The first 25 • ICLR 1997-2022
Letter from the Executive Director

This report celebrates the first 25 years of insurance industry leadership to advance the science of seismic and climate resilience through the Institute for Catastrophic Loss Reduction. My sincere thanks to the many individuals who have contributed to this remarkable journey of learning and service.

While celebrating what has been accomplished, the ICLR team is excited about the adventure ahead. The Institute is Canada’s leading disaster research centre and dedicated to champion implementation of resilience action based on science.

Natural hazards are powerful forces. They regularly demonstrate the capacity to cause fatalities and extensive destruction of property. This was evident in the Calgary flooding, Fort McMurray wildfire, and the impacts of Hurricane Fiona. Direct damage from extreme weather in Canada is increasing at a rate that is alarming and unsustainable.

Most losses are preventable. Implementing resilience knowledge significantly reduces the risk of damage. ICLR is working to champion progress on three critical elements to enhance seismic and climate resilience in Canada:
• reduce the risk of loss for existing structures
• prevent the creation of new risk
• resilience in recovery

Most losses are preventable. Implementing resilience knowledge significantly reduces the risk of damage.
First, there are millions of homes and other buildings in Canada that can be made more resilient through retrofits. More than 95 percent of the homes in Canada, for example, do not have a backwater valve to reduce the risk of basement flooding if it was not included during initial construction. ICLR research identifies proven and cost-effective opportunities to introduce seismic and climate resilience features in existing structures.

Second, it is essential to build the right way at the right locations to prevent the creation of additional risk. Buildings and public infrastructure can become much more resilient during initial construction at little or no additional cost. The Institute is working with builders and governments to integrate resilience knowledge in new construction design and practices.

Third, we find that most resilience action takes place during recovery from a major loss. Homeowners, businesses, and governments seek to build back better. The Institute looks to contribute our knowledge and strong links with the insurance industry to seize this opportunity. There is potential for transformative improvement in resilience through recovery planning and practices.

Canada’s insurance industry created ICLR 25 years ago anticipating the need for science to support effective resilience action. Industry thought leadership about preparedness for a catastrophic earthquake and climate change included a commitment to build capacity for the rigorous study of critical perils and development of risk reduction solutions.

My thanks to Carol Jardine and the other members of the ICLR Board of Directors, past and present, for your unwavering support and thoughtful guidance. Thanks to our 120 member insurers and many government agencies that support our work. A special thank you to the ICLR staff and research associates as they demonstrate every day their commitment to build resilience in Canada based on science.

We celebrate our accomplishments of the first 25 years with a keen sense of the need to implement solutions in the years ahead.

Paul Kovacs
Executive Director, ICLR
It was 25 years ago that families and businesses in Quebec and Eastern Ontario were hit by a devastating ice storm, one that remains among the top three largest insured events in Canadian history. For leaders in the insurance industry, it was clear that severe weather was increasing and more must be done to help Canadians.

Insurance leaders stepped-up, partnered with leading engineers, climate scientists and others at Western University, and created the Institute for Catastrophic Loss Reduction, formed as a non-profit, science-based research institute committed to helping Canadians take a more active role in defending themselves and their communities from severe weather and catastrophic loss.

Today, 120 insurance companies are ICLR members. Oversight is provided by the Board of Directors, which includes elected members from insurance companies as well as representatives appointed by Western University. In the last 25 years, these forward-thinking insurance leaders, academic experts, and the dedicated ICLR team have created a trusted scientific body, one with international respect and a growing list of accomplishments that benefit Canadians.

As global warming tested the ability of municipal infrastructure to manage the impact of increasing rain and overland flooding, insurance companies saw water replace fire as the most concerning peril. ICLR undertook extensive research and worked with municipalities to create prevention materials for homeowners on basement flooding. At the same time, ICLR advanced work on wind, hail, earthquake, and wildfire, and ICLR's research has enabled insurers to offer new products to make properties in Canada more resilient from these perils. From the Insurance Research Lab for Better Homes and other research at Western and ICLR have come recommendations regarding adding hurricane straps, building code improvements in roofing materials along with hail resilient shingles and siding. ICLR's work in partnership with Canadian municipalities has increased the level of awareness that local governments have of the impact of climate change on their communities, empowering their advocacy work and informing new infrastructure investments that better protect people and property.
But our work is far from done. As weather events continue to grow in frequency and ferocity, insurers, academics, and scientists are committed to the importance of this work and its value to Canadians.

