



PREPARING CANADA FOR AN
EARTHQUAKE
A NATIONAL CONVERSATION



REPORT

February 2015

Table of Contents

1	Executive Summary
2	The Risk
4	What Would a Major Quake Look Like?
6	Theme 1: Strengthening Partnerships and Collaboration
10	Theme 2: Building Resilient Communities
17	Theme 3: Preparing for the Long Haul – the New Zealand Experience
24	Conclusion
25	Presentation Synopses
39	List of Attendees

Preparing Canada for an Earthquake: A National Conversation REPORT 2015 is published by Insurance Bureau of Canada (IBC). IBC is the trade association representing Canada's private property and casualty (P&C) insurance companies.

The data in the report come from presentations made at the national earthquake symposium hosted by IBC in October 2014 in Vancouver, B.C.



Executive Summary

Insurance Bureau of Canada (IBC) hosted “Preparing Canada for an Earthquake: A National Conversation” in Vancouver, B.C., in October 2014. More than 160 federal and provincial politicians, senior government staff, scientists, risk modellers, emergency responders and insurers attended the symposium to share their insights and research.

The goal of the symposium was to spark conversations and exchange knowledge and ideas across disciplines. By all accounts, the symposium was a major success, and participants expressed a strong interest in continuing the conversation.

The symposium galvanized around three main themes:

- The value of strengthening partnerships and collaboration among stakeholders
- The value of building resilient communities
- The value of learning from post-quake experiences and recovery efforts, such as those in New Zealand following the quakes in 2010-2011.

Attendees offered their views in wide-ranging discussions and through instant polling during the event. They agreed that the national conversation on preparing for an earthquake should not end with the close of the Vancouver symposium.

To that end, IBC proposes carrying on the conversation by creating a National Earthquake Resilience Working Group and, in 2015, will invite key stakeholders to participate in continuing this important discussion.



The Risk

What is the largest risk that Canada faces? If you polled Canadians, you'd receive many answers – climate change, terrorism, the economy. But arguably one of the greatest risks this country faces would likely go unmentioned. That risk is a major earthquake.

Canada encompasses two active seismic zones. The Charlevoix seismic zone runs through Quebec and eastern Ontario. The Cascadia subduction zone, which is part of the “Ring of Fire” around the Pacific Ocean (Figure 1), includes coastal British Columbia. Many countries on the Ring of Fire – including New Zealand, Japan



Figure 1

and Chile – have had major earthquakes in recent decades. Canada hasn't had one since 1700.

All that could change in the blink of an eye. According to Natural Resources Canada, in the next 50 years, there is a 30% probability of a significant earthquake in Western Canada. In the eastern region, there is a 5 to 15% probability of a significant quake.

Canada's property and casualty insurers recognize that the country is at risk of a major earthquake. They recognize that it will have devastating consequences for individuals, communities and the country's economy. While other stakeholders – such as the federal and provincial governments, academics and first responders – also understand this risk, most Canadian citizens simply do not. There is little public urgency to face the earthquake risk and make plans for recovery. Messages related to earthquake risk are ignored.

Sparking a national conversation

IBC convened the national earthquake symposium in an effort to change that reality. The focus of the symposium was to encourage a national conversation on how the country, its communities and citizens can best prepare for – and recover from – this huge, inevitable natural catastrophe.



The symposium galvanized around the best ways to increase Canada's financial and physical resilience to a major earthquake. Some important themes emerged:

- Top of the list is the value of **strengthening partnerships** among stakeholders to solve problems together.
- Another recurring theme was to focus on **resilient communities** as the building blocks to a resilient country.
- And finally participants were eager to **understand the long-term implications of a major quake**, as told through the cautionary tale of New Zealand's ongoing recovery and rebuilding as a result of the 2010-2011 quakes near Christchurch.

During the two-day event, IBC and the symposium participants committed to continuing the conversation, sharing what they had learned and forging closer relationships among participants. To that end, IBC is proposing a National Earthquake Resilience Working Group and, in 2015, will invite key stakeholders to participate in continuing this important discussion.

INSTANT POLL

When it comes to Canada's resilience to an earthquake, what is your biggest concern?

HOW ATTENDEES VOTED:	RESPONSES
The level of damage and destruction	24.58%
The long-term impact on the national economy	17.80%
How infrastructure will be affected and how quickly it can be fixed	16.95%
The long-term impact on victims and how to manage displaced people	16.95%
Who will pay for the rebuild	8.47%
The ability to provide immediate relief to victims	7.63%
The loss of life	7.63%
Total	100%



What Would a Major Quake Look Like?

To set the stage, IBC shared the findings from its research paper Reducing the Fiscal and Economic Impact of Disasters. It also shared the results of its earthquake impact study prepared by AIR Worldwide, a modelling firm. This study models two scenarios – a major quake off the coast of British Columbia and one below the St. Lawrence River along the Ottawa/Montreal/Quebec City corridor.

The B.C. scenario

This scenario models a magnitude 9 event in the Cascadia subduction zone. The quake creates long-period seismic waves that damage tall buildings and bridges. It also creates liquefaction-induced ground failure that causes buildings to settle, tilt or slide. The earthquake results in a tsunami wave that is two metres high when it reaches Victoria.

Private and public property losses caused by the shake, liquefaction, tsunami and fire following the event are estimated at \$62 billion. As well, damage

to transportation, water, communications and power infrastructure could cause \$13 billion in indirect economic losses, such as business interruption, and supply chain and service disruption. Total estimated losses: \$75 billion (Figure 2).

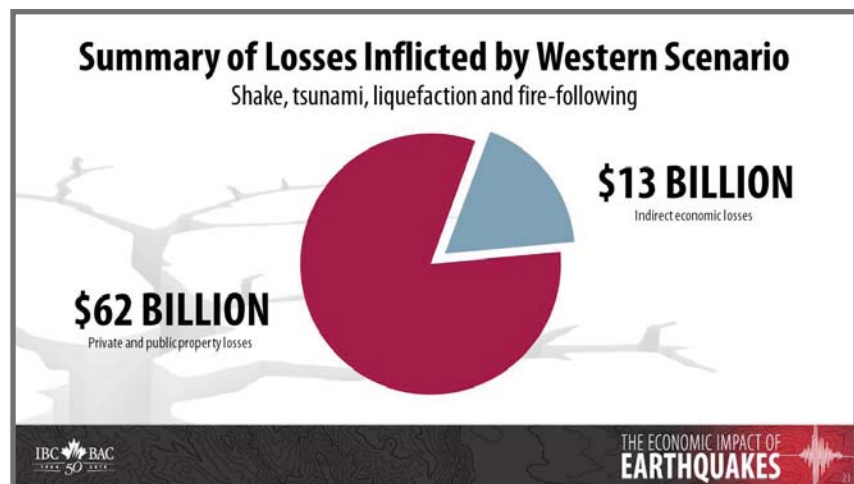


Figure 2

The Ottawa/Montreal/Quebec City corridor scenario

This scenario models a magnitude 7.1 event in the Charlevoix seismic zone. The epicentre is 100 kilometres northeast of Quebec City.

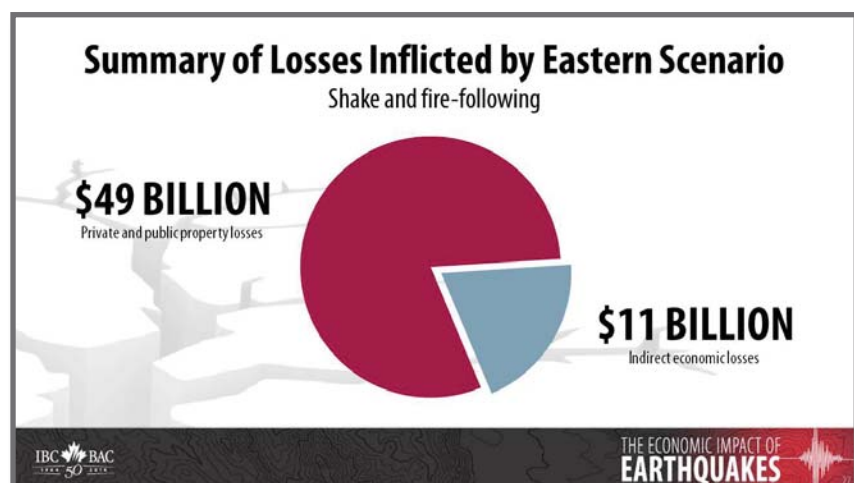


Figure 3



The capital city of Quebec sustains significant damage to its historic buildings, which are made from unreinforced masonry.

The private and public property losses predicted to result from the quake and ensuing fire amount to \$49 billion. In addition, there are \$11 billion in indirect economic losses due to business interruption. Total estimated losses: \$60 billion (Figure 3 on previous page).

Macroeconomic and fiscal consequences

Earthquakes have significant fiscal and economic consequences for countries. The 1995 Kobe earthquake in Japan, for instance, resulted in a long-term decline in local per capita GDP of 13%.

Natural disasters, in general, hurt public finances. A 2011 World Bank study found that, on average, disasters raise government expenditures by 15% and lower revenues by 10%, leading to a combined 25% increase in budget deficits.

