasha Fee
Acadia University



Frederick Jackson
Western University



Nadya Moisseeva
University of
British Columbia



Ashley Rudy
Queens University

Jennifer Bruneau, University of Manitoba

Presentation - Future Changes in Convective Precipitation & Severe Weather Environment in Western Canada

There is an interest to study future changes on high impact weather that causes significant economic loss in Western Canada each year. Currently, there are a lack of studies on trends of severe storms in Canada as they are smaller scale systems and inherently difficult to model. This study focuses on the large scale environmental variables associated with severe storms. Climate simulations were performed for a current period and a future period, and the three pairings that most accurately depicted climatological patterns of precipitation and hail were chosen. The convective precipitation as a percentage of total precipitation was calculated, and results show that in Western Canada the amount of convective precipitation will increase in the future. The next steps for this study will be to characterize the severe weather environment into three types: vertical wind shear, thermodynamic propensity for updraft, and process of convective initiation.

Natasha Fee, Acadia University

Presentation - Shoreline Vulnerability Mapping Using Topo-Bathymetric Lidar and Multispectral Imagery for Marine Oil Spill Contingency Planning

There are 80 million tonnes of oil transported in Canadian coastal waters annually, and first responders need all the tools they can get in the event of a spill. An important tool is spatial information on shoreline vulnerability and this project has created an inventory using remote sensing data and surveying to map the shoreline of areas with heavy tanker traffic. In the case of an oil spill, it is important to be prepared and know the cleanup techniques that are specific to the affected shoreline. This study will determine shoreline vulnerability, help tankers plan routes to minimize risk, and develop a response plan. Using multispectral imagery from airborne data collection, detailed information on the composition of the shoreline was retrieved. Also, a topo-bathymetric lidar system was used to provide a

3-D model of the shoreline area. This study hopes to prove that shoreline vulnerability maps can be created cheaper and faster, thus increasing the likelihood of effective oil spill contingency plans.

Frederick Jackson, University of Western Ontario

The Role of Non-invasive Ambient Noises Analysis in Improving Seismic Microzonation Mapping in Vancouver, British Columbia, Canada

Greater Vancouver is in the area of highest seismic risk in Canada, and this research aims to improve seismic microzonation mapping and then assess and update the earthquake site response. Ground shaking depends on the source, material, and site conditions, with the largest damage usually occurring in areas of soft soils. This research can be used as a quick and inexpensive way to characterize earthquake sites which improves exposure, as well as improved risk and loss estimates.

Nadya Moisseeva, University of British Columbia

Presentation - A New Approach to Modelling Smoke Plume Rise for Wildfires

Smoke dispersion modelling exists to aid decision makers and is used across many sectors for safety measures during a wildfire. Challenges exist when models predict the initial rise of the plume from the smoke; when wildfires are large enough they generate their own environment. In this study, numerical models predict turbulence well in a simulated environment but is not yet ready for a real-time environment. When evaluating the model plume rise performance, a comparison is done against a profile from airplane measurements. After generating synthetic data, of the turbulent kinetic energy under varying topography and wind conditions, new equations are developed and can be used in operational forecasting to improve models. The goal of improving these smoke plume models is to reduce the threat to human life.

Ashley Rudy, Queen's University

Presentation - Permafrost Hazards in the Canadian Arctic

In a changing climate, the high arctic will experience significant impacts to engineering and infrastructure as permafrost areas are sensitive to frequent freeze and thaws. Land impacts include subsidence, slope failures, and these can affect water quality and drainage, as well as coastline changes. Northern communities need to understand these hazards, how to detect, predict, and monitor the changes to create adaptation strategies. In this study, remote sensing techniques combined with field studies are used as the detection strategies. The outcomes can be predicted in these communities by using land planners. Finally, inframometry can be used to monitor changes. These types of studies can be used to promote sustainable development in northern communities.

Resilient Indigenous Communities



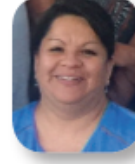
Moderator
Pat Van Bakel
President & CEO,
Crawford & Company
(Canada) Inc.



Chief Matilda Ramjattan
Lennox Island
First Nation



Chief Steve Thomas
Mohawk Council
of Akwesasne



Regina Jacobs
Emergency Management
Officer, Mohawk
Council of Akwesasne



Scott Peters
Environmental
Assessment Officer,
Mohawk Council
of Akwesasne

Moderator: Pat Van Bakel

Panelists: Chief Matilda Ramjattan, Chief Steve Thomas, Regina Jacobs, Scott Peters

Indigenous communities have a rich traditional history and the emergency management and resiliency efforts for these communities show a different perspective on how they deal with catastrophes and climate change.

