Institute for Catastrophic Loss Reduction
Building resilient communities

Institut de Prévention des Sinistres Catastrophiques
Construction de resilient communities

Global change and catastrophic loss

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Institute for Catastrophic Loss Reduction
April 2018

ICLR


Designed...
for safer living
NEWS 10
CHANNEL


NASDAQ
2715.61
14.59


SLAVE LAKE WILDFIRE
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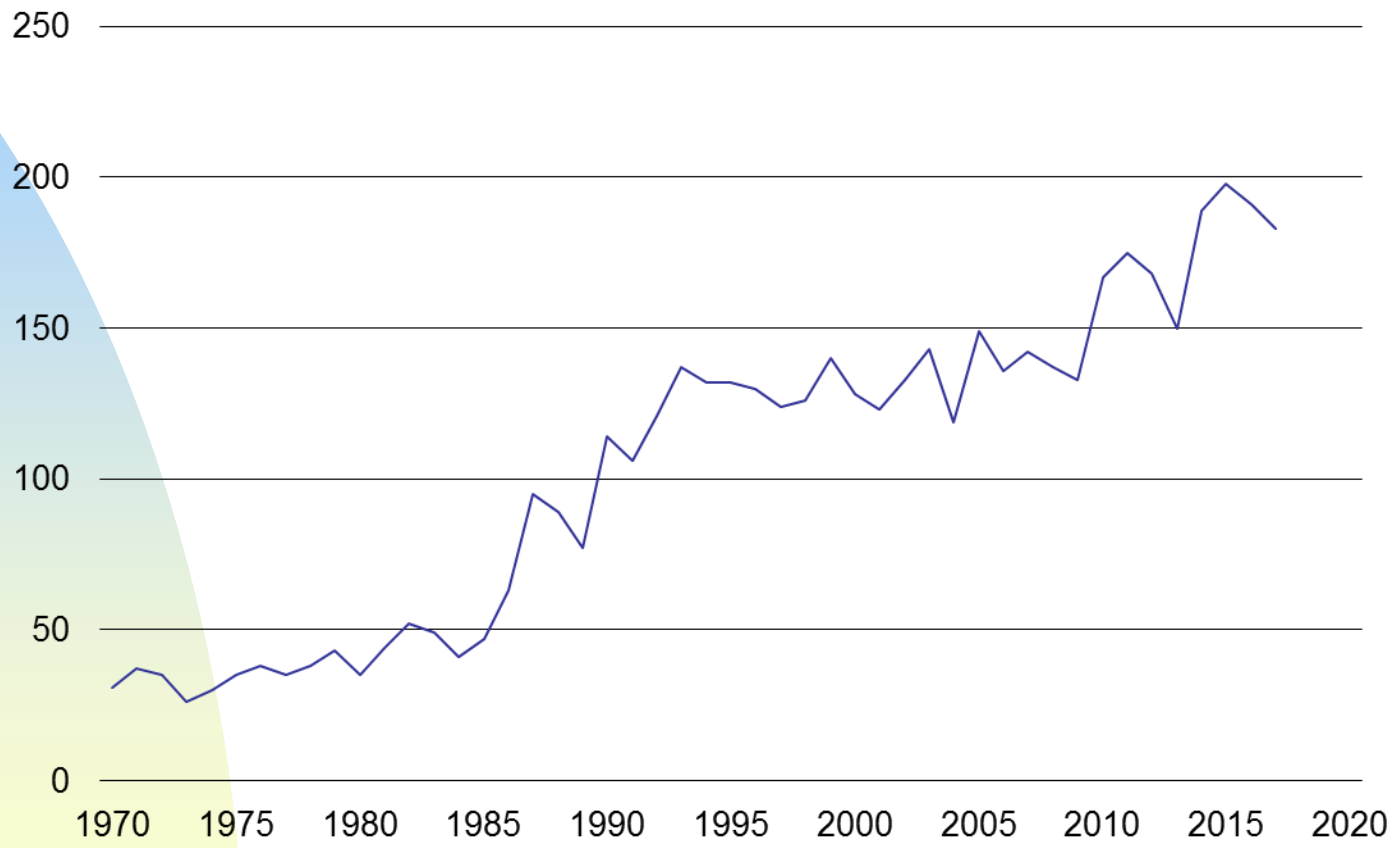
EARTHQUAKE PREPAREDNESS
Is Canada ready for a "big one?"
news now

Considerations

- Disasters are a growing threat
- Losses are rising. Why?
- What can be done about it?

Number of cat. events 1970-2017



Source: Swiss Re, sigma

Insured losses 1970-2017

Minimum selection criteria:

Total losses USD 99.0 m

Or:

Insured property claims

Shipping: USD 20.3 m

Aviation: USD 40.7 m

Other: USD 50.5 m

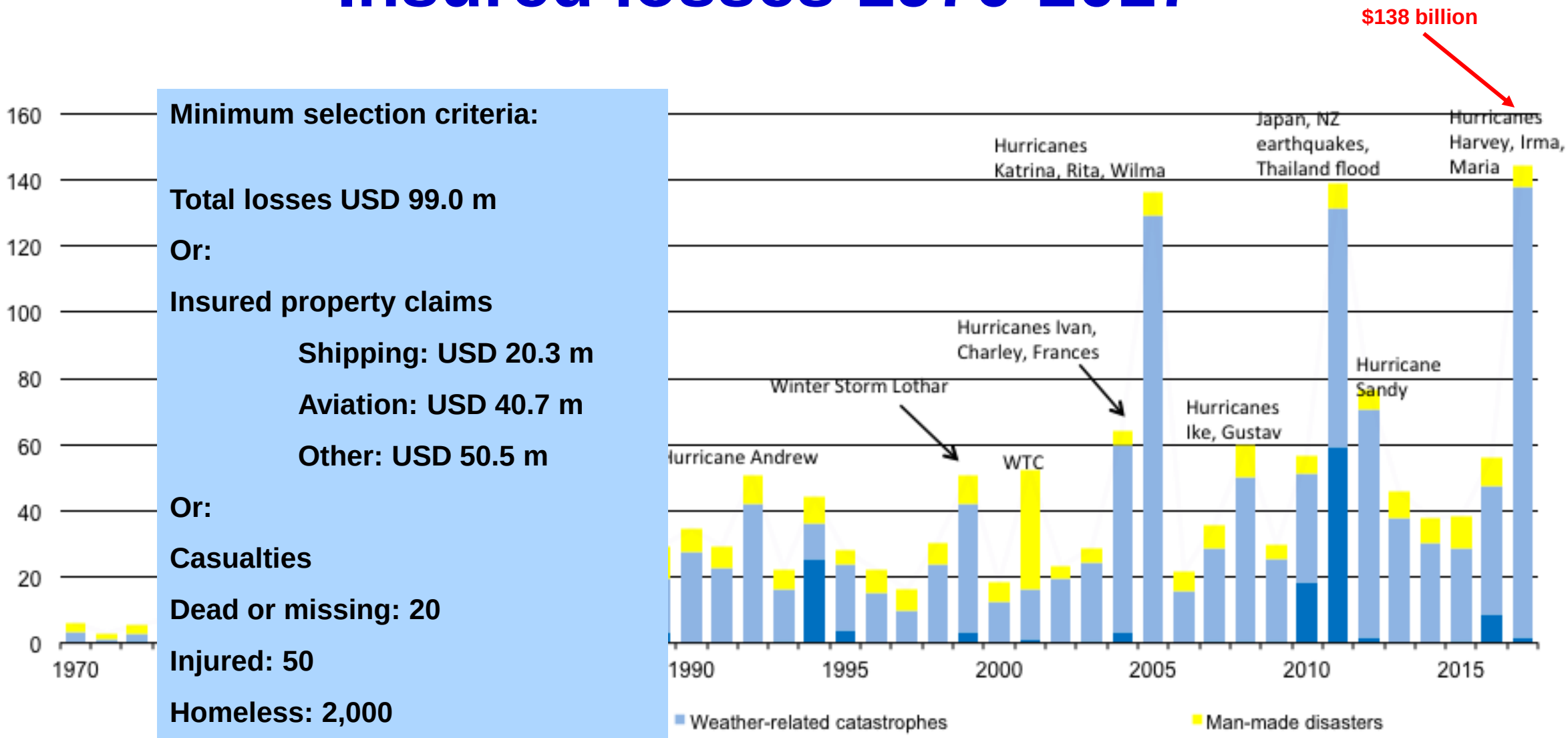
Or:

Casualties

Dead or missing: 20

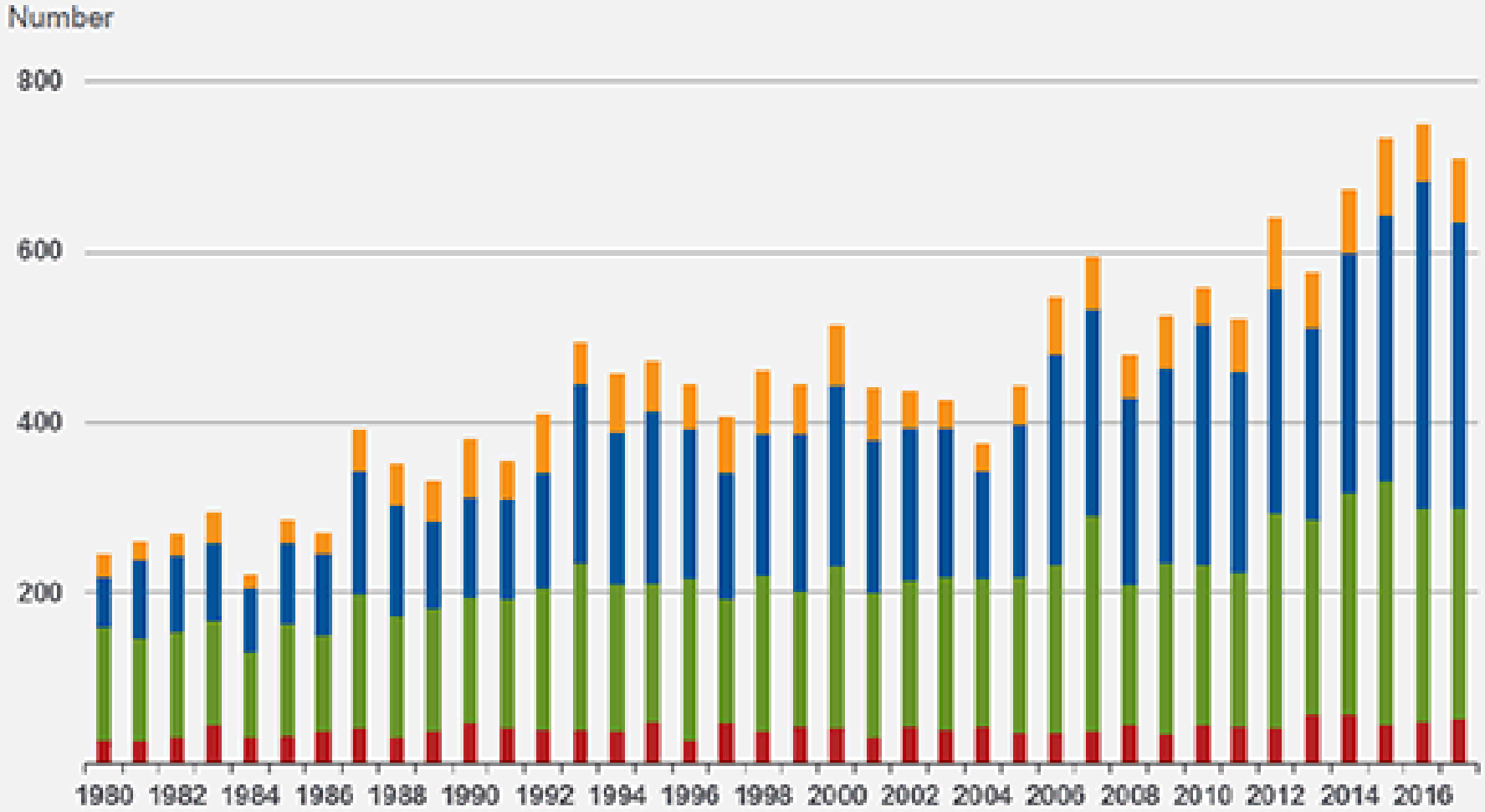
Injured: 50

Homeless: 2,000



Source: Swiss Re, sigma

Insured losses by peril 1980-2017



Geophysical events
(Earthquake, tsunami, volcanic activity)