A country's financial and physical resilience to disaster is telling. In 2010, there were two magnitude 7 quakes – one in Haiti and one in New Zealand. In Haiti, with its more vulnerable public and private infrastructure, more than 100,000 people died, and economic losses were US\$8 billion or 126% of Haiti's GDP. In New Zealand, there were no deaths, and economic losses were US\$6.5 billion or 5.3% of GDP.



Theme 1: Strengthening Partnerships and Collaboration

The dominant theme running through the symposium was the crucial need for strong partnerships. Solid relationships are vital to reducing the impact of a major earthquake on Canadians.

In some cases, presenters called for building new partnerships to manage both financial and physical risk ahead of a quake. In other cases, presenters described how already strong partnerships could help organizations provide a rapid response to those affected by a quake. These partnerships could also provide support through the recovery and rebuilding phases.

Canada's Minister of Public Safety and Emergency Preparedness, Steven Blaney, pointed to the increasing cost of natural disasters and said that the federal government recognizes that no one organization alone can handle a major disaster. He said the main point he wanted the audience to take away from his presentation was that "we will win on this issue and make Canadians safer if we work together in partnership."

Public-private partnership to share financial risk

Gregor Robinson, IBC's Senior Vice-President of Policy and Chief Economist, raised the need to explore a new partnership in Canada – between the public and private sectors. This partnership could share in the financial management of earthquake risk, similar to public-private partnerships in other Organisation for Economic Co-operation and Development (OECD) countries.

To ensure their economy remains resilient in the event of catastrophic disaster, many OECD jurisdictions have some form of public-private partnership to share the financial management of risk between government and industry.

Robinson explained that Canada's property and casualty insurers are well capitalized, given that current regulation requires them to be prepared for a 1-in-500 year event by 2020. However, there is a risk of industry-wide insolvency in the event of a catastrophic quake such as the magnitude 9 Tohoku quake and tsunami in Japan in 2011.



INSTANT POLL

Should the insurance industry work with government to explore a public-private partnership to share the financial risk of an earthquake?

HOW ATTENDEES VOTED:	RESPONSES
YES	89.13%
NO	10.87%
Total	100%

Scientific and academic collaborations

The scientists and engineers in the room described the many ongoing partnerships that inform their work. Scientists at Natural Resources Canada, for instance, work collaboratively with governments and academics around the world on earthquake-modelling strategies.

Murat Saatcioglu, Research Chair in Earthquake Engineering at the University of Ottawa, shared a concrete example of how partnerships make Canadians safer. He described how the B.C. Ministry of Education collaborated to bring public schools in the province up to current standards for protection against earthquakes. The collaboration included the Association of Professional Engineers and Geoscientists of British Columbia with support from the University of British Columbia Civil Engineering Department. The project, which began in 2004, cost \$2.2 billion to upgrade more than 200 high-risk schools. “Wouldn’t it be nice if other provinces adopted the same proactive way of mitigating seismic risk?” he asked.

Communities helping communities

Emergency Management BC (EMBC) is building a stronger culture of resilience in the province including growing its partnerships with other levels of government, the private sector, non-governmental organizations and the public. The 2012 agreement between the province and the Canadian Red Cross to support the province in a major disaster is an example of one such partnership.

EMBC is also forging partnerships among municipalities throughout the province. If a major earthquake affects Vancouver and/or Victoria, partnerships in these and other supporting regions will assist in the overall provincial response, including providing logistics and operations support, Patrick Quealey, the Assistant Deputy Minister of EMBC, explained (Figure 4 next page).

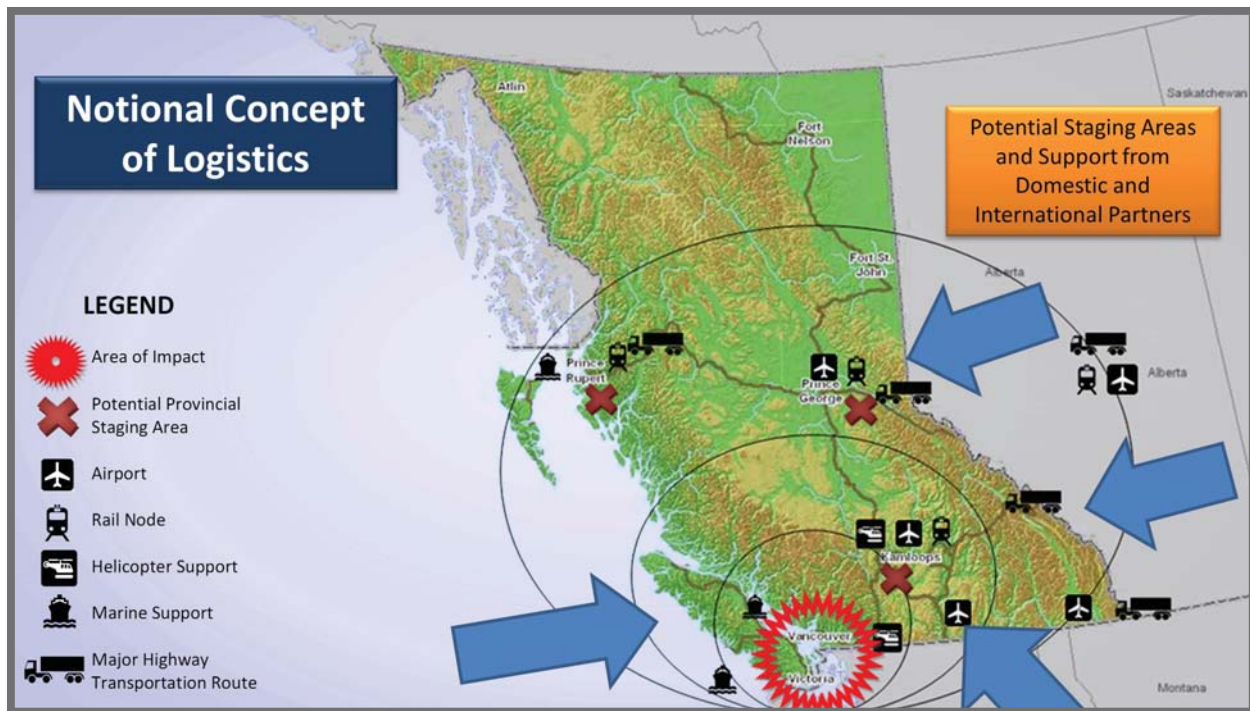


Figure 4

International disaster relief partnerships

The symposium participants from the disaster relief community described robust examples of strong ongoing partnerships. These participants shared their hands-on experiences of responding to large catastrophes with the help of their international partners.

Jean-Philippe Tizi, the Canadian Red Cross' Deputy Director General of Disaster Management, explained that his organization partners with other national Red Cross organizations around the world to respond to major catastrophes. He pointed out that Canada would receive help from other countries' Red Cross organizations in a domestic disaster, as part of the organization's international response.

In the event of a major earthquake in Canada, an international strike force made up of Red Cross organizations from around the world would be immediately mobilized to help the population recover. "Many would want to help us," he said.

The Canadian Red Cross has agreements with Public Safety Canada and the B.C. government. Its services include family reunification; providing emergency shelters, dietary support and clothing; fundraising; and disseminating information.

The Red Cross is a funnel for international fundraising, Tizi said. After the 2011 Japan earthquake and tsunami, the Red Cross raised \$2.2 billion worldwide for recovery. After the Haiti earthquake, it raised \$1.2 billion.



Tizi emphasized the crucial role of partnership in all aspects of disaster relief. He said it is vital to design models for cooperation and partnership well ahead of a major disaster. He encouraged national and international organizations to come together to help.

The Canadian Armed Forces stand at the ready as well. In describing the Forces' role in the event of a major earthquake, Rear Admiral Bill Truelove, Commander, Maritime Forces Pacific/Joint Task Force (Pacific), Department of National Defence, said it would immediately work with partners to help save lives and bring stability to the affected area. The Armed Forces would then withdraw to allow industry and others to return the situation to normal.

Truelove said the military has developed and practised its earthquake response plan, including taking part in ongoing training exercises with other stakeholders. It has built relationships with many helping organizations and stakeholders to ensure trust and confidence. The goal: to work together on the disaster in a unified, coordinated manner.

Both the U.S. and Canadian military would work together on the response, in accordance with the Canada-U.S. Civil Assistance Plan. Truelove told the delegates that he is in constant contact with his counterparts in the U.S. military on earthquake preparedness planning and training. He stressed the value of relationship-building ahead of a major quake "so we're not having that first conversation in a moment of crisis."

It goes without saying that saving lives and alleviating human suffering is top priority. As well, both the Canadian and U.S. military would focus on reopening seaports. "Ninety percent of what we're using here today got here through the West Coast seaports," he said. "Getting those ports back open will be important for our national economy."

The Lac-Mégantic response

Denis Landry, Director of the Recovery and Funding Programs Directorate at Quebec Public Safety, offered examples of how collaboration among partners helped Public Safety Quebec respond to the Lac-Mégantic rail derailment in 2013. Immediately following the event, 22 government agencies and organizations came together to manage the crisis. One of the group's first decisions was to create a joint office where affected citizens could receive information and support "from one counter" for the duration of the recovery and rebuilding.