The Lennox Island First Nation, located off the northern shores of mainland PEI, has created a Climate Change Adaptation Program with the understanding of vulnerabilities to storms. Though sea-level rise is a large concern for this First Nation, they are also considering erosion, flooding, and the impacts on drinking water, forests, fisheries, infrastructure, and mental health. They have found that intense storms cause significant erosion to Lennox Island and can greatly impact their infrastructure; for example, during a major 2010 ice storm the only causeway was washed out in a few hours due to a high storm surge. Chief Matilda Ramjattan outlined their 3-year plan that involved a 3-part action plan. First, they surveyed the community on their level of climate knowledge; second, they performed an economic study on the infrastructure; third, they completed a hazards assessment for action recommendations. By researching the hazards of climate change and modelling the potential effects, The Lennox Island First Nation now has an adaptation plan tailored to their community.

In addition to environmental and emergency planning, the territory of Akwesasne is directly affected when there are elections in Canada and the United States, as they are situated across New York, Ontario and Quebec. Akwesasne ensures that they plan well ahead, an attribute that be seen in their food storage preparation where they maintain enough food for seven years. “Plan for seven generations” is the idea of the Mohawk Council of Akwesasne after they created their emergency plan in 1990 following a civil war. Akwesasne deals with 9 different governments when in a State of emergency and they recognize the importance of a coordination plan. This coordination plan considers the local and provincial laws and bylaws, border crossing agreements, fire and ambulance services and more. The council has familiarized themselves with their hazards (floods, environmental contamination, bomb threats etc.), and perform mandatory annual exercises for each hazards emergency plan, and update when necessary.

CAT Models – Model & Hazard Uncertainty



Moderator
Paul Cutbush
SVP Catastrophe
Management, Aon
Benfield Analytics



Dr. Elliot Klein
Senior Scientist,
AIR Worldwide



Justin Moresco
Manager,
Model Product
Management,
RMS



Tom Larsen
Hazard Product
Architect
CoreLogic



Alexander Allmann
Head of Section/
Expert, Corporate
Underwriting,
Munich Re

Moderator: Paul Cutbush

[CatIQ Blog - Earthquake Risk in Canada: What Is 'The Big One'? by Maiclaire Bolton \(CoreLogic\)](#)

[CatIQ Blog - Earthquakes in Eastern Canada - Really? by Balz Grollmund \(Swiss Re\)](#)

Panelist: Alexander Allmann

Presentation

Alexander Allman of Munich Re stated that the current earthquake modelling situation in Canada is “very good,” as more data is being acquired on earthquakes and soil, as well as structure vulnerability. There have been many lessons learned since the Japan earthquake, the best measured event ever, and will benefit future modeling. However, there remains limited knowledge in low seismicity regions, like Canada (excluding Cascadia), and unfortunately ground motions are greater in these regions and have a severe impact on structures. Larger issues arise when there are a series of earthquakes which are not typically modelled well and becomes a mess for insurance companies. Allmann recalled how the Christchurch earthquake exposed the lack of procedures implemented regarding loss inflation and claim inflation increases. In Canada, there is low probability of earthquakes but higher consequences, thus protection gaps need to be filled on insurance, reinsurance and government sides.

Panelist: Dr. Elliot Klein

Presentation - Advancements in Earthquake Modeling for Canada

The National Building Code of Canada (NBCC) has had provisions related to earthquakes since 1953, demonstrating how impactful the shake can be on structures. There is greater learning potential from recent earthquakes now that there is better instrumentation in high probability areas. As a result, the GSC (Geological Survey of Canada) and USGS have improved their models to incorporate a new understanding of the Cascadia Subduction Zone. The damage at Christchurch outlined the importance of building design and the NBCC continues to use the GSC to design buildings. In the future, models will have improvements in modelling events that follow an earthquake, like tsunamis, fire, landslides, and liquefaction.

Panelist: Justin Moresco

Presentation - 2017 RMS Canada Earthquake Model

Moresco presented that the 2017 RMS Canada Earthquake model will have a new view on seismic risk and showed the preliminary results in Vancouver. The model is averaging risk of loss to decrease in the City of Vancouver and for all British Columbia, however there is an increase in risk for the Vancouver Basin (which is south of Vancouver and includes Richmond). The Vancouver Basin risk increase is a result of the increased frequency of deep, interslab events in the Cascadia Subduction Zone, increased ground motion amplification within the basin, and increased losses due to liquefactions compared with the current RMS model. The new model will be released this April.

Panelist: Tom Larsen

Presentation - Canada Earthquake Model from CoreLogic

Similar to the other panelists, Larsen agreed that models in Canada are improving greatly. The improvements come in probabilistic modelling and ground motion models. There have been improvements on building information, such as the codes it has in place which helps expose vulnerability. In addition, there is more information on high probability areas that may be impacted by a post-event like a tsunami in the west or fire-following. Larsen stressed the importance of going to the areas impacted by the earthquake to see the damage and the structures material first-hand. “Big events always have an *and*,” and in Canada this could be the electric utilities being shut down.