Meteorological events
(Tropical storm, extratropical storm, convective storm, local storm)

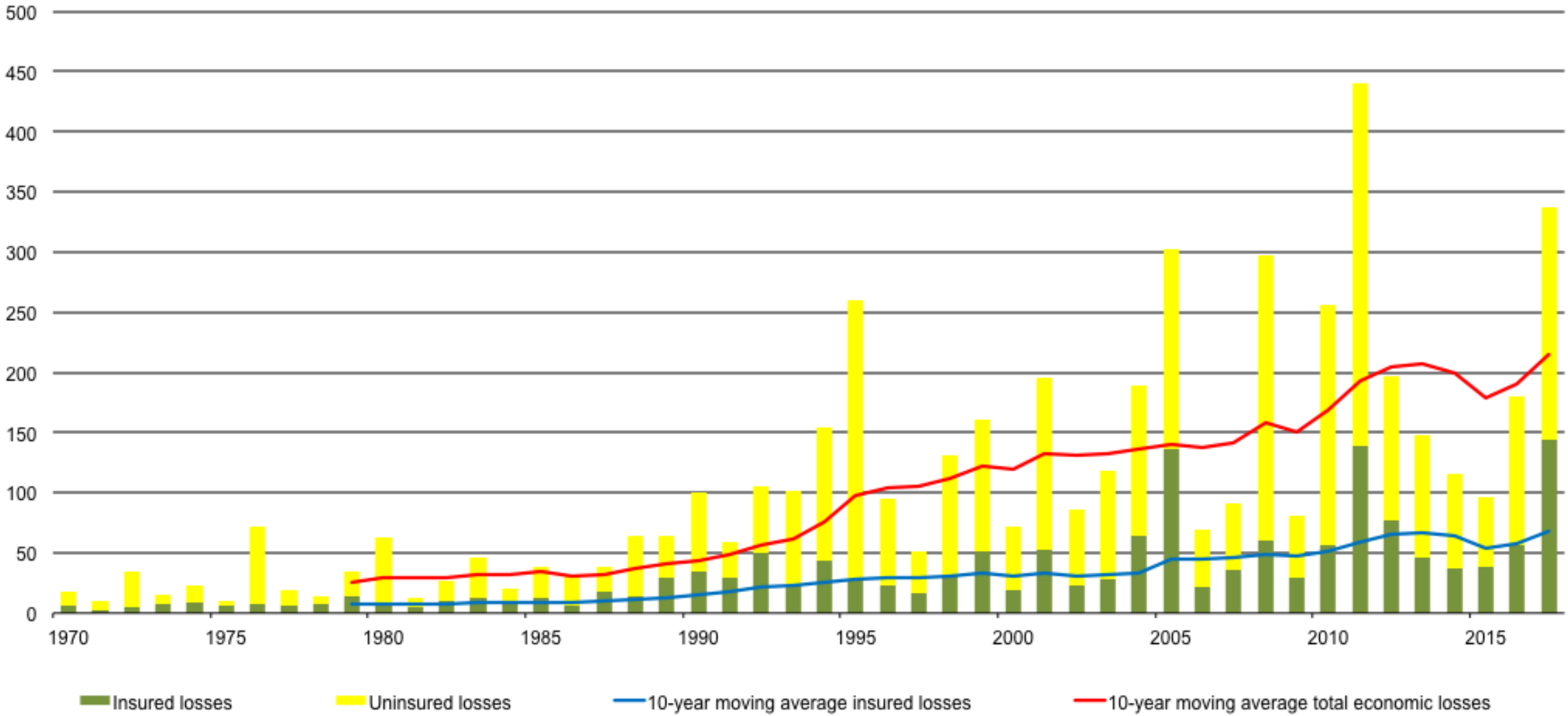
Hydrological events
(Flood, mass movement)

Climatological events
(Extreme temperature, drought, forest fire)

Accounted events have caused at least one fatality and/or produced normalized losses ≥ US$ 100k, 300k, 1m, or 3m (depending on the assigned World Bank income group of the affected country).