Collegiality and coordination

Finally, Tim Grafton, Chief Executive of the Insurance Council of New Zealand, underscored the need for partnership and collaboration when faced with a major event, such as New Zealand faced in the 2010-2011 Christchurch quakes. At the top of his list of what worked well in the aftermath of the quakes and the multi-year rebuilding process was the "high level of collegiality and coordination" among various helping agencies.



Theme 2: Building Resilient Communities

The importance of building in resilience was woven throughout the IBC national earthquake symposium presentations. Some speakers discussed the specifics of how to increase financial resilience. Others discussed how to increase physical infrastructure resilience. But the overarching theme was how efforts need to work in concert to create resilient communities.

Canada's Minister of Public Safety and Emergency Preparedness, Steven Blaney, put it this way: "Preparing for an earthquake means acting now to build resilient communities that can better withstand and recover from the impacts of natural disasters and other emergencies."

The financial resilience of Canadians

A recent Pollara consumer poll that IBC commissioned revealed some serious gaps in the financial resilience of individual Canadians. Although two-thirds of respondents believed they were financially prepared for an earthquake, only one-third had earthquake insurance. The take-up rate of quake insurance varies from 4% in Quebec to about

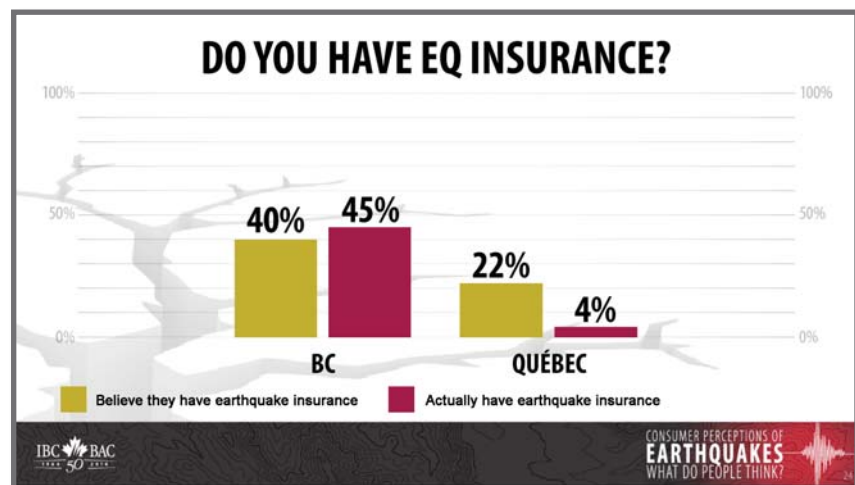


Figure 5

45% in B.C. (Figure 5). Most respondents said they didn't have insurance because they didn't expect an earthquake to happen. Almost half of respondents expected to rely on government financial assistance in the event of a quake.

"But that might not work," countered Mary Lou O'Reilly, IBC's Senior Vice-President of Issues Management and Communications, who presented the survey findings. "The reality is that our government may not be in a position to pick up that tab, at least not in the entirety that people expect."

O'Reilly called for increased consumer education of earthquake risk as a step toward promoting better individual financial resilience. She recommended focusing on resilience at the community level to engage the public and create a sense of urgency. Along with several other presenters, O'Reilly pointed to the value of the Great ShakeOut earthquake drills in B.C. and Quebec in raising awareness within communities.



Gregor Robinson, IBC Senior Vice-President of Policy and Chief Economist, looked at financial resilience in the face of a catastrophic earthquake at the national level and in terms of the property and casualty insurance industry in Canada. He itemized four ways to improve financial resilience nationally:

- Raise awareness of earthquake risk among consumers to spur action to reduce individual risk
- Improve the resiliency of homes and infrastructures to reduce losses
- Increase insurance take-up
- Explore a public-private partnership to manage the financial risk of earthquake and protect the insurance industry from insolvency in the case of a catastrophic event, such as occurred in Japan in 2011.

Raising consumer awareness

In the discussion following O'Reilly's and Robinson's presentations, O'Reilly talked about the best approach to raising consumer awareness. "We're not about the business of frightening people," she said.

Robinson added that it is important that citizens not have a "fatalistic view about risk." He pointed out that the City of Victoria has the highest earthquake insurance take-up rate in Canada, at 70%. He

INSTANT POLL

Who is responsible for educating the public about the risk of an earthquake and how to prepare for an earthquake?

HOW ATTENDEES VOTED:	RESPONSES
Provincial government	8.82%
Federal government	6.62%
Not-for-profit organizations	2.94%
Emergency response services	1.47%
Insurance industry	0.74%
School boards	0%
All of the above	79.41%
Total	100%



suggested that the way people learn about risk affects their actions. “In Victoria, we know that even schoolchildren learn to drop, cover and hold on,” he said. “It’s not just about risk awareness. It’s also that you can do something about this risk,” he said.

Glenn Pomeroy, CEO of California Earthquake Authority, agreed. “What social scientists have told us is that fear tactics only take you so far,” he said. “In fact, they can turn people off.” Pomeroy recommended a more optimistic approach. He suggested encouraging citizens to make their home safer to protect their family and putting financial protection in place to ensure they can rebuild.

Raising awareness to save lives

Several speakers during the day returned to the topic of how best to raise consumer awareness. Patrick Quealey, the Assistant Deputy Minister of EMBC, described work EMBC and B.C. First Nations are doing on oral traditions as a way to pass down information through families.

Murat Saatcioglu, Research Chair in Earthquake Engineering at the University of Ottawa, recounted a conversation he had with a woman from a small village in Chile that was destroyed in the tsunami following the 2010 earthquake. Although every building was flattened, all 450 people in the village survived. When he asked how that happened, she replied, “Because we were educated.” She explained that as children they were told in bedtime stories to run up the hill the moment the ground started shaking. All the villagers ran up the hill and protected themselves.

The value of early education and curriculum on earthquake preparedness as important ways to protect schoolchildren was mentioned several times during the symposium.

On a much more sombre note, Brian Gray, Assistant Deputy Minister and Chief Scientist at Natural Resources Canada, shared a discussion he had with a Japanese scientist about the tsunami that followed the 2011 quake. The scientist showed him a map that had modelled the tsunami, which matched satellite imagery of the actual flooding. Although the possible extent of the tsunami was known and there was an early warning system in place, 16,000 people lost their lives, in part because many did not act on the warning, Gray said.

In closing the discussion, Andrew Tablotney, past president of Insurance Brokers Association of B.C., pointed out that insurance brokers are in constant contact with consumers. This communication is a valuable conduit for increasing consumer awareness of earthquake risk and building community resilience, he said.



Physical infrastructure resilience

Asking “How can we best serve Canadians and create more resilient communities?” is how Shawn Tupper, Assistant Deputy Minister, Emergency Management and Programs Branch at Public Safety Canada, opened the panel discussion on physical preparedness.

Each scientist on the panel shared practical steps that are being taken to make our communities safer.

Upgrading earthquake alert stations

Brian Gray, Assistant Deputy Minister and Chief Scientist at Natural Resources Canada, described the improvements to Canada’s 150 earthquake alert stations and the continuous updating of the National Building Code to reflect current earthquake resistance standards.

Building resilience through earthquake-resistant design

Murat Saatcioglu, Research Chair in Earthquake Engineering at the University of Ottawa, provided an overview of earthquake resilience and vulnerability of critical infrastructure in Canada.

Earthquake engineering is a young field with most advancements taking place in the last four or five decades, he explained. Consequently, a building’s vulnerability is closely linked to its year of construction. Over many years, Canada’s National Building Code has evolved to incorporate advances in earthquake engineering. Earthquake-resistant design offers resistance to seismic forces and the ability to absorb seismic energy to give a building the ability to “bounce back” without collapsing. These code improvements are applied to new construction.

Most infrastructure in Canada, including bridges, communication towers and transportation facilities, was built prior to these advancements. Also, many hospitals, shelters and gathering places – such as schools and hockey arenas – that would be used after a disaster, were built prior to current earthquake engineering standards.

Saatcioglu singled out masonry construction – especially unreinforced masonry construction typical of heritage buildings – as being particularly vulnerable to structural damage in an earthquake (Figure 6).

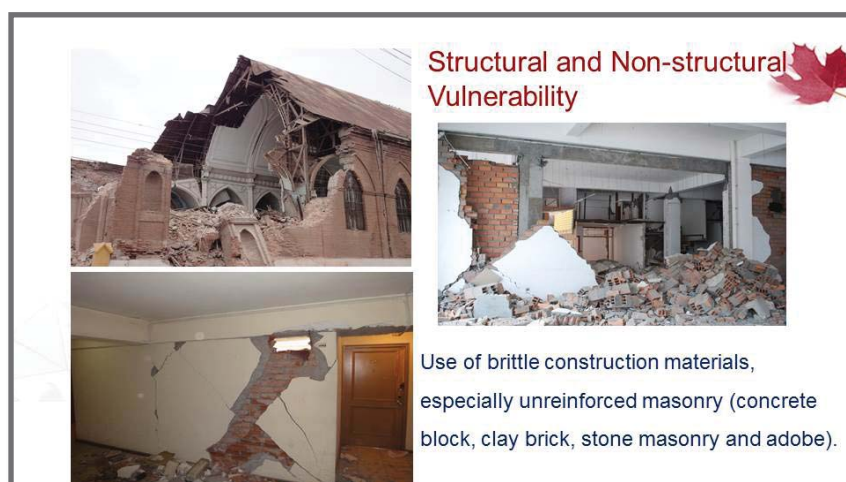


Figure 6



He also pointed to the damage caused by shifting building contents and non-structural components, such as drywall, light fixtures and even furniture (Figure 7).