I applaud the foresight of the leaders 25 years ago who built this coalition and those who continue to support and fund the Institute. As a 40-year veteran of the Canadian insurance industry, our ability to work together for the betterment of our country is as humbling as it is inspiring.

As we look ahead to the next 25 years, ICLR’s value has never been greater. Climate change is now accepted. Adaptation and resiliency are discussed and foremost in the minds of insurers and Canadians. ICLR will and must continue to provide the science and knowledge to help us all adapt to a warmer planet and chart a more climate resilient future for our children and grandchildren.

Carol Jardine, ICLR Board Chair
President, Canadian P&C Operations, Wawanesa Mutual Insurance

ICLR’s research has enabled insurers to offer new products to make properties in Canada more resilient from perils.
The birth of an Institute

In late 1996 member insurers of the Insurance Bureau of Canada (IBC) decided that the insurance industry needed to more actively promote measures that protect homes and businesses across Canada from severe weather and earthquake. This would build on recent IBC work to ensure that the industry was financially prepared for a major temblor.

To lead this initiative, IBC established a committee of Chief Executive Officers, chaired by Terry Squire, then CEO of The Co-operators. Other industry leaders that volunteered their time to this committee included: Howard Moran, Commercial Union; Bill Green, Federated Insurance; Gregg Hanson, Wawanesa; and David Wilmot, Frankona.

An IBC staffer was assigned the task of assisting Paul Kovacs, then Senior Vice President, Policy Development and Chief Economist at IBC, in providing support to the committee.

IBC staff presented the CEO Committee with a number of options to promote investments in catastrophic loss reduction. Among the options considered included, among other things:

- Public education campaigns to invest in specific safety products
- Lobby for tax credits to encourage homeowners to make investments that would make their homes more disaster-resilient
- Consider exclusions on homeowners insurance to reduce insurance risk
- Strengthen building codes
- Improve municipal building code enforcement
- Invest in improved weather forecasting, and
- Encourage governments to invest in improving infrastructure in Canadian cities

A presentation that captured the committee's interest came from the President of the Insurance Institute for Property Loss Reduction (now known as the Insurance Institute for Business and Home Safety), Eugene Lecomte. IBHS was the organization founded by the U.S. insurance industry to promote investment in loss mitigation.

Mr. Lecomte described his Institute's signature program to promote the building of new homes that are more resilient to damage from severe weather and earthquakes. Interest in the program grew following extensive losses due to Hurricane Andrew in 1992.

From these discussions, the CEO Committee made the important decision that a dedicated, research-based and sustained effort to protect Canadians was needed. With this decision, the Institute for Catastrophic Loss Reduction was born and staff began preparing a business plan for the approval of IBC's Board of Directors. That plan was approved in the summer of 1997.
In that first year, more than 80% of IBC’s member insurers agreed to be members of ICLR. The IBC CEO Committee became the first ICLR Board of Directors.

Paul Kovacs was appointed Executive Director. Tracy Waddington and Alan Pang joined ICLR shortly thereafter and together formed the core of ICLR in those early years.

These three people were responsible to implement ICLR’s work in the four key result areas outlined in the original business plan:

*Provide research to build safer communities*
Conduct research to identify and promote cost-effective approaches so new structures can be built and existing structures retrofitted to better withstand future catastrophes.

*Establish safety partnerships*
Provide a forum for the insurance community and concerned allies to work together to reduce the human and financial cost of natural disasters, and to act as a resource for the study of natural perils.

*Enhance industry awareness*
Promote awareness within the insurance community of effective disaster risk management practices through targeted research and dissemination of information.

*Promote consumer awareness*
Enhance, through the Insurance Bureau of Canada, consumer awareness of the benefits of prevention as a means of reducing loss due to catastrophes.

With these initial key result areas, the CEO Committee provided a focused path that ICLR has expanded on over the years.

The Institute’s first major project was with Emergency Preparedness Canada. EPC asked ICLR to hold five workshops across Canada to document gaps in Canada’s emergency response framework. Following these workshops, ICLR documented the country’s strength in disaster preparedness and response. However, the participants of these workshops reported that our national effort to reduce the impact of natural hazards was, at best, sporadic and uncoordinated. This could only be remedied by developing a National Disaster Mitigation Strategy. ICLR presented this report to the Government of Canada in the fall of 1998. This report resulted in an announcement by then Prime Minister Jean Chretien that EPC would develop such a strategy.