Disaster Assistance



Moderator:
Mazdak Moini
VP Commercial
Lines and
Reinsurance,
Aviva Canada



Jennifer Dolecki
Director, Recovery
Branch, Alberta
Emergency
Management
Agency



Matthew Godsoe
Manager,
Research Unit,
Public Safety
Canada



Johanna Morrow
Manager, Recovery &
Funding Program,
Emergency
Management BC



Rod Story
Financial Advisor &
Analyst, Office of the
Parliamentary
Budget Officer

[CatIQ Blog - Average Annual Cost of Federal Disaster Assistance due to Weather Events by Rod Story \(Parliamentary Budget Office\)](#)

[CatIQ Blog - Prepare for Disasters and Severe Weather by Mazdak Moini \(Aviva\)](#)

Moderator: Mazdak Moini

Panelists: Jennifer Dolecki , Matthew Godsoe, Johanna Morrow, Rod Story

There have been many disaster events in recent years that have resulted in provincial governments using the Disaster Financial Assistance Arrangement (DFAA). At the provincial and federal levels, they want to know how much money is needed in a disaster. Rod Story reflects on his report on the cost of disasters that will be required by DFAA every year, and results showed approximately \$900 million required with 75% towards flooding. This report exposed the lack of flood insurance coverage, particularly in high risk areas like flood plains. Story pointed out that the prairies have a lot more issues with flood insurance because they do not have the land regulations that B.C., Ontario, and Quebec have. Story's report crunched the numbers for tangible losses but Jennifer Dolecki mentioned that psycho-social costs and other longer term impacts should also be considered.

Johanna Morrow noted that the political will to spend money right after a disaster is easy, but getting money to mitigate against a future disaster is much more difficult. The National Disaster Mitigation Program became available but there are some shortcomings which permits only the enhancement of existing structures and not the development of new, preventative structures. Dolecki noted that this happens because response shows results right away, whereas recovery is a long-term process. Matthew Godsoe, of Public Safety Canada (PSC), indicated that emergency management at the federal level was built as a response function but they are now trying to add preventative measures such as the Creative Enhancements Clause within the Disaster Mitigation Strategy that will allow provinces to build new mitigation structures- "A band aid solution". Thus far, Medicine Hat, Alberta has been approved for approximately \$70,000 to enhance flood mitigation structures.

The government will likely always need to be involved in disaster financial assistance as Morrow and Dolecki agreed that the scope of potential costs is beyond the insurance industry. There are many uninsurable linear structures, like roads and sewers, in addition to the "5 percent" of uninsurable properties on the private side. Dolecki said that it would be beneficial for insurance companies to clarify to their clients what you *can* get and what you *should* get so you know what to *expect*. There is a lack of communication in defining what is *reasonably and readily available*. Dolecki has found that coverage might be available from some insurers, but unsure if PSC consider the event eligible, or that insurance is reasonably and readily available? British Columbia, on the other hand, has taken a strict approach in deciding that insurance is readily available if you can get it through your local agent or broker, and it is reasonably available if it is appropriate to the risk, but this does not mean it is affordable (something that may differ among provinces, ex. Ontario performs an income based test). Forest fires in B.C. are a good example of this, where the province will not cover a house that was uninsured because of high premiums and not unavailability.

The difference between the provinces adds to the complexity of insurance, in addition to political savviness. There is history of politicians showing up with a cheque book post-disaster and getting re-elected, but those that take mitigation measures will not necessarily be re-elected. These *political savvy events* create an unhealthy image of the government where society thinks that the government will

always come through for them. Morrow mentioned that, as a provincial government, this may have created a perverse incentive for people to not buy insurance because citizens think someone else will come in and rebuild their house in the event of a disaster— There needs to be a change in openness and honesty with the citizens that, if you could have purchased insurance, your house is not eligible for government disaster aid. The conversation needs to happen in between events not just during, as well as if disaster assistance should be privatized. In general, the money needs to go to the cure – mitigation.

DAY TWO

Lessons Learned from Ice, Flood & Hail



Moderator
Kyle Winston
President,
CRU Group



Geoff Coulson
Warning Preparedness
Meteorologist,
Environment and Climate
Change Canada



Sharon Pollyck
Manager, Legislative
Services & Corporate
Communications,
City of Airdrie



John Duong
Manager of Systems
Planning & Customer
Service, Public Works
Halton Region

[CatIQ Blog - Not enough rain is also a problem by Geoff Coulson \(ECCC\)](#)