Canadian scientists continue to develop new techniques for identifying and retrofitting existing buildings and infrastructure. The Canadian Seismic Research Network, an affiliation of 26 researchers from eight Canadian universities, is developing many new techniques.

In one new technique, fibre-reinforced polymers are applied like wallpaper to structural elements, such as columns, to reinforce them and make them resistant to shearing (Figure 8).

In another technique, the base of a building is isolated in a way that protects its foundation from earth movement. Saatcioglu showed two wings of a hospital in Lushan City, China. The new wing had an isolated base and continued to operate during and after a recent earthquake. The old wing, though, was severely damaged (Figure 9).

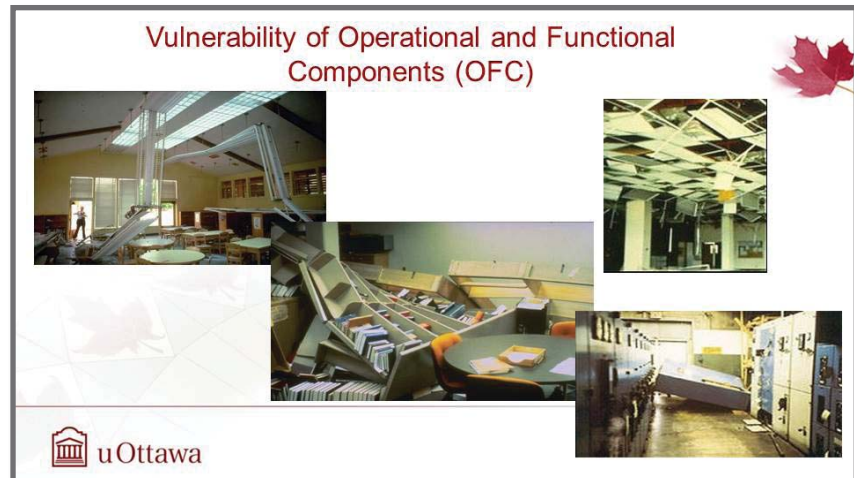


Figure 7

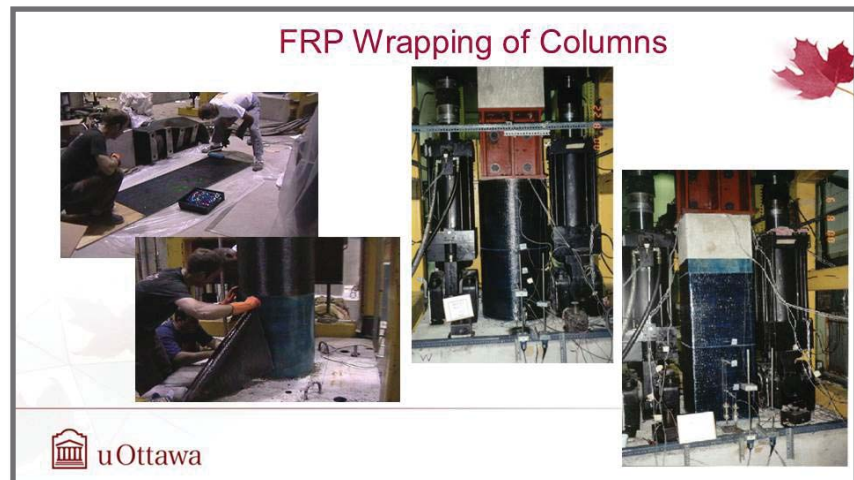


Figure 8



Figure 9

How resilience reduces losses

Jayanta Guin, Executive Vice-President of AIR Worldwide, focused his remarks on how resilience within a community affects the financial and economic losses that result from a major earthquake. He summarized resilience as: robustness, redundancy, resourcefulness and rapidity.

Guin explored the 2011 magnitude 9 earthquake in Japan. The quake and resulting tsunami caused total devastation to critical infrastructure, including airports, railways and highways. However, the country had a high level of resiliency because of careful planning and disaster mitigation efforts.

Many stakeholders came together and responded efficiently and had critical systems up and operating again in a short time (Figure 10).

The goal of resiliency planning is to reduce the drop in infrastructure functionality that occurs after a major quake and improve the rate at which a system or piece of infrastructure returns to full functioning (Figure 11).

Several U.S. jurisdictions and the City of Vancouver through its Earthquake Preparedness Strategy are identifying critical pieces of infrastructure and creating action plans to ensure their quick return to functionality after an earthquake.

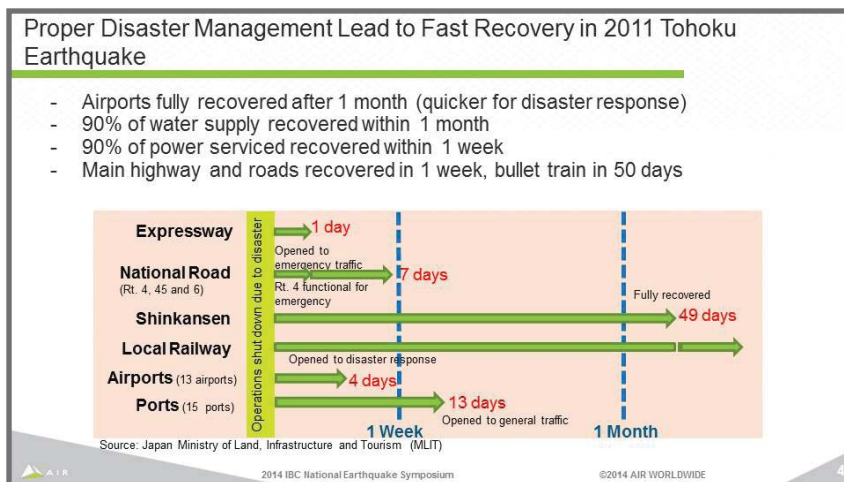


Figure 10

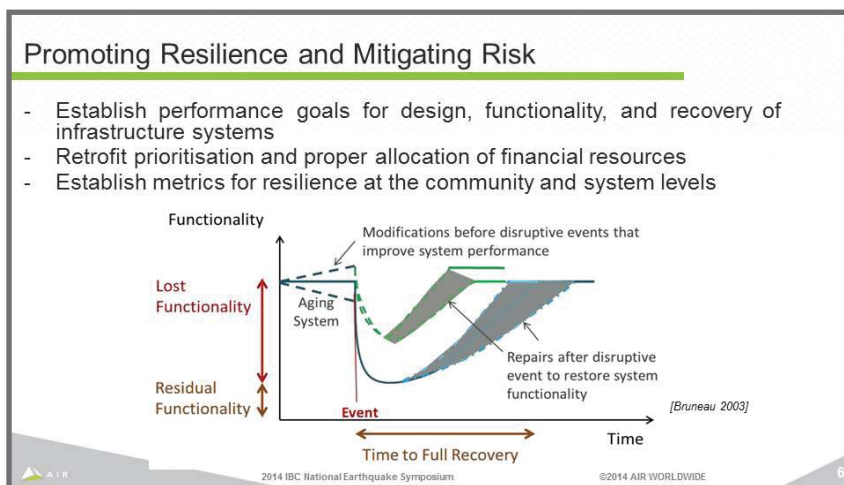


Figure 11



Guin also described the earthquake impact model that AIR Worldwide prepared for IBC. (See page 34 for a full description of the model.) On the B.C. scenario, Guin focused on the indirect losses that would result because of damage to major infrastructure. He demonstrated how those indirect losses decrease as the level of resilience increases (Figure 12).

Guin then moved onto the topic of ensuring that financial resources are available to rebuild major national infrastructure following a large natural catastrophe, such as an earthquake. Unlike residential and commercial property, infrastructure is not insured by the private insurance industry. He described the

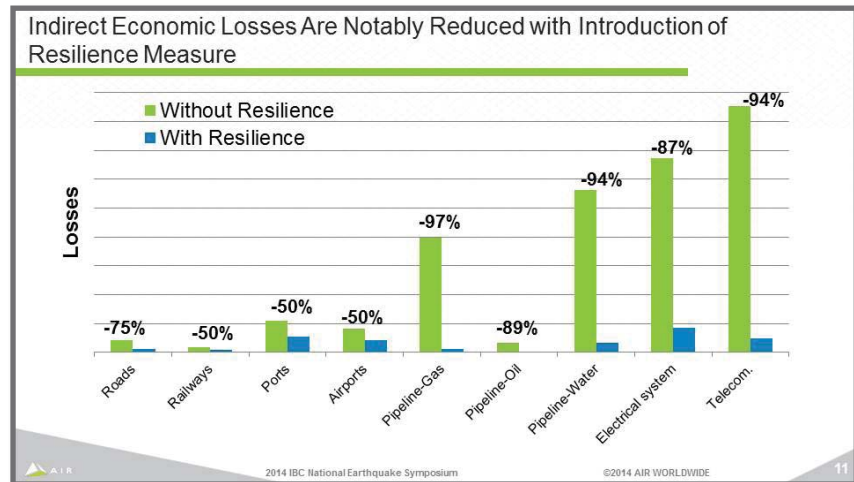


Figure 12

role of catastrophe bonds as one way for governments to transfer risk and tap into international financial markets to rebuild after a major event.