This initial success raised awareness about risk reduction within the disaster management community and its researchers and raised ICLR’s profile.
In 1999, universities that sought to partner with the insurance industry approached ICLR. These universities were seeking to make a proposal to the Ontario Challenge Fund. This was a pool of money that the Ontario government set aside to encourage applied research at universities.

Under this program, if a university matched every dollar contributed by the private sector into a dedicated research project, the province would match with an additional dollar. It meant that $1 of money from the insurance industry could, under the program, result in $3 of research at an Ontario university since ICLR had been established at arms length from IBC, yet was still managed by Canada's insurers.

Two partnership proposals were seriously considered. They were from University of Toronto's School of Environmental Studies and University of Western Ontario's Faculty of Engineering. Both proposals would have resulted in significantly increasing research capacity at ICLR. However, the difference that led to the current partnership with Western is that insurers would retain a majority of ICLR's Board of Directors and control of the Institute.

The partnership with Western resulted in a remarkable collaboration with Dr. Allan Davenport and his team at Western’s Boundary Layer Wind Tunnel (BLWT). This group was recognized as world leaders in wind engineering. Dr. Davenport's pioneering research established the discipline of wind engineering and his knowledge and expertise was invaluable to ICLR.

The ongoing relationship with Western has provided the Institute access to a network of academic experts across Canada and leveraged the investment of the insurance industry into millions of dollars in research.

ICLR has gone on to build a world class research centre and Canada’s oldest university-based disaster risk reduction institute. In 2015, ICLR was named an IRDR International Centre of Excellence. ICLR is presently Chair of the Global Alliance of Disaster Research Institutes and was the inaugural Chair of the North American Alliance of Hazards and Disaster Research Institutes.

The Institute has established itself as a key voice and a valued source of evidence-based knowledge concerning the best practices to reduce risk of loss due to water, wind, hail, wildfire and earthquake.
Strategic priorities (2022-2026)

Be Canada’s leading provider of disaster research and loss reduction advice
The Institute will continue to build and share its knowledge about practices to reduce the risk of loss from major hazards in Canada.

Advocate for construction resilient to damage from severe weather and climate change
ICLR will press to include our understanding of the science in practices adopted by communities, homebuilders, the construction industry, governments and those responsible for building codes and standards.

Empower risk reduction by communities and building owners
The Institute will also press existing homeowners and businesses to retrofit their buildings and encourage governments to introduce regulations and incentives to strengthen resilience.

Champion building back better following a major loss
The Institute will push to establish a national commitment to build resilient buildings and public infrastructure in recovery.

Our strategy in brief

- Canada’s oldest university-based Disaster Risk Reduction research institute
- 120 member companies
- Tens of millions of dollars invested in research
- ICS International Centre of Excellence in integrated research of disaster risk
- More than 200 monthly workshops and webinars hosted
- More than 320 YouTube videos posted
How we engage

**Scientific research**
ICLR has issued more than 70 reports in its numbered research paper series and has issued or been involved in the publication of hundreds more.

**Advocacy**
The Institute works with policymakers at all levels of government and others to actively press issues related to natural hazards and societal resilience.

**Active programs**
Through such active programs as *Designed for safer living*, *Showcase homes*, and *Resilience in Recovery*, ICLR works to ensure that its science and evidence-based findings carry over to real world practices that reduce natural hazard risk for Canadians.

**Tools & data**
ICLR has developed and/or provides technical and/or financial supports for a range of tools, such as The PIEVC Protocol, IDF_CC and Earthquake Risk by Postal Code, to ensure that those working in the Disaster Risk Reduction space have what they need to reduce the impacts of severe weather and earthquake on Canadians.

**Outreach and education**
The Institute provides a host of resources for the purposes of keeping interested parties informed including websites and microsites, educational information, newsletters, monthly webinars, special conferences and workshops, an active social media and media relations program, the ICLR’s *Climate Resilience Centre*, *HailSmart*, *QuakeSmart* and others.