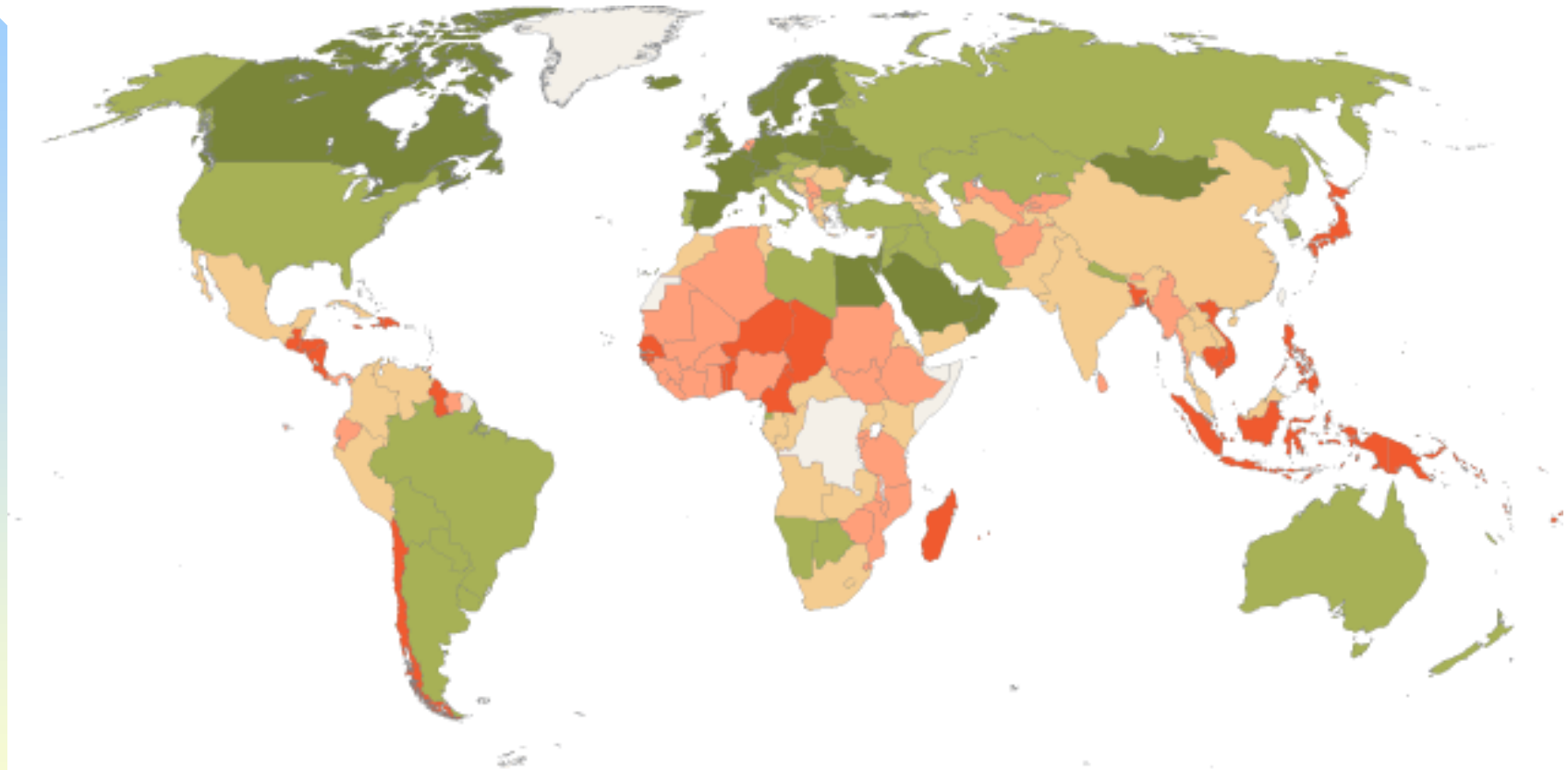
Source: Munich Re

Growing coverage gap

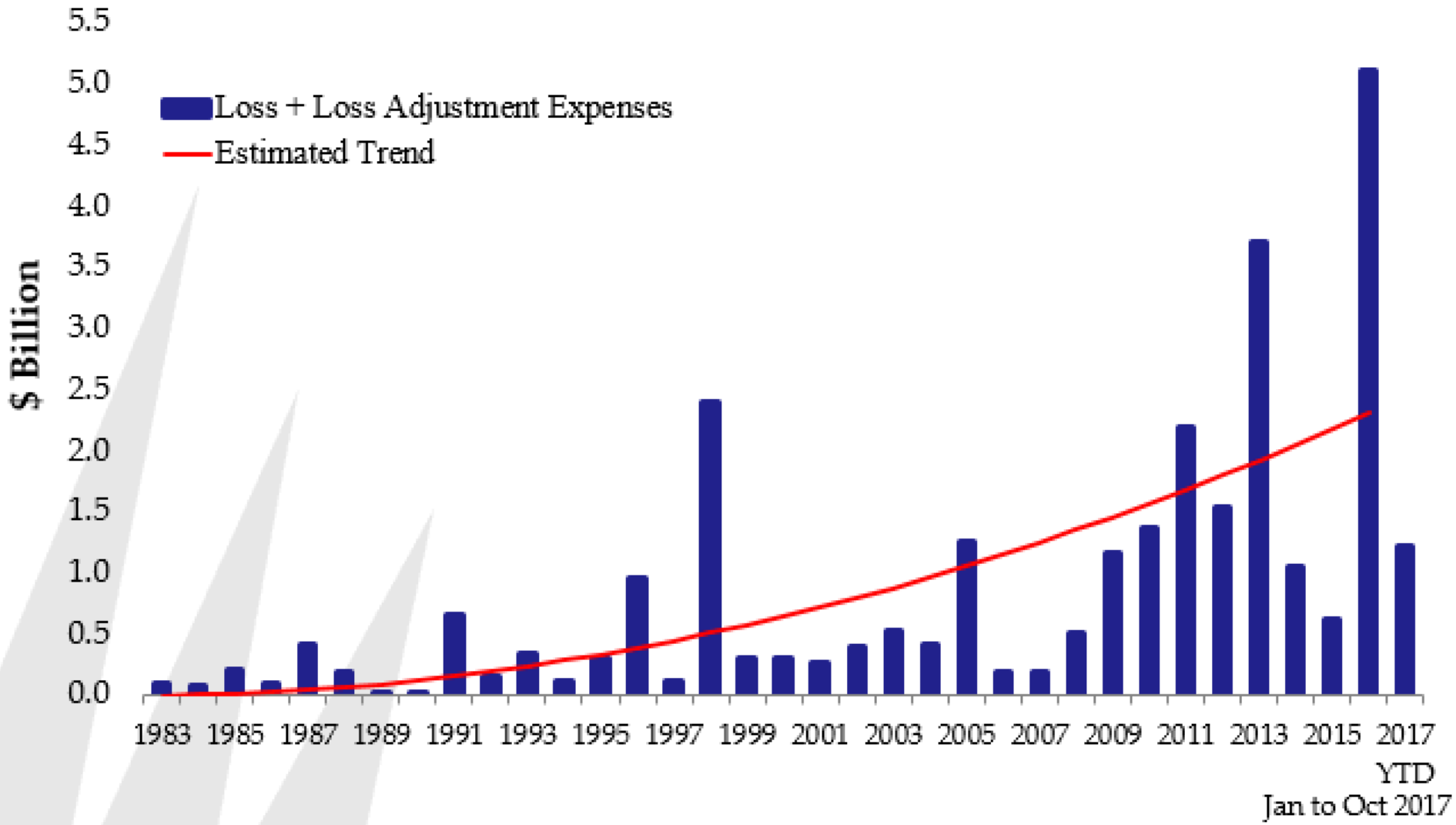


Source: Swiss Re, sigma

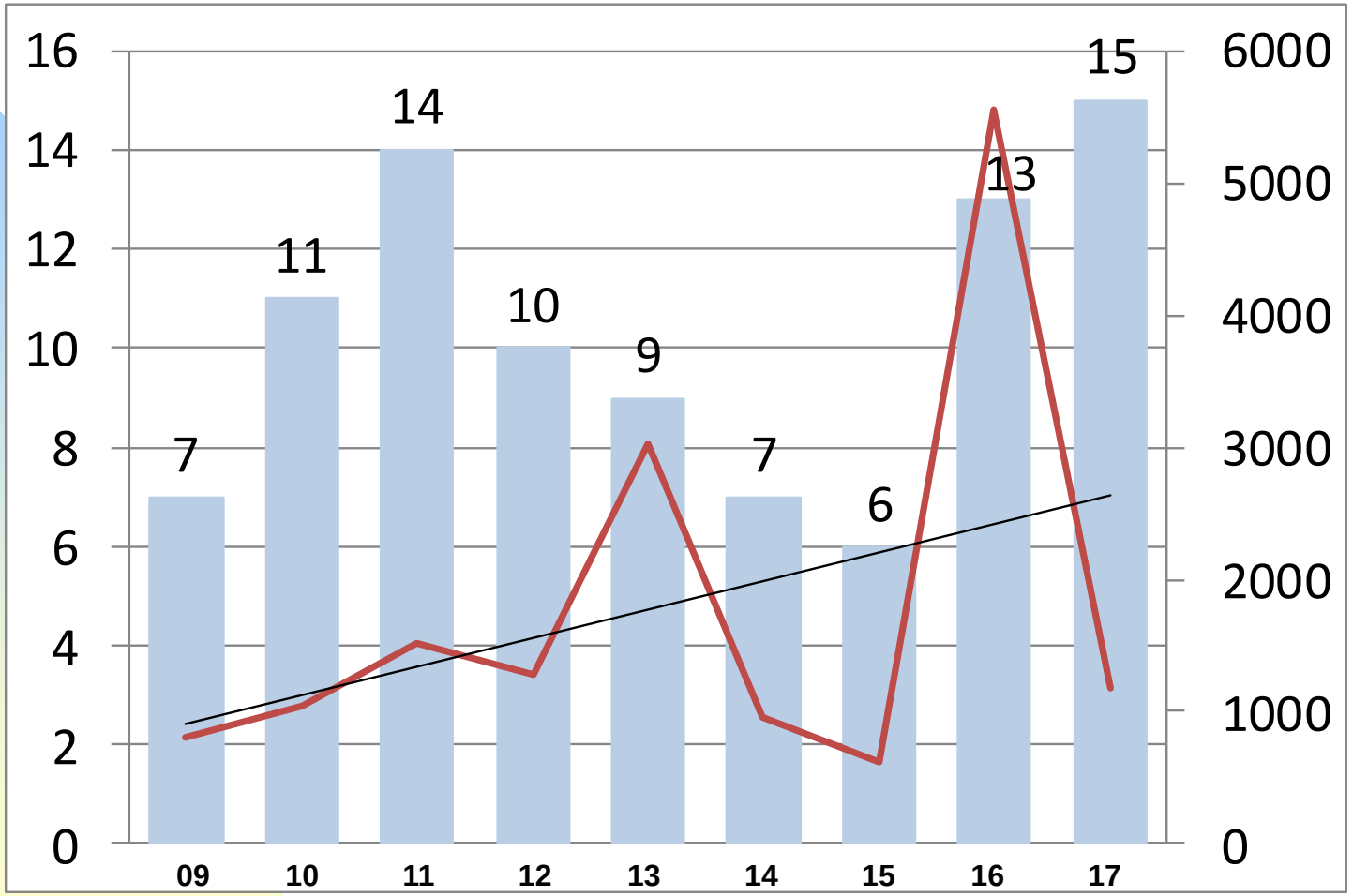
Canadian catastrophes
World risk index



Canadian disaster damage



Frequency & Severity



Catastrophe = event of ≥$25 million in insurance claims
Data: Catastrophe Indices and Quantification Inc. (CatIQ Inc.)

Canadian cats 2009

- Winter storms in eastern Canada (Feb. 2)
  - **$25 million**
- Hamilton rain (July 26)
  - **$100- to $150 million**
- Alberta wind etc. (August 2-3)
  - **$500 million**
- Mont Laurier tornado (August 4)
  - **$6 million**
- Manitoba hail etc. (August 13-15)
  - **$50- to $75 million**
- Ontario tornadoes (August 20)
  - **$50- to $100 million**
- Tropical storms Bill & Danny (August 23 & 29)
  - **$10 & 25 million**

Source: Aon Benfield (Canada)

Canadian cats 2010

- Saskatchewan storms (Spring)
- Leamington & Harrow tornadoes (June 6)
- Midland tornado (June 23)
- Calgary hailstorm (July 12)
  - **>$400 million**
- Hurricane Igor (September 21)