Moderator: Kyle Winston

Panelist: Geoff Coulson

Presentation - Southern Ontario Ice Storm

Geoff Coulson, a warning preparedness meteorologist of Environment Canada and Climate Change (ECCC), provided a closer look at the lessons learned of the southern Ontario ice storm of December 20-22, 2013. Coulson indicated that winter events tend to be well forecasted and well warned since they are due to larger-scale systems. However, a slight change in track of a winter system can lead to large differences in the forecast and reality, adding to the challenge of providing longer lead-times for warnings. In this event, ECCC released a special weather statement on December 17th and then issued a freezing rain warning on December 19th. The significant ice accretion in the GTA caused trees to fall, extensive power failures and poor driving conditions. During the event, ECCC received a number of reports from CANWARN storm spotters and members of the public concerning ice accretions across south central and eastern Ontario. When the event was over, the air mass remained cold with strong winds causing more damage to trees and powerlines. ECCC is dedicated to increasing their social media presence to improve timeliness and provide clarity for their public warnings.

Panelist: John Duong

Presentation - Into the Eye of the Storm: An insight into Halton's Actions and Response to the 2014 Burlington Flood

The Halton Region shared their lessons learned from the Burlington flood of August 2014. On August 4th, a series of thunderstorms brought 200 mm of rain to the City of Burlington in 8 hours, with 60% occurring in just 2 hours. Halton Region has an increasing population and they have been developing with mitigation strategies which became evident during this heavy rain event. Halton's goal is to prevent sewer backups and overland flooding, so they have developed a separate sewer systems for domestic

waste water and rain water. The Region owns the pipe from the street to the property line and the homeowner takes control from there to the house. Halton offers a one-time grant of \$1000 to homeowners for sewer backup, and then they go out and survey the property. They had learned from a previous flood to increase education on basement flooding, as they realized flooding cannot be 100% avoided but controlling it at the source is the most economical and cost effective way. They commissioned a study as to why this event happened, focused on high priority areas first and then will follow a 10-year program for the rest of Halton to perform these mitigation efforts (ie. disconnecting downspouts). Halton created an enhanced basement flooding prevention subsidy program which is considered “one of the most aggressive and extensive subsidy programs amongst all Canadian municipalities.”

Panelist: Sharon Pollyck

Presentation - Lessons Learned: Airdrie Hail Storm

Hail events are common in Alberta during the convective season and an event on August 7, 2014 in the City of Airdrie resulted in more than \$500 million in damage. Sharon Pollyck from the City of Airdrie discussed the lessons learned from this catastrophic event. She mentioned it is important to have an overarching plan in place to manage the claim rather than handling each issue on a case-by-case basis as well as using multiple ways to communicate. There were issues when the City, a member of Alberta Urban Municipalities Association, took an advance in funds for this event because the City felt the insurers then stepped away. The advance in funds had worked in other emergency situations for two municipalities but not for this event due to Procurement and Finance Department legal, internal and auditor requirements. It is important to bring the right departments together and form an ad-hoc committee to manager the claim. This includes involving the appropriate support and project management services and insurer representatives. Know your policy, plan ahead, and communicate!

Geomagnetic Storms – The Next Black Swan



Paul Cutbush
SVP Catastrophe
Management,
Aon Benfield Analytics



Dr. Balz Grollimund
Head Treaty
Underwriting,
Swiss Re



Dr. Luis Marti
Director Reliability Studies,
Standards and Compliance,
Hydro One

Moderator: Paul Cutbush

Panelist: Dr. Balz Grollimund

Presentation - Solar Storms: Too hot to handle?

Geomagnetic storms can have a wide range impacts on technology which include interrupting radar, satellite, radio communication, and power grid synchronization. Dr. Balz Grollimund provides a perspective on the insurance considerations if a large geomagnetic storm was to occur. Starting with the worst-case scenario, blackouts, the results would be non-linear and become very costly after a few days; a blackout caused by a damaged transformer would result in liability and property damage; and without a blackout there would not be many impacts apart from space and aviation. On record, there have been 10 large geomagnetic storms (the strongest in 1859), but unfortunately predicting these storms are unreliable due to lack of data. Grollimund said that there is still work to be done on understanding the impacts on society in different scenarios followed by preparation and mitigation for utilities.

Panelist: Dr. Luis Marti

Presentation - Impact of Space Weather on Technological Systems

Dr. Luis Marti of Hydro One provided a power grid perspective on the potential impacts of a geomagnetic storm. Most solar storms occur over a 4- to 6- year period referred to as the “solar maximum,” and Earth is currently in a “solar minimum.” The solar minimum does not mean geomagnetic storms cannot occur as some of the worst have taken place near the minimum. The current power grid infrastructure is designed to work on AC 60 Hz, however a storm would cause geomagnetic induced currents to flow through powerlines and transformers leading to hotspot heating and a drop in voltage. In this situation, transformers would become overwhelmed due to the lower frequency of the additional currents. Early studies showed that a large geomagnetic storm in the U.S. would cause blackouts from weeks to months, a recovery period of 4-10 years, and \$1-2 trillion in the first year of recovery alone. However, Hydro One has been studying geomagnetic storms since the mid-1980’s and, in 2012, found that those early studies were flawed; the most likely outcome would be that the voltage would be so depressed that you would have to turn off the system.