**Partnerships**
Since inception, ICLR has actively partnered with others to further its resilience work, including academics and universities, governments of all levels, private sector groups (including insurers), domestic and international NGOs and others.
Helping homeowners & insurers

Canadian insurers and reinsurers are on the front lines dealing with property damage claims from severe weather. Much of this damage is happening to single family homes and this has been the focus of much of ICLR's research and outreach efforts in recent years. ICLR has invested great attention and resources into determining what damage is being experienced to Canadian homes and ways in which this damage can either be completely prevented or significantly mitigated.
ICLR has developed a wide range of both broad-based and specific advice to help insurers, local governments, homeowners and others reduce the impacts of severe weather and earthquakes on both people and property. Some of the actions we advise can be accomplished by homeowners in a weekend, while other advice is best addressed by professionals.

ICLR’s ‘Focus on’ titles get into details about sump pump systems, backwater valves, emergency generators and more.
ICLR’s Climate Resilience Centre at Western University showcases practical, cost-effective, consensus-based methods that insurers, home builders, homeowners and others can address to become resilient to climate disasters. Current displays address basement flooding, severe wind, and hail. Future displays will address wildfire and other hazards.
Helping homeowners & insurers

Hail damage has cost Canadian insurers almost $9 billion (2008 to 2021). ICLR’s *HailSmart* program was introduced to encourage homeowners to install an impact resilient (IR) roof, shelter their vehicle when a storm approaches and take other actions. The program also provides tips to businesses to reduce their risk of experiencing damage from hail.

Visit **www.hail-smart.com** to find out how to make your home, vehicles and business HailSmart.
The Institute’s free online Earthquake Risk by Postal Code tool helps homeowners and others determine if they live in an at-risk area.
Helping local governments

Local governments are confronting one of the most important issues of our time – the alarming recent increase in damage to Canadian homes from extreme weather. Communities large and small across the country are now taking action to reduce the risk of basement flooding, wind, hail and wildfire damage to property. ICLR is a leader in working with local governments on strategies to involve property owners in the management of natural hazards and has developed a range of free tools that municipalities can use to assist their residents in reducing the risk that they experience property damage and disruption.

ICLR launched the Resilience in Recovery program to support build back better initiatives in Canadian communities following severe losses. Through this program, the Institute provides assistance to communities in an advisory capacity as they aim to build climate resilient homes and infrastructure following a major loss. We find scope for transformative improvement in community resilience to climate change during reconstruction of damaged homes, buildings and public infrastructure.

The Public Infrastructure Engineering Vulnerability Committee (PIEVC) Protocol was developed to assist engineers in factoring climate change impacts into plans for design, operation and maintenance of public infrastructure. The Protocol is free of charge for any application to public infrastructure in Canada and may also be used for private infrastructure.

Local governments are taking action to reduce the risk to Canadians from extreme weather. ICLR’s Cities adapt: Celebrating local leadership is a series of books extolling local governments adapting to climate change and building more resilient communities. The books include case studies describing local actions in Canada that are consistent with best practices for climate resilience as identified by the Institute.
A collaboration between ICLR and the University of Guelph's School of Engineering, the Basement Flood Protection Lab seeks to better understand technologies that are applied to control urban flood risk in Canada. This collaboration has specifically emphasized understanding of lot-level (household level) methods of managing flood risk. The primary intent is to better understand the reliability and efficacy of these measures.

IDF_CC is a web-based intensity-duration-frequency tool to update and adapt local extreme rainfall statistics to climate change. The IDF_CC tool is pre-loaded with 898 Environment and Climate Change Canada rain stations. Users can select any rain station with 10 or more years of data and develop IDF curves based on historical data and curves adjusted to reflect climate change.

This microsite contains a protocol that will help plumbers/installers, plumbing inspectors and others to review the necessary steps involved in the installation of a backwater valve. This site provides information relevant to homes serviced by underground, public sewer systems, typically located in urban areas.
According to the US-based Insurance Institute for Business & Home Safety (IBHS), at least one in four small businesses impacted by a natural hazard never opens. Protecting businesses from damage and disruption keeps people working and protects the local tax base, allowing for quicker recovery after disaster strikes.

The Open for Business program, used under licence from IBHS, not only reduces potential disaster losses but also assists businesses to reopen quickly should disaster strike.
Increasingly, Canadian businesses are being impacted by severe weather events, from physical damage, disruption to supply chains and other disruptions (like power outages). At the request of its insurance company members, ICLR has extended the reach of its research and outreach to include commercial loss risk reduction.