In the question period that followed the presentations, a participant asked about the most cost-effective way to make physical infrastructure more resilient. Murat Saatcioglu said there is no single answer. He explained that scientists are always developing new, cost-effective retrofit techniques that can be installed with little downtime for the building.

Jayanta Guin also pointed out that there are simple, cost-effective ways to reduce quake damage to residences. These include bracing walls and strapping water heaters in place.

INSTANT POLL

We have heard a lot of discussion on the impact of specific resilience measures. Please rank in order of impact.

HOW ATTENDEES VOTED:	RESPONSES
Prioritizing key infrastructures and resources	44.69%
Retrofitting existing buildings	36.91%
Changing building codes for new builds	18.40%
Total	100%



Theme 3: Preparing for the Long Haul – the New Zealand Experience

Recovering and rebuilding following a major earthquake takes years, billions of dollars and a broad range of partners, as participants learned from the presentation by Tim Grafton, Chief Executive of the Insurance Council of New Zealand.

Grafton's firsthand account of New Zealand's experience raised questions and offered lessons for Canadian stakeholders preparing Canada for a major earthquake event. Grafton compared the City of Christchurch, which received the most damage from the quakes, to Vancouver. Both are major city centres with a coastal location on the Ring of Fire.

New Zealand experienced four major earthquake events – a main quake and a series of aftershocks – near Christchurch on South Island over a 15-month period (Figure 13). The first quake was on September 4, 2010, and no lives were lost. The February 22, 2011, quake caused 185 deaths. Total financial loss for all events: NZ\$40 billion.

The quakes were ongoing, and some caused the land to become unstable from liquefaction. Consequently, substantial rebuilding could not begin for two years. Residential building is expected to continue until 2017. Commercial rebuilding is expected to continue until 2020 or later.

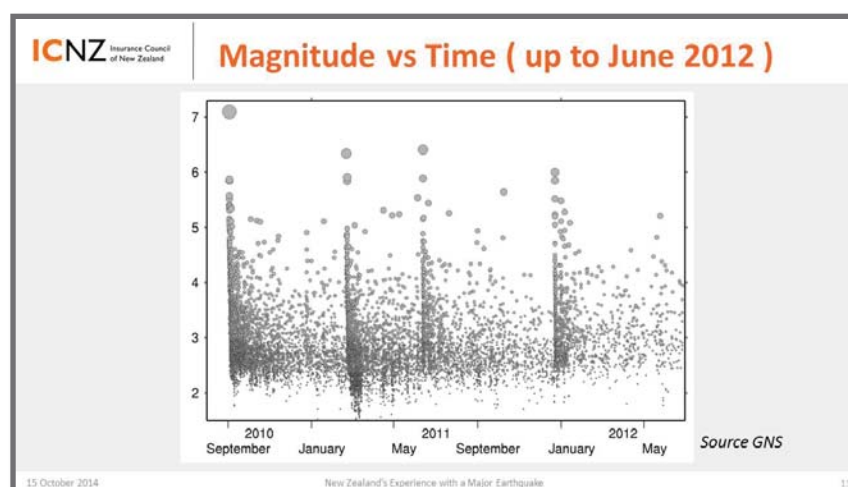


Figure 13

New Zealand's financial preparedness

Grafton began by sharing information on the New Zealand earthquake insurance system. All homeowners who buy house insurance are required to pay a yearly levy to a government pool for earthquake coverage.

The public Earthquake Commission (EQC) manages the pool and is responsible for claims resulting from an earthquake. It covers the first NZ\$100,000 in residential property and land damage, NZ\$20,000 in contents damage and NZ\$20,000 in alternative accommodation. Consumers can purchase additional earthquake coverage from private insurers. Private insurers also sell commercial earthquake insurance.



Since house insurance take-up is 95 to 98%, earthquake coverage is equally high. This means there are dollars available to immediately help pay for damage. At the time of the Christchurch quakes, the EQC pool was NZ\$6 billion.

The scale of the disaster

Grafton outlined New Zealand's experience with numbers:

- EQC had 800,000 separate claims for buildings, contents and land at a final cost of NZ\$12 billion. (Property owners often had more than one claim because each major earthquake event was treated separately.) Of the NZ\$12 billion, NZ\$6 billion was paid out from the pool, NZ\$5 billion from reinsurance and NZ\$1 billion from Crown guarantee.
- Private insurers face NZ\$20 billion in claims split evenly between commercial and residential. Although private insurers had fewer claims than EQC – 162,000 in total – the claims were for larger repairs and rebuilding. Private insurers have paid out NZ\$13 billion in claims so far.
- 7,000 homes were assigned for destruction or “red zoned” because the land was so unstable the homes could not be rebuilt. Grafton likened the situation to “wartime conditions” (Figures 14a to 14d).
- 1,354 commercial buildings were demolished.
- 6,000 homes became vulnerable to liquefaction, requiring land repair before rebuilding. This led to significant delays as new repair methods needed to be designed.
- Christchurch sank as much as one metre, which brought the ground surface closer to the



Figure 14a



Figure 14b

water table. This drop, coupled with increased precipitation as a result of climate change, means many more homes are now vulnerable to flooding, which had to be accounted for in rebuilding plans.

- The quake damage amounted to 20% of New Zealand's GDP for 2011. By comparison, the 2011 quake and tsunami damage in Japan amounted to 5.3% of GDP that year.



Figure 14c



Figure 14d



What worked well in the New Zealand recovery

Collegiality and coordination

- Insurers and EQC worked collegially, for the most part, to resolve challenges and manage rebuilds.
- Banks postponed loan repayments.
- Inland Revenue, New Zealand's revenue agency, suspended its usual filing requirements.
- Single government authority had sweeping "wartime" powers.
- Innovative solutions were created to manage complex claims from shared multi-unit properties.

Community support

- Insurers engaged with the community at the grassroots level. They worked with social workers and applied a vulnerability index to prioritize claims. They funded a residential advisory service to help citizens navigate post-quake complexities.
- The community showed a high level of resilience and developed innovative solutions. For example, affected businesses created shipping-container shopping malls and some relocated together to buildings outside the affected area.

The crisis sparked future improvements

- Building standards and codes improved.
- Residential and commercial insurance coverage improved.
- Better underwriting of risk.
- Science advanced our understanding of the effects of liquefaction and earthquake-resilient building construction.
- Christchurch will be a safer, more sustainable city.

Insurance coverage

- 98% insurance penetration and basic earthquake coverage, including accommodation cover, for all insured.
- Transparency and functionality of insurance system ensured critical ongoing reinsurance capacity.
- Speedy commercial settlements, including business interruption payments, kept pay cheques going and families together. This ensured people stayed in the community, which is crucial for economic recovery.

What did not work well in New Zealand's recovery

- EQC was thrust into new rebuilding responsibilities beyond its mandate to manage reinsurance and educate. It had to ramp up from 22 staff to 1,800 staff plus 10,000 contractors.
- Before rebuilding could begin, it took 18 months to develop land-settlement policy around issues such as liquefaction, subsidence, land repair and increased flood risk.
- Consumers lacked knowledge of how claims would be handled and by whom (EQC or private insurers).
- There was a disconnect between EQC and insurers around data exchange because there were no existing protocols. Differences in policy wording and organizational culture intensified the disconnect.
- EQC legacy IT systems were unsupported.
- There was political pressure to deliver additional services outside of the original scope of rebuilding.
- There were legal disputes and disagreements among stakeholders, including city councils, over technical issues, such as whether to repair or rebuild. As well, there were inflated claims.
- Legal disputes over the responsibility for insuring, rebuilding and approving retaining walls held up rebuilding (Figure 15).