The Hydro One eXtreme Space Weather Preparedness (XSWP) project involves “the most technologically advanced and comprehensive [geomagnetic disturbance] management system in North America.” In the Hydro One control room they use a real-time storm tracker, and they are prepared to manage any storm, concluding that “we are not going to see the night of a thousand years.”

Municipal Mitigation Success Stories



Moderator
Megan Meaney
Director,
ICLEI Canada



Fiona Dercole
Section Manager,
Public Safety District
of North Vancouver



Loretta Chandler
Director, Office of
Emergency Management,
City of Toronto



Marie-Ève Marquis
Engineer - Department
of the Environment,
City of Montreal



Alain Normand
Manager, Brampton
Emergency Management,
City of Brampton

Moderator: Megan Meaney

Panelist: Loretta Chandler

Presentation - Municipal Mitigation - City of Toronto

The City of Toronto’s Office of Emergency Management (OEM) covers the largest municipality in Canada and stresses the importance of planning ahead. For municipal mitigation, they prioritize planning, emergency response, education and outreach. Municipalities in Ontario are required to have an emergency plan and Toronto uses Emergency Support Functions as sub-plans. One Emergency Support Function provides Emergency Social Services. Loretta Chandler, the Director of the OEM, indicated the need to focus on people, particularly the vulnerable population, in an emergency. During the 2013 ice storm, there were over 1 million people without power for 72 hours, and the OEM opened 13 Emergency Reception Centres. Emergency Reception Centres can provide health and special needs services and psychological first aid as well as a warm space, food, emergency accommodation and power outlets to charge electronic devices. Chandler said that it is also important to have resources dedicated to educating the public on the importance of preparing a plan, having a kit and staying informed during an emergency. The goal is to have 80% of the population resilient in an emergency so that the focus can be on the 20%, the vulnerable population, who need more support.

Panelist: Fiona Dercole

Presentation - Managing Risk in a Changing Climate

Climate change is impacting structures and Fiona Dercole of Public Safety Vancouver discussed the efforts being done to create a more resilient community in a suburb of Vancouver. Flooding on the west coast is a major issue and Dercole indicated that most of the infrastructure was built in the 50’s and 60’s, and is now in need of upgrades in preparation for climate change impacts. In 2007, the Natural

Hazards Management Program was established which uses a proactive approach to reduce risk to life, infrastructure, and environment. Risk assessments are performed on existing properties to expose the vulnerability of the structure to natural hazards, which helps in enhancing community awareness. Now they are developing safely, and any new development must meet strict requirements with following reports to ensure criteria is met. An online map has been created that shows the history of issues on every property which will soon be available to the public; Dercole indicated that it is the best way to maintain total transparency.

Panelist: Marie-Ève Marquis

Presentation - Climate change adaptation plan: Montréal success story

Montréal agglomeration is made up of 16 cities with a population near 2 million and aims to be a leader in fighting climate change. Marie-Ève Marquis, an engineer at the Department of Engineering, outlined the climate change adaptation plan that has been created by the city of Montréal on behalf of the agglomeration. There were 3 main objectives: knowing the adaptation measures already in place, obtaining vulnerability information, and planning for development, maintenance and repair operations. Firstly, to expose the vulnerabilities, six climate hazards were identified: higher temperatures, heavy rainfall, heat waves, destructive storms, drought and river floods. The vulnerability analysis involved a breakdown of each of the six hazards into exposure, as well as social, territorial, and environmental sensibilities. Upon completion of the vulnerability analysis, 24 adaptation measures were selected, and then collaborated with the boroughs and cities for a commitment to these measures. This plan has been successful because of the knowledge of the territory and the strong vulnerability analysis and the result of commitments by the agglomeration from the 24 flexible measures.

Panelist: Alain Normand

Presentation - Brampton Ice Storm 2013: The Perfect Storm and the (almost) Perfect Response

Alain Normand described the response of Brampton's emergency management office during the ice storm of 2013 as near perfect, despite being the hardest hit area. On December 22nd, 2013, there were more than 20,000 customers without power and, because the rest of the GTA was facing their own difficulties with this storm, mutual aid and assistance in the immediate area was not possible. Older areas of the city have overhead wiring, so the power outages were generally confined there, where the new development had been built underground. The emergency unit created a 6-step response and recovery plan which helped make this event successful. The first step was an emergency response to critical safety and security issues, followed by a safety response, initial and post-thaw cleanups, dead tree removal, and tree canopy reinstatement (a 10-year plan). The challenges that were faced came mainly as a result of the power outages making it hard to communicate with the public, and have since then made their site mobile-friendly. The emergency office decided that it will keep a list of the vulnerable population and spontaneous volunteers to speed up the process next time. Normand stressed the importance of having a plan and dedicated staff for emergency response that receive frequent training.