**Mind your Business**, ICLR’s new line of commercial loss risk reduction bulletins, offer advice on how business entities can take action to reduce the risk of damage and disruption from a range of hazards.
Helping researchers

ICLR has established itself as the national leader in the development of research and resources to reduce the risk of natural hazards to people and property in Canada. Materials generated by ICLR researchers and staff have been used widely by insurers, all levels of government and non-government groups engaged in disaster risk reduction and climate change adaptation.

ICLR’s Quick Response Program

ICLR’s Quick Response Program was designed to allow social, behavioural and economic scientists to quickly deploy to a disaster-affected area in the aftermath of a flood, extreme weather event or earthquake to collect perishable data. In addition to expanding academic knowledge, funded researchers submit brief reports that make preliminary analyses of recent events available to ICLR’s multidisciplinary network of researchers, practitioners, and educators as well as other interested parties. The program promotes innovation in disaster research by favoring students, new researchers, and novel areas of study.
The Institute has more than 320 videos on its YouTube Channel on topics related to disaster risk reduction and climate change adaptation. New videos are added on a regular basis.
Helping researchers

Friday Forum webinars

Since inception, ICLR has hosted more than 200 workshops under the *Friday Forum* banner on the latest disaster risk reduction science. At one time held in person in ICLR’s boardroom, in recent years the Institute first moved to a hybrid, then solely to an online Webinar format. The workshops have gained a reputation for being timely, interesting and thought-provoking.
Ice Storm ’98
Eugene L. Lecomte
Alan W. Pang
James W. Russell
December 1998
ICLR Research Paper Series – No. 1
Available for download at:
http://www.iclr.org/winterstormicestorm98.html

Disaster Mitigation and Preparedness in a Changing Climate
James P. Bruce
Ian Burton
Mark Egener
1999
ICLR Research Paper Series – No. 2
Available for download at:
http://www.iclr.org/climateextremedisasterm.html

Foreign earthquake insurance programs
Richard Roth Sr.
1999
ICLR Research Paper Series – No. 3
Available for download at:
http://www.iclr.org/earthquakeforeigneqno.html

Psychosocial Aspects of Disaster Recovery: Integrating Communities into Disaster Planning and Policy Making
David Hutton
2001
ICLR Research Paper Series – No. 4
Available for download at:
http://www.iclr.org/healthimpactspsychologic.html

Flood Management in Canada at the Crossroads
Dan Shrubsole
May 2000
ICLR Research Paper Series – No. 5
Available for download at:
http://www.iclr.org/flooddroughtfloodmgmt.html

A review of the performance of two large sub-stations and eight large dams during the Chi Chi, Taiwan earthquake
Robin Charlwood
T.E. Little
J.K. Lou
April 2000
ICLR Research Paper Series – No. 6
Available for download at:
http://www.iclr.org/earthquakesubstations.html

The Media and Public Trust in Natural Disaster: The Canadian Experience: A Roundtable
April 2000
ICLR Research Paper Series – No. 7
Available for download at:
http://www.iclr.org/publicpolicypublictrust.html

Reflections on the future: Climate Change and its impacts on the insurance industry
June 9, 2000
Angus Ross
ICLR Research Paper Series – No. 8
Available for download at:

Hurricane Hazel and Extreme Rainfall In Southern Ontario
November 2000
ICLR Research Paper Series – No. 9
Available for download at:
http://www.iclr.org/hurricanehazelpaper.html

L’état de préparation des intervenants en l’an 2000 Face à des pluies diluviennes comme celles du 14 Juillet 1987 (Montreal’s preparedness for flood)
Julie Boissonneau
November 2000
Série de documents de recherche – No 10
Available for download at:
http://www.iclr.org/flooddroughtletatdepr.html
Wildfires and insurance
Paul Kovacs
January 2001
ICLR Research Paper Series – No. 11
Available for download at: http://www.iclr.org/wildfireswildfiresinsura.html

Assessment of Risk Due To Fire Following Earthquake Lower Mainland, British Columbia
Charles Scawthorn
January 2001
ICLR Research Paper Series – No. 12

Managing Catastrophic Risk: Lessons from Canada
Paul Kovacs
Howard Kunreuther
April 2001
ICLR Research Paper Series – No. 13
Available for download at: http://www.iclr.org/publicpolicymanagingris.html