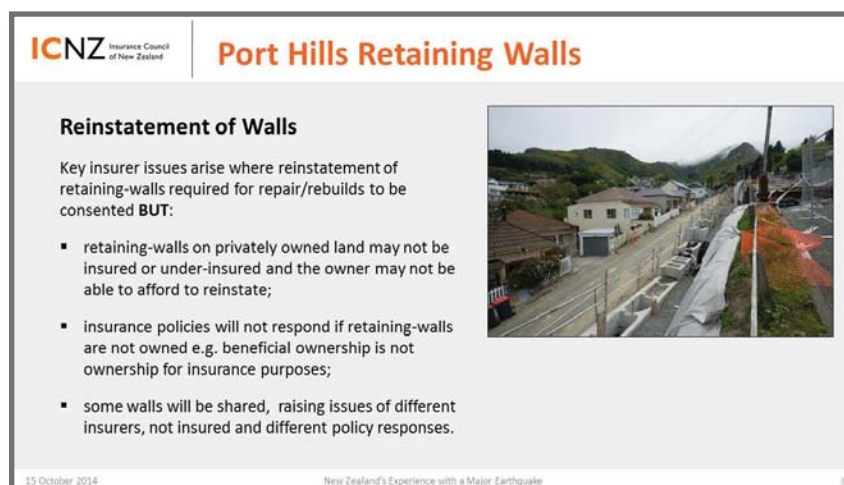


Figure 15



What Canada can learn from New Zealand's quake recovery

Exploring a public-private partnership to manage financial risk

Grafton's first point was the need for Canada to consider a public-private partnership to manage the financial risk of a major earthquake. "The big question mark" after a catastrophe is a country's capacity to recover, he said. He raised the political risk for a government dealing with hundreds of thousands of people who have experienced a loss but are not insured. Most governments would buckle under the pressure to help. But Grafton asked, "What signal does that send to the rest of Canada – that you don't have to take out insurance because we will bail you out?" He added that recovery after such a large catastrophe takes many years and several electoral cycles.

He also discussed what he called "functional risk." Without full coverage and an agency in place to manage the recovery, he warned, "There will be some ensuing chaos and that feeds back into political risk."

Other lessons from the New Zealand experience that he wanted to share included:

Improving building standards for commercial buildings

New Zealand now has public notification of earthquake-prone buildings, and tenants are voting with their feet and moving to safer locations. "The value of earthquake-prone buildings drops and people move," he said.

Fixing unreinforced masonry

"Take care of it, get rid of it," he said. "It falls down on cars, kills people."

"And you need to have some policy for cultural sites. It's a problem."

Improving non-structural seismic restraint standards

"Up to 70% of the damage to buildings and risk to life comes from all that stuff up in the ceiling – the electrics, the Internet cables and the like – coming down on people."

Requiring in legislation that infrastructure plans include quake mitigation

"Our legislation now mandates 30-year infrastructure plans to include mitigation of a major quake. I would highly recommend that."

Putting in place short-term recovery plans for essential services

"You lose power, you lose sewage, you lose fresh water, and that goes on for weeks and in some cases months. It's not fun going out to find a latrine two blocks away in the middle of winter with your kids."



Having sufficient capital and reinsurance cover in place

"We're moving to a 1-in-1,000 year cover. The Canterbury quake was a 1-in-2,500 year event ... So surprises happen."

Continuing to improve underwriting of risk

"The key learning is that the insurance contracts and the terms within them were stress-tested to the max. A lot of fresh legal interpretation has come out of all that."

Raising public awareness

"Public education is absolutely critical."

Has Christchurch recovered?

At the end of the question period after Grafton's presentation, moderator Evan Solomon asked one final question: Has Christchurch recovered?

"Yes," said Grafton. "Christchurch's unemployment is the lowest in the country. Christchurch's growth is the strongest in the country. And all of that is on the back of the money that's been kicked in through the EQC and the insurance industry."

INSTANT POLL

What is the most important lesson for Canada from New Zealand's experience with a major earthquake?

HOW ATTENDEES VOTED:	RESPONSES
Public/private partnership	59.84%
Community resiliency and innovation	14.75%
Collegiality and coordination	13.93%
Improvements to building standards and code	6.56%
Advancements in science around EQ resistant building design	4.92%
Total	100%



Conclusion

In his closing comments at IBC's national earthquake symposium, IBC President and CEO Don Forgeron remarked on how eager the participants were to connect with each other and share information.

Forgeron said that the symposium certainly succeeded in its goal – to spark conversations, and exchange knowledge and ideas across disciplines on what is one of the largest immediate risks facing the country and individual Canadians.

Several excellent suggestions were raised at the symposium, Forgeron said. He gave the example of the need for improved early education and school curriculum focused on earthquake preparedness as a suggestion that resonated with many participants.

As a next step in that vital conversation, IBC proposes the creation of a National Earthquake Resilience Working Group and, in 2015, will invite key stakeholders to participate in continuing this important discussion.



Presentation Synopsis



THE HONOURABLE STEVEN BLANEY

*Minister of Public Safety and Emergency Preparedness,
MP for Lévis-Bellechasse (Quebec)*

In his address, Minister Blaney detailed the responsibilities of Public Safety Canada, formed in the aftermath of September 11, to lead and coordinate emergency management activities within the federal government. He pointed out that representatives from several federal ministries were attending the symposium, including those from his ministry, and the ministries of National Defence, Public Works, Finance, Environment Canada and Natural Resources Canada.

Earthquake response partnership

Blaney described his ministry's work – which includes hosting the annual national roundtable on disaster risk reduction – as part of supporting the work of Canada's Platform for Disaster Risk Reduction. He said the federal government has drafted an earthquake response protocol that clearly defines the federal roles and responsibilities. He also reported that the federal government set aside \$11.4 million in the 2014 budget to improve the earthquake-monitoring and public-alert systems in high-risk and urban areas.

Minister Blaney told the audience that the increasing cost of natural disasters has shifted thinking in the emergency management community. The community now recognizes that no one organization, including the federal government, can handle a major disaster alone. His ministry now places greater emphasis on prevention, mitigation and resilience, while still maintaining its strong emergency preparedness response and recovery networks.

The minister spoke positively about the role of partnership in managing disaster risk, including earthquake risk. He mentioned the importance of coordinating efforts with other ministries and the provincial governments. He expressed that he was proud of his ministry's partnership with IBC on disaster preparedness.

Blaney referenced the need for flood mitigation within the emergency preparedness file. The National Disaster Mitigation Program – which was announced in the 2014 budget and allotted \$200 million over five years – will focus, in part, on improving Canada's flood mapping. The minister said he was committed to gaining the scientific knowledge needed to develop a flood insurance market in Canada.



Presentation Synopsis



DON FORGERON

President and CEO, Insurance Bureau of Canada

In opening the symposium, Don Forgeron welcomed participants and urged them to engage with each other in conversation throughout the symposium.

Forgeron highlighted Canada's high risk of earthquakes. He pointed out that Canada experiences 6,000 quakes every year, and some are major. In April 2014, for example, there was a 6.7 magnitude quake off the coast of Vancouver. Fortunately, it did not affect any urban areas.

He compared that quake to the 6.3 magnitude quake in Christchurch, New Zealand, in 2011. The Christchurch earthquake caused US\$33 billion in total economic losses for the city of 350,000.

If a similar quake had hit the Greater Vancouver area with its population of 2.4 million, the extent of damage would have been much greater than Christchurch's.

IBC's earthquake impact study

Forgeron shared some highlights from the earthquake impact study that IBC commissioned and AIR Worldwide conducted. The modelling of a magnitude 9 quake in Western Canada showed \$75 billion in total economic damage, of which \$20 billion would be insured. The same modelling in the Ottawa/Montreal/Quebec City corridor resulted in \$60 billion in total economic losses, of which \$12 billion would be insured.

Forgeron also placed earthquake risk within the context of natural disasters in general. He pointed out that 2013 was the worst year on record for the Canadian property and casualty insurance industry, which spent \$3.2 billion on claims related to natural disasters.

Although some might see an insurance organization hosting a symposium on earthquakes as self-serving, Forgeron assured the audience that the property and casualty insurance industry's goal is not to sell more earthquake insurance. In fact, the high risk of an earthquake leaves the industry vulnerable to higher claims costs.

The industry is raising the issue and engaging stakeholders in conversation because earthquake risk and the need to be prepared are national issues that call for a shared response, Forgeron said.

In his closing remarks, Forgeron congratulated participants on the calibre of their positive discussions and for their passion for addressing the issues. He called for ongoing partnership and continued conversation. He pledged IBC's commitment to continuing to lead on the earthquake preparedness file and asked participants for their ideas on next steps.



Presentation Synopsis



TIM GRAFTON

Chief Executive, Insurance Council of New Zealand

For Tim Grafton's full presentation, see *Preparing for the Long Haul – the New Zealand Experience*, page 17.

Grafton shared New Zealand's experience of recovering from four major earthquake events within a 15-month period, from September 2010 to December 2011.

He described New Zealand's earthquake insurance system. He also outlined Christchurch's recent quake experience by the numbers. One startling number was that 7,000 homes were assigned for destruction because the land was so unstable they could not be rebuilt. He likened the situation to "wartime conditions."

What worked well

There is much that New Zealand has to be proud of in how it handled the crisis:

- A high level of collegiality and coordination among various helping agencies
- A single government authority was established and given "wartime" powers to manage the situation
- An insurer-funded Residential Advisory Service was created to help citizens navigate through the complex recovery system
- Businesses offered innovative solutions, such as shipping-container shopping malls and companies co-locating in offices outside of the affected area.

Improvements made

The crisis sparked several improvements:

- Building standards improved
- Residential and commercial insurance coverage improved
- Underwriting of risk improved
- The understanding of the effects of liquefaction and earthquake-resilient building construction advanced.