Keynote Speaker: George Kourounis



George Kourounis
Storm Chaser & Adventurer

George Kourounis

[CatIQ Blog - Keynote Speaker at CatIQ's Canadian Catastrophe Conference by George Kourounis \(Angry Planet\)](#)

While insurers are on their way into a disaster area George Kourounis is usually on his way out, after having documented the latest catastrophic event live. Kourounis considers himself a global adventurer and storm chaser, a likely result of his childhood heroes of Jacques Cousteau and Indiana Jones. As the host of Angry Planet, Kourounis' typical work day might involve chasing a tornado or hurricane, diving with sharks, swimming with piranhas, standing on the edge of a volcano, and any other extreme nature that you can imagine. Although Kourounis loves to storm chase, he understands that these events can have serious impacts on the lives of humans, and explains that a tornado is not a natural disaster unless it hits something. Kourounis aims to show viewers how bad these natural phenomena can be to help familiarize and prepare them, using his footage of experiencing Hurricane Katrina as an example. He has participated in avalanche defenses in British Columbia which demonstrates how the avalanche risk to humans is mitigated. Kourounis spoke of one of his favourite adventures where he stood in a 230-foot-wide pit of fire, the outcome of an oil rig collapsing in a desert in Turkmenistan in the 1970s and has been burning ever since. He pitched the idea to NASA after they discovered planets with hot, methane environments and that gathering soil samples from this fiery pit might help to find out if alien life form can survive in this environment. Kourounis has a love for science and gets to share it with the world.

How to Create an Inventory of Canadian Hazard Data



Moderator
Jason Thistlethwaite
Assistant Professor,
School of
Environment,
Enterprise and
Development,
University of Waterloo



Jim Abraham
Director,
Canadian
Climate Forum



Nicky Hastings
National-Scale
Geohazard Risk
Project Lead,
Geological Survey of
Canada, Natural
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Steve Taylor
Research Scientist,
Forest Fire,
Pacific Forestry
Centre, Canadian
Forest Service



Tom Kralidis
Senior Systems
Scientist,
Meteorological
Service of Canada

[CatIQ Blog - Model Flood Risk Without Historical Data - An Innovative Solution! by Carl Lambert \(The Co-operators\)](#)

Moderator: Jason Thistlethwaite

Panelist: Jim Abraham

Presentation - Citizen Science and Social Media to assess impacts

Jim Abraham of the Canadian Climate Forum provided an assessment of citizen science and the current role of social media in collecting data. Abraham presented several tools currently available to the public; The Weather Company is using mobile crowd reports to validate observations which presents a potential to get data in the developing world; The NWS created mPING, a mobile phone application that allows users to report precipitation type and other severe weather; Another mobile phone use is with CrowdHydrology, where users can text the water level of a gauge, which aims to have more information relating to flood risk. Currently there are more than 60 gauges in the United States with 90% of the messages usable. In addition to mobile applications, there has been a rapid increase in private weather stations whose data can be found on many sites including the CoCoRaHs Canada website. Also, the Canadian Red Cross uses key words on social media to assist people affected by disasters. Social media and advances in technology are clearly having a positive impact on reporting weather.

Panelist: Nicky Hastings

Presentation - Understanding Risk: An Earthquake Risk Profile for British Columbia

To complete mitigation and disaster resilience planning there is an urgent need for exposure and vulnerability data at the community level. Nicky Hastings of Natural Resources Canada noted that a deep earthquake is likely to happen next and her group is looking at a series of scenarios since hazards are not limited to ground shaking, but can involve liquefaction, landslides and flooding. In addition, there are social, health, and economic vulnerabilities to consider when developing mitigation plans. It is useful to have as much knowledge on the existing buildings as possible in combination with the time of day.

Natural Resources Canada has completed an earthquake risk profile for these different types of exposures and vulnerabilities.

Panelist: Tom Kralidis

Presentation - ECCC/MSC C4 Data Session: Data Access

There is an open data initiative and the Meteorological Service of Canada (MSC) is making real-time weather, archived weather, and the world ozone and ultraviolet radiation data available. This includes model output, real-time observations, and warnings in the Datamart. The World Meteorological Organization Information System, like the Government of Canada Open Data Portal, has been modernizing how weather data is moved around and is making all the information available to the public. In Canada, a national dataset would be valuable, however there are still challenges with the ownership, implementation and integration of the data. A hazards data infrastructure would be very valuable to ensure attribution, authority and data closest to source.