Canada’s Hail Climatology: 1977 – 1993
David Etkin
Soren Erik Brun
April 2001
ICLR Research Paper Series – No. 14
Available for download at: http://www.iclr.org/haillightninghailclima.html

Weather Information and Road Safety
Jean Andrey
Brian Mills
Jessica Vandermolen
August 2001
ICLR Research Paper Series – No. 15
Available for download at: http://www.iclr.org/winterstormweatherinfo.html

Disaster Response Systems in Canada
R. Kuban
H. MacKenzie-Carey
A.P. Gagnon
2001
ICLR Research Paper Series – No. 16
Available for download at: http://www.iclr.org/publicpolicydisasterres.html

Studies on the application of tuned liquid dampers (TLD) to upgrade the seismic resistance of structures
A. El Damatty
April 2002
ICLR Research Paper Series – No. 17
Available for download at: http://www.iclr.org/earthquakeliquiddampers.html

Management and maintenance practices of storm and sanitary sewers in Canadian Municipalities
E. N. Allouche
P. Freure
April 2002
ICLR Research Paper Series – No. 18
Available for download at: http://www.iclr.org/earthquakemanagementpra.html

Numerical Simulations of High Intensity Winds. Downburst Simulations
Horia Hangan
July 2002
ICLR Research Paper Series – No. 19
Available for download at: http://www.iclr.org/tornadonumericalsolutio.html

A Tornado Scenario for Barrie, Ontario
David A. Etkin et al
July 2002
ICLR Research Paper Series – No. 20
Available for download at: http://www.iclr.org/tornadotornadoscenario.html
Role of Remote Sensing in Disaster Management
Nirupama Agrawal
Slobodan P. Simonovic
September 2002
ICLR Research Paper Series – No. 21
Available for download at:
http://www.iclr.org/flooddroughtremotesens.html

Adjusting to Policy and Fiscal Change: The Case of Land Use Planning in London, Ontario
Bridget Schulte-Hostedde
Dan Shrubsole
October 2002
ICLR Research Paper Series – No. 22
Available for download at:
http://www.iclr.org/flooddroughtadjustingt.html

Dan Henstra
Andrew Sancton
November 2002
ICLR Research Paper Series – No. 23
Available for download at:
http://www.iclr.org/publicpolicymitigatingl.html

A spatial fuzzy compromise programming for management of natural disasters
Slobodan S. Simonovic
December 2002
ICLR Research Paper Series – No. 24
Available for download at:
http://www.iclr.org/flooddroughtspacialfuz.html

Natural Hazards and the Canadian Insurance Industry
Mark Baker
December 2002
ICLR Research Paper Series – No. 25
Available for download at:
http://www.iclr.org/publicpolicyhazardsand.html

Seismic Response of Structures with Underground Storeys
M. Hesham El Naggar
January 2003
ICLR Research Paper Series – No. 26
Available for download at:
http://www.iclr.org/earthquakeseismicrespon.html

Insurance Securitization: Catastrophic event exposure and the role of insurance linked securities in addressing risk
Peter Carayannopoulos
Paul Kovacs
Darrell Leadbetter
January 2003
ICLR Research Paper Series – No. 27
Available for download at:
http://www.iclr.org/publicpolicysecuritizati.html

An Assessment of Flood Risk Management in Canada
Dan Shrubsole et al
January 2003
ICLR Research Paper Series – No. 28
Available for download at:
http://www.iclr.org/flooddroughtassessment.html

Natural Disaster Health Research Network: Workshop Summary
March 2003
ICLR Research Paper Series – No. 29
Available for download at:
http://www.iclr.org/healthimpactsworkshopsu.html

Inventory of Disaster Management Education in Major Canadian Universities
L. Falkiner
March 2003
ICLR Research Paper Series – No. 30
Available for download at:
http://www.iclr.org/healthimpactsinventory.html

Climate Change, Natural Hazards and Cities
Gordon McBean
Dan Henstra
March 2003
ICLR Research Paper Series – No. 31
Available for download at:
http://www.iclr.org/climateextremecities.html

Wind Loads on Houses: A wind tunnel study
L.M. St. Pierre et al
July 17, 2003
ICLR Research Paper Series – No. 32
Available for download at:
http://www.iclr.org/tornadoWindloads.html
Collisions, Casualties, and Costs: Weathering the elements on Canadian Roads
Jean Andrey
Brian Mills
July 3, 2003
ICLR Research Paper Series – No. 33
Available for download at:
http://www.iclr.org/winterstormcrashes.html