Roadblocks

What did not work well in resolving the New Zealand crisis included:

- The ability of the Earthquake Commission to handle the huge increase in claims
- Consumers lacked knowledge of how claims would be handled and by whom
- Legacy IT systems were unsupported
- Political interference
- Legal disputes and disagreements among stakeholders, including city councils.

Lessons for Canada

- Ensuring adequate insurance coverage to avoid a scenario in which hundreds of thousands of citizens are uninsured and expect government help
- Improving building standards, including replacing or reinforcing unreinforced masonry, and legislation that mandates that infrastructure plans include mitigation for a major quake
- Ensuring short-term recovery plans for essential services
- Ensuring sufficient capital and reinsurance coverage is in place
- Continuing public education
- Continuing to improve insurance underwriting of risk.



Presentation Synopsis



BRIAN GRAY

Assistant Deputy Minister and Chief Scientist, Natural Resources Canada

Brian Gray outlined the role of Natural Resources Canada (NRCan) as a provider of “national public-good science” as it relates to earthquake risk assessment and preparedness.

One of NRCan’s primary roles is to develop models that can be used to create hazard maps and knowledge products that inform critical infrastructure design and location, and strengthen regulation and building codes.

6,000 quakes a year

NRCan’s other key role, through its Canadian Hazard Information Service, is to monitor earthquakes around the clock and alert citizens as well as infrastructure operators when a quake occurs. Approximately 6,000 earthquakes are detected in Canada every year; of those, about 60 are strong enough to be felt.

NRCan operates 150 seismic stations, which are mainly clustered on the B.C. coast and along the Ottawa/Montreal/Quebec City corridor. In the 2014 budget, the federal government allocated \$11.4 million over three years to update the stations.

Gray described NRCan scientists as international experts in modelling both subduction and interplate earthquakes. They rely on historical data, current seismic station data and new global position system (GPS) capabilities in their seismic research.

NRCan works collaboratively with other areas of government, universities, industries and other countries, including the U.S., Japan, Korea, Australia and China.



Presentation Synopsis



JAYANTA GUIN

Executive Vice-President, AIR Worldwide

Jayanta Guin focused his remarks on both mitigation and resilience. Specifically, he targeted how the resilience level within a community affects the financial and economic losses from a major earthquake. He summarized resilience as robustness, redundancy, resourcefulness and rapidity.

In his presentation, Guin first explored the 2011 magnitude 9 earthquake in Japan. While the quake and resulting tsunami caused total devastation to critical infrastructure, including airports, railways and highways, the country had a high level of resiliency because of careful planning and disaster mitigation efforts. Many stakeholders came together and responded efficiently and had critical systems up and operating again in a short time.

Resiliency planning

The goal of resiliency planning is to reduce the drop in infrastructure functionality that occurs after a major quake and improve the rate at which a system or piece of infrastructure returns to full functioning.

Several U.S. jurisdictions and the City of Vancouver through its Earthquake Preparedness Strategy are identifying critical pieces of infrastructure. Then they're creating action plans that will ensure a quick return to functionality after an earthquake event.

Guin then discussed the earthquake impact model that AIR Worldwide prepared for IBC as it relates to resilience. (See the synopsis of Gregor Robinson's presentation, page 34, for a full description of the model.)

On the B.C. scenario, Guin focused on the indirect losses that would result from damage to major infrastructure. He demonstrated how these indirect losses decrease as the resilience level increases.

Guin moved on to the topic of ensuring that financial resources are available to rebuild major national infrastructure following a large natural catastrophe, such as an earthquake. Unlike residential and commercial property, infrastructure is not insured by the private insurance industry. He described the role of catastrophe bonds as one way for governments to transfer risk and tap into international financial markets to rebuild after a major event.

As an example, Guin cited the Multi-Cat Mexico bond, which is designed to cover risks for both earthquakes and hurricanes. He also explained that governments interested in issuing such bonds commission risk modellers, such as AIR Worldwide, to help assess the risk.



Presentation Synopsis



DENIS LANDRY

Director, Recovery and Funding Programs Directorate, Quebec Public Safety

Denis Landry gave an account of the responsibilities of Quebec Public Safety and how the ministry would respond in the case of a major disaster. He also shared lessons learned from the ministry's response to the Lac-Mégantic rail derailment in 2013.

The Lac-Mégantic disaster caused 47 deaths and extensive property damage. When recovery and rebuilding is completed in 2017, the cost to the Quebec government is expected to be more than \$350 million. Landry said that in the case of major disasters in Quebec, the Quebec government, through his department, is responsible for administering financial aid that is then claimed from the federal government.

To manage the response to a major disaster, Public Safety convenes a round table of representatives from Quebec's key ministries and stakeholders. Public Safety created such a round table immediately after the Lac-Mégantic disaster.

One of the management group's first actions after the derailment was to bring representatives of 22 ministries and organizations involved in the recovery into one building. This allowed the group to serve citizens from one location.

Public Safety created another office to supervise recovery and rebuilding. This office coordinated reintegrating the 2,000 people who were affected; decontaminating air, soil and buildings; cleaning streams; re-establishing rail service; and relocating affected businesses.

To explain its approach to effective and rapid recovery, the ministry is now creating a guide to recovery based on the Lac-Mégantic event.



Presentation Synopsis



MARY LOU O'REILLY

*Senior Vice-President, Issues Management and Communications,
Insurance Bureau of Canada*

Mary Lou O'Reilly reviewed the results of a recent poll that IBC commissioned on consumer attitudes toward earthquake risk and earthquake insurance. Pollara conducted the poll by phone in British Columbia and the Ottawa/Montreal/Quebec City corridor, surveying more than 2,000 residents.

The poll found that Quebec respondents see the risk of earthquake as very low. B.C. respondents see the risk as valid but 50 years in the future and not in their lifetime. O'Reilly pointed out there was no sense of urgency about the risk.

The respondents were confused about whether they had earthquake insurance. In Quebec, 22% said they thought they were covered; in reality, only 4% were covered. In B.C., 40% said they were covered but 45% were actually covered.

Poll: most don't expect quake

When asked why they did not have earthquake insurance, most said they never considered buying it. The main reason they gave for not buying it was that they did not think an earthquake would happen. A smaller group said they felt it was too expensive.

O'Reilly also reported that the poll showed an increase in consumer awareness of the need to physically prepare for an earthquake compared to a similar poll taken in 2012. However, when asked about specific actions they had taken to prepare – such as compiling an emergency kit – about 30% of British Columbians and 60% of Quebecers had done nothing.

On financial preparedness, two-thirds of respondents said they were financially prepared. However, only one-third had earthquake insurance. Almost half of the respondents said they would rely on the government's financial assistance after an earthquake. O'Reilly said these results beg an ethical question: Should governments pay when insurance was available to consumers and they opted not to buy it?

O'Reilly concluded her presentation with a call for improved consumer education and an acknowledgment that all stakeholders must work together to raise consumer awareness of earthquake risk and the need to prepare.



Presentation Synopsis



PATRICK QUEALEY

Assistant Deputy Minister, Emergency Management BC

Patrick Quealey described the role of Emergency Management BC (EMBC) and how it is evolving.

EMBC currently follows the B.C. Emergency Response Management System using an Incident Command System structure, which requires a response to an event to first occur at the lowest levels of the organization. However, the organization is shifting to a new paradigm that ensures all levels of the organization respond at once.

Quealey said that EMBC had recently gone through an audit that pointed to various deficiencies. EMBC hired Henry Renteria, the former director of California Governor's Office of Emergency Services, to address some of these issues. His report was expected soon.

Building a culture of resilience

Quealey pointed to some of the recommendations that are expected from the report. These include increasing public education to affect behavioural change and building a culture of resilience.

He said that EMBC is already working on improving the provincial emergency notification system and increasing its participation in emergency training exercises. It planned to have an immediate emergency response plan in place by early 2015.

Quealey explained that EMBC uses an NRCan model for earthquake planning that describes a 7.3 magnitude crustal earthquake under Vancouver and Victoria. EMBC chose this model because it simulates an event that would be instantaneous and affect the area of highest population density. Such a quake would affect seats of government in Victoria and Vancouver so provincial leadership, including EMBC, would be directly involved.

He said EMBC wants to plan for catastrophic earthquake scenarios where provincial leadership includes an integrated response from all levels of government, industry, and non-government organizations. EMBC is building partnerships throughout the province that will be critical to an emergency response. The partnerships also help raise awareness throughout the province and encourage wide participation in preparing.

EMBC has relationships with neighbouring states, provinces and territories to provide mutual assistance, through the Pacific Northwest Emergency Management Arrangement. In addition, B.C. signed an agreement with the Canadian Red Cross in 2012 that establishes the Red Cross as an auxiliary organization to government to support the province in a disaster.



Presentation Synopsis



GREGOR M. ROBINSON

*Senior Vice-President, Policy and Chief Economist,
Insurance Bureau of Canada*

The presentation of Gregor Robinson covered three themes:

1. The impact of a major earthquake in Canada
2. Recent research on the macroeconomic and fiscal consequences of a major quake
3. What Canadians can do to prepare and improve the country's fiscal and economic resilience to earthquake risk

1. The impact of a major quake

Robinson drew on the earthquake impact study that IBC commissioned and AIR Worldwide prepared. The study models two scenarios – one off the coast of British Columbia and one below the St. Lawrence River along the Ottawa/Montreal/Quebec City corridor.