Canadian cats 2011

- Storms in Ontario & Quebec (March)
- Storms in Ontario & Quebec (April)
- Wildfire in Slave Lake, Alberta (May 15)
  - **$700 million**
- Flooding in Saskatchewan, Manitoba, Quebec (Spring)
- Hail, tornadoes and wind in Alberta, Man. & Sask. (July 18/19)
- Tornado in Goderich (August 21)
- Hurricane Irene (August 28 to 30)
- Alberta windstorm (November 27)

Canadian cats 2012

- Flooding and wind in Ontario and Quebec (May 26 to 29)
- Flooding, wind and hail in Alberta (July 12)
- Flooding, wind and hail in Ontario (July 23)
- Hail and wind in Alberta (July 26)
- Flooding, wind and hail in Alberta (August 12)

Canadian cats 2013

- Two small events early in the year
- Southern Alberta flood (June 19-21)
  - **$1.7 billion**
- GTA flood (July 8-9)
  - **$940 million**
- Ontario/Quebec storm (July 19)
- Ontario/Quebec/Atlantic ice storm (December 22-26)
  - **$200+ million**

High River, Alberta


© 2013 Reuters/Andy Clark

Trans-Canada Highway, Alberta


>$1.7 billion insured damage
© 2013 AP Photo/The Canadian Press, Jonathan Hayward

Toronto, Ontario


Toronto, Ontario
$225 million
insured damage

2013 high water marks

- Canada’s costliest and third costliest insured loss events within two weeks of each other
- Ice storm now the second costliest – took 15 years!
- Two billion dollar natural catastrophes in one year – a first!
- Second place event (Slave Lake) fell not one, but two notches to fourth place
- 5th consecutive year of billion-dollar events

Canadian cats 2014

- Angus tornado (June 17)
  - >$30 million
- Saskatchewan & Manitoba storms (June 28)
- Ontario storms/Burlington flood (August 4)
  - $90 million
- Alberta wind & thunderstorms (August 7 & 8)
  - $500+ million
- Ontario/Quebec windstorm (November 24)
- $880 million


Aidrie, Alberta hailstorm
MAZDA
MAZDA
Service Reception
>$500 million
insured damage

Canadian cats 2015

- Alberta/Saskatchewan storm (June 11 & 12)
  - $55 million
- Alberta/Saskatchewan storm (July 21 & 22)
  - $235 million
- Alberta storm (August 4 & 5)
  - $100 million
- $510 million

Canadian cats 2016

- Fort McMurray wildfire (May 1)
  - More than the 2013 flood and 1998 ice storm combined
    - $3.67 billion insured
  - 12 other ‘catastrophes’ declared in 2016
    - Six catastrophes involved Alberta
    - Nine featured hail
  - $5.3 billion insured


Windsor, Canada
September 28 & 29, 2016
>$108 million insured damage
©2013 Reuters/Mark Blinch


Sydney, NS, Canada
October 10, 2016
>$100 million insured damage
© 2013 Reuters/Mark Blinch

Canadian cats 2017

- Ontario windstorm
- East Coast windstorm
- Ontario/Quebec rain/wind
- Flooding in eastern Canada
- Western Canada windstorm
- Saskatoon hailstorm
- Alberta storms
- Elephant Hill wildfire, B.C.
- Alberta storms
- Williams Lake wildfire, B.C.
- Alberta storm
- Alberta and Saskatchewan storm
- Windsor flood