Earthquake Planning for Business: A Guide for Business in British Columbia
Emergency Preparedness for Industry & Commerce Council
ICLR Research Paper Series – No. 34
Available for download at:
http://www.iclr.org/earthquakeearthquakepla.html

Reliability of steel frame systems with semi-rigid connections
H.P. Hong
S. Wang
September 2003
ICLR Research Paper Series – No. 35
Available for download at:
http://www.iclr.org/earthquakesemirigid.html

The Role of Government in Services for Natural Disaster Mitigation
Dan Henstra
Gordon McBean
February 2004
ICLR Research Paper Series – No. 36
Available for download at:
http://www.iclr.org/publicpolicyroleofgovt.html

Wind Loads on Houses: Destructive Model Testing of a Residential Gable Roofed House
B. Visscher
G.A. Kopp
P.J. Vickery
March 24, 2004
ICLR Research Paper Series – No. 37
Available for download at:
http://www.iclr.org/tornadogableroof.html

Cyber- Incident Risk in Canada and the Role of Insurance
Paul Kovacs
Melissa Markham
Robert Sweeting
April 2004
ICLR Research Paper Series – No. 38
Available for download at:
http://www.iclr.org/publicpolicycyberincede.html

Earthquake Hazard Zones: The relative risk of damage to Canadian buildings
Paul Kovacs
Robert Sweeting
June 2004
ICLR Research Paper Series – No. 39
Available for download at:
http://www.iclr.org/earthquakehazard.html

Emergency Management and the August 14th, 2003 Blackout
Brenda L. Murphy
June 2004
ICLR Research Paper Series – No. 40
Available for download at:
http://www.iclr.org/publicpolicyblackout.html

Toward a National Assessment of the Travel Risks Associated with Inclement Weather
Jean Andrey
Michael Christie
Sarah Michaels
Dan Unrau
Brian Mills
June 2005
ICLR Research Paper Series – No. 41
Available for download at:
http://www.iclr.org/climateextremeassess.html

Limits to Insurance
ISCU Workshop: Comet/Asteroid Impacts and Human Society
Paul Kovacs
Andrew Hallak
January 2005
ICLR Research Paper Series – No. 42
Available for download at:
http://www.iclr.org/publicpolicymeteorites.html
Enhancing Local Level Emergency Management: The Influence of Disaster Experience and the Role of Households and Neighbourhoods
Brenda Murphy et al
July 2005
ICLR Research Paper Series – No. 43
Available for download at:
http://www.iclr.org/tornadoenhancinglocal.html

Sewer Backup: Homeowner perception and mitigative behaviour in Edmonton and Toronto
Dan Sandink
November 2007
ICLR Research Paper Series – No. 44
Available for download at:
http://www.iclr.org/flooddroughtsewerbackup.html

The resilience of the City of Kelowna: Exploring mitigation before, during and after the Okanagan Mountain Park Fire
Dan Sandink
January 2009
ICLR Research Paper Series – No. 45
Available for download at:
http://www.iclr.org/wildfirescityofkelowna.html

Human dimensions of fire management at the wildland-urban interface in Alberta: A summary report
Tara K. McGee
Bonita L. McFarlane
Lauren Harris
Hilary Faulkner
November 2009
ICLR Research Paper Series – No. 46
Available for download at:
http://www.iclr.org/mcgeeaalbertapaper.html

Citizen participation in flood reduction planning: Strategic choices in Peterborough, Ontario
Greg Oulahen
Brent Doberstein
March 2010
ICLR Research Paper Series – No. 47
Available for download at:
http://www.iclr.org/peterboroughfloodpaper.html

Canadians at Risk: Our exposure to natural hazards
David Etkin, Editor
February 2010
ICLR Research Paper Series – No. 48
Available for download at:
http://www.iclr.org/canadiansatrisk.html

Reducing the risk of earthquake damage in Canada: Lessons from Haiti and Chile
Paul Kovacs
November 2010
ICLR Research Paper Series – No. 49
Available for download at:
http://www.iclr.org/lloydseq.html

Climate change information for adaptation
James P. Bruce
February 2011
ICLR Research Paper Series – No. 50
Available for download at:
http://www.iclr.org/climateextremesbruce.html