Panelist: Steve Taylor

Presentation - Data to inform wildfire risk analysis

In the strive for open data, the Canadian Forest Service (CFS) has increased availability of data. Their data can be found on the Wildfire DataMart, Environment Canada, StatsCan, and through published reports and software, where the CFS has integrated data into models or research studies. However, the challenges associated with making data available is developing common frameworks for hazards and risks since climate is not stationary, and until recent events (ie. Fort McMurray) there were weak policy drivers.

Wildfire Risk Management



Moderator
Glenn McGillivray
Managing Director,
ICLR



Andreas Siebert
Head Geospatial Solutions,
Munich Reinsurance
Company



Manuel Chirouze
Managing Director,
Natural Hazards and
Geoscience for the Americas,
Guy Carpenter



Ian Frost
Director, Complex Claims,
Wawanesa Mutual
Insurance Company

[CatIQ Blog - WHY WAIT FOR 911? -Private Firefighting by Kristopher Liivam \(Arctic Fire Safety Services Ltd.\)](#)

Moderator: Glenn McGillivray

Panelists: Andreas Siebert, Manuel Chirouze, Ian Frost

The Fort McMurray wildfire is considered a “wake-up call” across the insurance industry and the lessons learned can be applied to any future catastrophic event. Outlined below are some key points from the session:

- The Mass Demolition/Debris Removal initiative in Fort McMurray did not go smoothly for Wawanesa
 - There were significant delays in obtaining demolition permission
 - Too many forms resulted in policy holders seeking their own contractor
 - The sifting program to find personal items among the ashes
 - Contaminated soil
 - Many policy holders have not decided whether they want to rebuild or build elsewhere
- Using aerial imagery to obtain pictures both before and after the event were useful to view the properties that they insured
 - Identify an accurate inventory of destroyed versus non-destroyed properties in the period of time leading up to when they were able to gain access to Fort McMurray
- Wawanesa hopes to have the lessons learned at Fort McMurray utilized to create a best-practice template for the industry and government and speed up the claims process in future events
- Wildfire models need to be improved and made readily available
 - Wildfires include urban-rural interface complexities
 - Another layer needs to be added that incorporates damage costs
- The Canadian industry can improve through research and learning about the approaches to modelling that other places are taking
 - The United States Forestry Service has a dedicated team that looks at millions of fire footprints every year
 - Probability and stochastic scenarios openly available to the public
 - European Space Agency uses machine learning to monitor thousands of wildfires through satellite pictures
 - The future of hazard models in Canada should be open source catastrophe modelling
- Canada is the third-most forested country in the world
 - 3-large wildfires in “modern” history
 - Kelowna, Slave Lake, and Fort McMurray
- Insurance companies remain on the fence about their concerns of wildfire as a risk in Canada
- Globally, wildfire modeling is considered the “poor cousin” of hazard modeling with Canada as the “outcast child”
 - No wildfire model freely available for Canada
- Wildfires are considered a once-in-a-lifetime event which does not motivate people to mitigate
 - Communities need regulations in place

- I.e. a funded program in British Columbia does not permit new homes to be built that are not FireSmart
 - The Canadian Wildland Fire Strategy is currently a non-funded program with hopes that the insurance industry may promote FireSmart strategies that will decrease policy costs
- There are myths that insurance companies have more power than in reality
 - The government has a lot more access and should step up
- The federal government should fully fund Canadian Wildland Fire Strategy and fully refund Canadian Forest Service

DAY THREE

Flood Workshop



Moderator
Shawna Peddle
Director,
Partners for Action,
University of
Waterloo



Moderator
Šárka Cerná
Product & Business
Development,
Aon Benfield
Impact Forecasting



Lapo Calamai
Director,
Catastrophic Risk
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Matthew Godsoe
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Ingrid Robinson
Director,
Enterprise Risk
Management,
Brookfield GIS

[CatIQ Blog - Disaster-Proofing Canada: Learning from Floods and Fires by Lapo Calamai \(IBC\)](#)

Moderators: Shawna Peddle, Sarka Cerna

Panelists: Lapo Calamai, Matthew Godsoe, Steve Litke, Rehana Rajabali, Ingrid Robinson



The flood workshop introduced each panelist to provide their expertise and experience on flood risk management. The introductions were followed by a discussion on 5 key questions, and the responses are outlined below.