2009 to 2017 inclusive

$15.4 billion

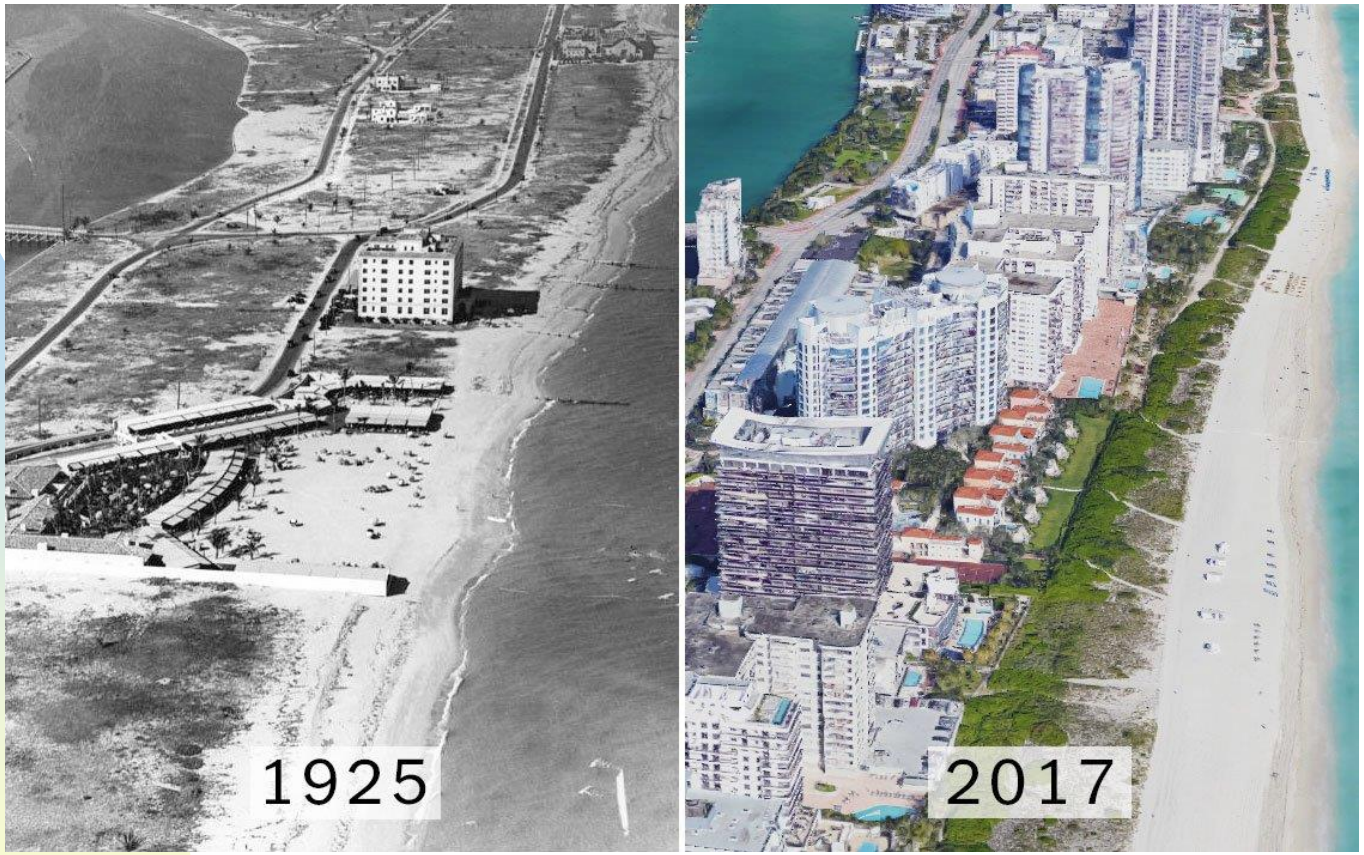
Billion-dollar years

- 1998 – due solely to the ice storm
- 2005 – due greatly to the August 19 GTA rainstorm
- 2009 – due greatly to back-to-back windstorms in Alberta
- 2010 – due greatly to large hailstorm in Alberta
- 2011 – due greatly to Slave Lake wildfire
- 2012 – due greatly to one large and two smaller hailstorms in Alberta
- 2013 – due to the Southern Alberta flood and GTA flood
  - First time ever for two billion-dollar events
- 2014 – Due largely to the Aidrie hailstorm
- 2016 – Due almost entirely to Fort McMurray

Why are losses rising?

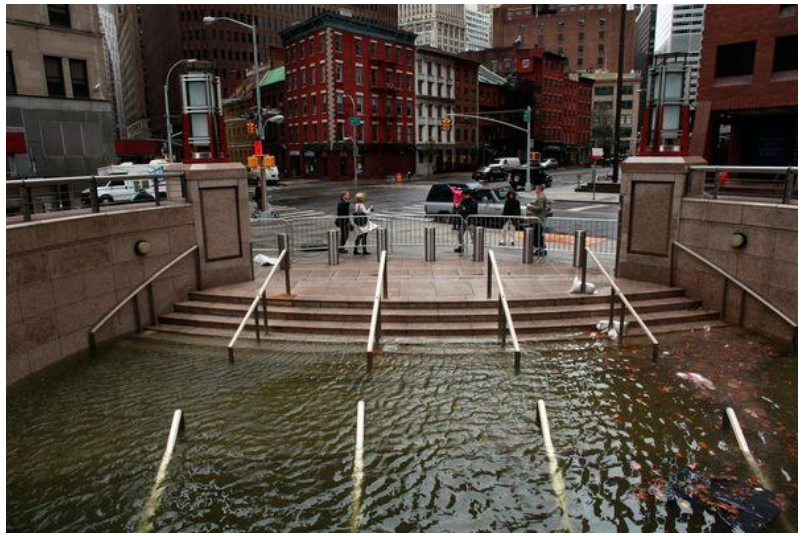
- More people and property at risk
- Aging infrastructure
- The climate is changing

Increasing values in exposed areas




DO NOT ENTER
CLEARANCE


86
Street

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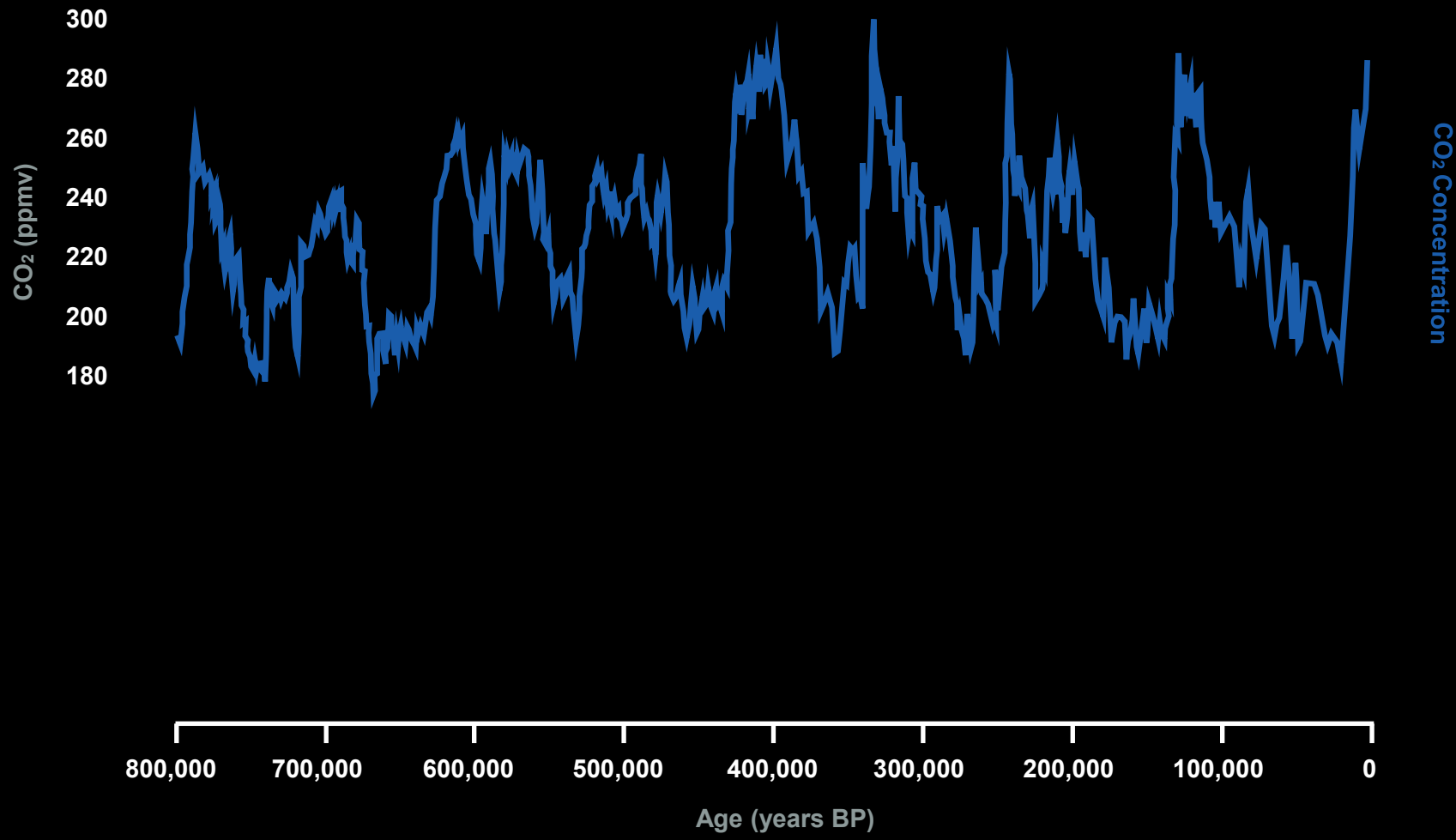
Infrastructure spending