Dan Sandink
May 2011
ICLR Research Paper Series – No. 51
Available for download at:

Urban flooding in Canada: Lot-side risk reduction through voluntary retrofit programs, code interpretation and by-laws
Dan Sandink
February 2013
ICLR Research Paper Series – No. 52
Available for download at:
Best practices for reducing the risk of future damage to homes from riverine and urban flooding: A report on recovery and rebuilding in southern Alberta
Paul Kovacs
Dan Sandink
September 2013
ICLR Research Paper Series – No. 53

Best practices guide: Management of inflow and infiltration in new urban developments
Ted Kesik
February 2015
ICLR Research Paper Series – No. 54

Risk reduction status of homes reconstructed following wildfire disasters in Canada
Alan Westhaver
September 2015
ICLR Research Paper Series – No. 55

Why some homes survived: Learning from the Fort McMurray wildland/urban interface fire disaster
Alan Westhaver
March 2017
ICLR Research Paper Series – No. 56

Assessing local mandatory measures to reduce flood risk and inflow & infiltration in existing homes
Joanna Kyriazis
Laura Zizzo
Dan Sandink
May 2017
ICLR Research Paper Series – No. 57

Communicating Hurricane Risk in Eastern Canada: Enhancing the communication lines between the Canadian Hurricane Centre, municipalities and insurers
Paul Kovacs
Sophie Guilbault
Brian Pentz
August 2017
ICLR Research Paper Series – No. 58

Hail Climatology for Canada: An Update
David Etkin
February 2018
ICLR Research Paper Series – No. 59

The governance of climate change adaptation in Canada
Danny Bednar
Jonathan Raikes
Gordon McBean
February 2018
ICLR Research Paper Series – No. 60
Development permits: An emerging policy instrument for local governments to manage interface fire risk in a changing climate
Paul Kovacs
May 2018
ICLR Research Paper Series – No. 61

Increasing High Wind Safety for Canadian Homes: A Foundational Document for Low-Rise Residential and Small Buildings
Dan Sandink
Gregory Kopp
Sarah Stevenson
Natalie Dale
April 2019
ICLR Research Paper Series – No. 62

Fire following earthquake in the Montreal region
Charles Scawthorn
August 2019
ICLR Research Paper Series – No. 63

Fire following earthquake in the Vancouver region
Charles Scawthorn
November 2020
ICLR Research Paper Series – No. 67

Reducing the Risk of Inflow and Infiltration (I/I) in New Sewer Construction: A National Foundational Document for the Development of a National Standard of Canada
Barbara Robinson
Dan Sandink
David Lapp
November 2019
ICLR Research Paper Series – No. 64

Estimating the benefits of Climate Resilient Buildings and Core Public Infrastructure (CRBCPI)
Keith Porter
Charles Scawthorn
February 2020
ICLR Research Paper Series – No. 65

Developing a method for conducting wildland/urban interface fire case study research: A foundational document
Alan Westhaver
Steve Taylor
November 2020
ICLR Research Paper Series – No. 66

Developing an Efficient and Cost-Effective Inflow and Infiltration (I/I) Reduction Program: A Foundational Document for the Development of a National Standard of Canada
Barbara Robinson
Dan Sandink
June 2021
ICLR Research Paper Series – No. 68
An impact analysis for the National Guide for Wildland-Urban Interface Fires
Keith Porter
Charles Scawthorn
Dan Sandink
May 2021
ICLR Research Paper Series – No. 69

Building climate resilient communities: Living within the earth’s carrying capacity
Gordon A. McBean
Paul Kovacs
James A. Voogt
Gregory A. Kopp
Sophie Guilbault
July 2021
ICLR Research Paper Series – No. 70

Enhancing the acceptability of buyouts for climate change adaptation: Exploring a social license approach for Erie Shore Drive, Ontario
Sara Bohnert
Brent Doberstein
January 2022
ICLR Research Paper Series – No. 71

Benefit-cost analysis of impact-resistant asphalt shingle roofing
Keith Porter
March 2022
ICLR Research Paper Series – No. 72

An examination of the Lytton, British Columbia wildland-urban fire destruction
Jack D. Cohen
Alan Westhaver
May 2022
ICLR Research Paper Series – No. 73
Available for download at: https://www.iclr.org/