The B.C. scenario models a magnitude 9 event in the Cascadia subduction zone. The quake creates long-period seismic waves that damage tall buildings and bridges; creates liquefaction-induced ground failure that causes buildings to settle, tilt or slide; and results in a tsunami wave that is two metres high when it reaches Victoria.

Private and public property losses caused by the shake, liquefaction, tsunami and fire following the event amount to \$62 billion. As well, damage to transportation, water, communications and power infrastructure could cost \$13 billion in indirect economic losses, such as business interruption, and supply chain and service disruption. Total estimated losses: \$75 billion.

The Ottawa/Montreal/Quebec City corridor scenario models a magnitude 7.1 in the Charlevoix seismic zone. The epicentre is 100 kilometres northeast of Quebec City. The provincial capital sustains significant damage to the unreinforced masonry in its historic buildings.

Private and public property losses as a result of the shake and ensuing fire amount to \$49 billion. In addition, there are \$11 billion in indirect economic losses due to business interruption. Total estimated losses: \$60 billion.

2. Macroeconomic and fiscal consequences

Earthquakes have significant fiscal and economic consequences for countries. The 1995 Kobe earthquake in Japan, for instance, resulted in a long-term decline in local per capita GDP of 13%.



Natural disasters, in general, hurt public finances. A 2011 World Bank study found that, on average, disasters raise government expenditures by 15% and lower revenues by 10%, leading to a combined 25% increase in budget deficits.

A country's vulnerability matters. Robinson compared two 2010 magnitude 7 quakes – one in Haiti and one in New Zealand. In Haiti, with its more vulnerable public and private infrastructure, more than 100,000 people died, and economic losses were US\$8 billion or 126% of Haiti's GDP. In New Zealand, there were no deaths, and economic losses were US\$6.5 billion or 5.3% of GDP.

3. How Canadians can prepare and improve the country's resilience

Robinson made four suggestions, including raising Canadians' awareness of earthquake risk, improving the resiliency of homes and public infrastructure, and increasing earthquake insurance take-up (which transfers risk away from local to global economies, and from taxpayers to the private sector). Earthquake insurance take-up in B.C. is approximately 45%; in Quebec, it's 4%.

His fourth suggestion was for decision-makers to explore the potential for public-private risk sharing in the financial management of earthquake risk. Canadian property and casualty insurers are well-capitalized given that current regulation requires them to be prepared for a 1-in-500 year event by 2020. However, there is a risk of industry-wide insolvency in the event of a catastrophic quake such as the magnitude 9 Tohoku quake and tsunami in Japan in 2011.

Many other OECD jurisdictions have some form of public-private partnership between government and industry to share the financial management of risk and ensure the economy remains resilient in the event of catastrophic disaster.



Presentation Synopsis



MURAT SAATCIOGLU

*Distinguished University Professor and University Research Chair,
Earthquake Engineering, Director of the Hazard Mitigation and
Disaster Management Research Centre, University of Ottawa*

Murat Saatcioglu provided an overview of infrastructure earthquake resilience and vulnerability in Canada. Earthquake engineering is a young field with most advancements taking place in the last four or five decades. Most infrastructure in Canada was built prior to these advancements. In particular, many hospitals, shelters and gathering places – such as schools and hockey arenas – that would be used after a disaster, were built before current engineering standards. This is also the case for critical infrastructure such as bridges, communication towers and transportation facilities.

Saatcioglu explained that a building's vulnerability is closely linked to its year of construction. As Canada's National Building Code has evolved to incorporate advances in earthquake engineering over many years, these code improvements have been applied to new construction.

Earthquake-resistant design

New design offers resistance to seismic forces by absorbing seismic energy and giving the building the ability to “bounce back” without collapsing. Saatcioglu singled out masonry construction – especially unreinforced masonry construction typical of heritage buildings – as being particularly vulnerable to structural damage in an earthquake. He also pointed to the damage caused by shifting building contents and non-structural components, such as drywall, light fixtures and even furniture.

Saatcioglu discussed techniques for identifying and retrofitting existing buildings and infrastructure. The Canadian Seismic Research Network, an affiliation of researchers at eight Canadian universities, has developed many new techniques.

In one new technique, fibre-reinforced polymers are applied like wallpaper to structural elements, such as columns, to reinforce them and make them resistant to shearing. In another technique, the base of a building is isolated in a way that protects its foundation from earth movement. Saatcioglu showed two wings of a hospital in Lushan City, China. The new wing had an isolated base and continued to operate during and after a recent earthquake. The old wing, though, was severely damaged.

Saatcioglu concluded his presentation with a success story from the B.C. Ministry of Education. The ministry has collaborated with engineering organizations and academics to assess, retrofit and, in some cases, replace, more than 200 B.C. public schools to bring them up to current earthquake-resistant standards at a cost of \$2.2 billion.



Presentation Synopsis



JEAN-PHILIPPE TIZI

*Deputy Director General, Disaster Management,
Catastrophic Response and Recovery, Canadian Red Cross*

Jean-Philippe Tizi outlined the Canadian Red Cross' role in responding to a major earthquake. Its role is to meet the needs of the most vulnerable populations in relation to disaster management, disaster preparation and response, recovery and rebuilding.

The Canadian Red Cross has agreements with Public Safety Canada and the B.C. government. Its services include family reunification; providing emergency shelters, dietary support and clothing; fundraising; and disseminating information.

The Canadian Red Cross partners with other national Red Cross organizations on major catastrophes around the world. In turn, Canada would receive help from other countries' Red Cross organizations in a domestic disaster, as part of an international response.

The Red Cross is a funnel for international fundraising, Tizi said. After the 2011 Japan earthquake and tsunami, the Red Cross raised \$2.2 billion for recovery. After the Haiti earthquake, it raised \$1.2 billion.

International strike force

Tizi said the Canadian Red Cross would rely on an international strike force that would arrive prepared to save lives, analyze needs and help the population recover.

He outlined several best practices in the work of the Red Cross. These include:

- Putting in place an effective system for the most rapid deployment possible of volunteers, who are crucial as first responders and throughout the initial response and recovery
- Designing models for cooperation and partnership well ahead of a major disaster in which many national and international organizations would come together to help
- Using proven methodologies for analyzing needs prior to responding
- Being realistic about timelines – recovery after an earthquake takes many years, not months – and encouraging and supporting affected individuals, families and communities to focus on self-recovery
- Building and maintaining a strong base of volunteers ready to manage both minor and major disasters

Tizi concluded by emphasizing the crucial role of partnership in all aspects of disaster relief. Partnership was a key theme of the symposium.



Presentation Synopsis



REAR ADMIRAL BILL TRUELOVE

*Commander, Maritime Forces Pacific/Joint Task Force (Pacific),
Department of National Defence*

Rear Admiral Bill Truelove described the role of the Canadian Armed Forces in the event of a major earthquake. He said Canadians would expect the Forces to be at the scene immediately to help save lives and bring stability, and then withdraw at the right time to allow industry and others to return the situation to normal. Part of the military's role would be to respond to and support civilian authorities, he said.

Truelove said that the military has developed and practised its earthquake response plan, including taking part in ongoing training exercises. It has built relationships with many helping organizations and stakeholders to ensure trust and confidence. The goal: to work together on the disaster in a unified, coordinated manner. In response to a major earthquake, both the U.S. and Canadian military would work together in accordance with the Canada-U.S. Civil Assistance Plan.

Saving lives

Saving lives and alleviating human suffering would be top priority. As well, both the Canadian and U.S. military would focus on reopening seaports along the West Coast as a crucial step to protecting the national economy.

Relationship building in preparation for a major earthquake is vital so that organizations know each other and are not having that first conversation in the moment of crisis, Truelove said.

The military response would be in three phases. The immediate response would be to bring individual members and units back together after the event and deploy them to stabilize the situation. The second phase would be the sustained response, which could last for as long as 180 days in a severe event. The third phase would be returning from duty and preparing for the next mission.



List of Attendees

Since IBC organized and hosted the national earthquake symposium and the location was Vancouver, B.C., it's not surprising that half of the participants were from British Columbia and also connected to the insurance industry. Here's a breakdown of attendees along with a list of names, affiliations and contact emails.

INSTANT POLL

Where do you live?

HOW ATTENDEES VOTED:	RESPONSES
British Columbia	50.85%
Ontario	18.64%
AB/SK/MB	16.10%
Quebec	9.32%
U.S.	4.24%
Elsewhere in the world	0.85%
Elsewhere in Canada	0%
NB/NS/PEI/NL	0%
Total	100%

INSTANT POLL

Which of the following categories best describes your primary area of expertise?

HOW ATTENDEES VOTED:	RESPONSES
Finance and insurance	51.67%
Emergency management	15.0%
Engineering	8.33%
Government and public administration	8.33%
Trade association	8.33%
Other	4.17%
Education	2.50%
Utilities	1.67%
Total	100%



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