1. How are we currently addressing flood risk?

- Some regions, like the District of North Vancouver, are hiring consultants to provide a long-term outlook on climate change, impacts, and new development applications
- Insurers price based on risk, they rely on commercially available flood models and some refine based on local defenses and mitigation measures. A way to mitigate corporate risk is to not offer coverage in high risk areas.
- Other examples included installing physical mitigation measures (dykes, berms), controlling development in floodplains, and taking personal actions to remove valuable items in basements

2. Interests and goals towards addressing flood risk? Common ground, goals?

- Pro-active management practices

- Form a cross-sector collaboration group with more skills and knowledge to make a larger and more effective impact when managing flood risk
- Improving homeowner education
- Create an effective partnership between government and the insurance industry to make risk information public

3. What are the sector-specific gaps?

- Reactive response rather than proactive efforts before the disaster occurs
- Homeowner education
- Lack of data and data inconsistency
- Participation from all levels of government to improve flood risk management

4. Can we work together? What does one sector have that another needs to effectively assess and mitigate flood risk?

- Share experiences and best practices for flood management
- Proactive flood risk management and mitigation in all sectors rather than reactive
- Share flood models to create a national-scale flood model with hazard and risk data

5. How can we deal with uncertainty, competition, and historic barriers to move forward on our shared goal of making our communities more resilient to flood?

- Cross-sector collaboration could provide a centralized information and data sharing platform
- Eliminate competitive advantage and bring expertise and experience to the table
- Focus on consistent data sets, policy alignment, and developing effective flood risk management nationwide
- Cooperative agreement towards responsibility for funding (insurance vs. government)

Conclusion:

- **Data and shared understanding** in a collaborative way that also protects proprietary interests will increase understanding for effective flood risk management.
- **Homeowner education and awareness** through a national-level outreach program with a focus on risk and ways to reduce the risk.
- **Proactive cross-sector collaboration** can streamline flood risk management.

A message from Partners for Action: “Partners for Action was created to address these three components of effective flood risk management in Canada. Initial emphasis in 2017 will be placed on a national flood risk communications program, and we welcome partners to join us in a collaborative movement towards proactive collaboration on data and shared information.”

Weather Workshop



Moderator
Rebecca Wagner
Associate Director, Prediction Services Operations - Central Region, Meteorological Service of Canada, Environment and Climate Change Canada



Jim Abraham
Director,
Canadian Climate Forum



Carolyn Rennie
Managing Director,
CatIQ Inc.



Shawn Allan
Manager,
Met-Ocean Services Group,
AMEC Foster Wheeler



Mark Schuster
Severe Weather Meteorologist,
Environment and Climate Change Canada

Moderator: Rebecca Wagner

Panelists: Jim Abraham, Carolyn Rennie, Shawn Allan, Mark Schuster



The weather workshop presented 3 questions to the delegates and resulted in the following main points:

- 1. How do you use weather data in your current job function and/or life?**
 - Internal planning for advanced warnings to assess risk and mitigate
 - Refer to public weather forecasts, not necessarily impact-based forecasts
 - Monitor severe weather events and estimate the potential losses
 - Use historical data to predict future outcomes
 - Use warnings to send alerts to clients
 - Use real-time data to monitor events
 - Try and get as much data as fast as possible
 - Monitoring the weather for road closures
 - Incorporate weather data into actuarial analyses
 - Input data for modelling

- 2. What are your specific needs with respect to weather information pre-event, during, and post-event?**
 - Pre-event:
 - Accurate weather information with severity, confidence, and impacts
 - Avoiding false alarms
 - Preventing “weather fatigue,” not every event is *the big one*

- Making the information tangible – what is occurring? How much? Where? What time of the day? The same event can have various impacts on different areas
- Mitigation strategies to alert clients
- Current observations (ie. water levels) to better understand the potential impacts on a community
- During-event:
 - Updates for internal planning to mitigate damage
 - National monitoring, how is the event panning out?
 - Need to know changes to wind direction for fire events
 - Road closures
- Post-event:
 - Forecasts, observations, and additional impacts after the event to increase the understanding of added damage and reach out to potentially impacted clients
 - Ex. If hail damages a structure, will heavy rain follow and cause potential flood damage?
 - Assess how pre-planning affected the outcome for the company
 - Assess how mitigation efforts improved the situation, ex. hail size using cloud-seeding planes

3. How can we as a country improve the current weather enterprise? Where are the gaps?

- More investment and technology needed, ex. Increase radar coverage, better flood models, reduce the spatial spread in the national monitoring network
- More communication between sectors (municipalities and government) to mitigate impacts
- **Educate** the public and clients (watch vs. alert and preventative measures)
- Create a standardized weather application that everyone will have
 - Enforce involuntary weather and impact-based alerts to the public
- Increase **data sharing** and it will lead to innovation, feels like there is a lack of data when there is so much information available – **create a public-private partnership**
 - Better integration across platforms
- Improve predictive models to provide accurate early warnings
- Changing to **impact-based alerts** for the public
- Emphasis on probabilistic forecasting
- Multi-year predictions to see how climate change affects particular catastrophic events
 - Dry snow pack for this year so may result in more fires
- Spatial information on perils in Canada
- Match vulnerability with mitigation efforts
- Translating information to external audiences

C4 2018

CatIQ's Canadian Catastrophe Conference

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