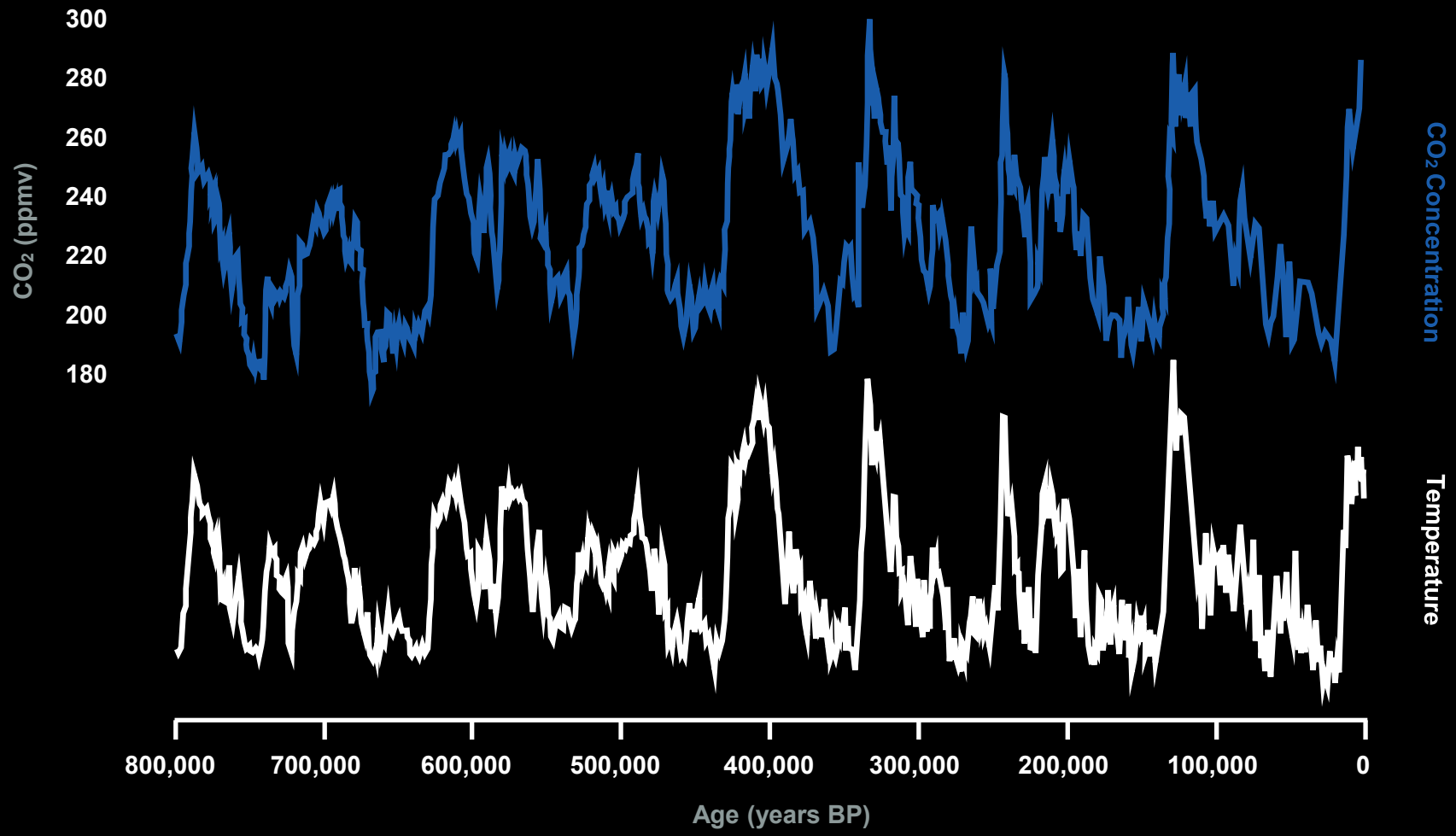
Infrastructure	Lower Target Reinvestment Rate	Upper Target Reinvestment Rate	Current Reinvestment Rate
Potable Water (linear)	1.0%	1.5%	0.9%
Potable Water (non-linear)	1.7%	2.5%	1.1%
Wastewater (linear)	1.0%	1.3%	0.7%
Wastewater (non-linear)	1.7%	2.5%	1.4%
Stormwater (linear)	1.0%	1.3%	0.3%
Stormwater (non-linear)	1.7%	2.0%	1.3%
Roads and Sidewalks	2.0%	3.0%	1.1%
Bridges	1.0%	1.5%	0.8%
Buildings	1.7%	2.5%	1.7%
Sport and Recreation	1.7%	2.5%	1.3%

Source: FCM Infrastructure Scorecard 2016

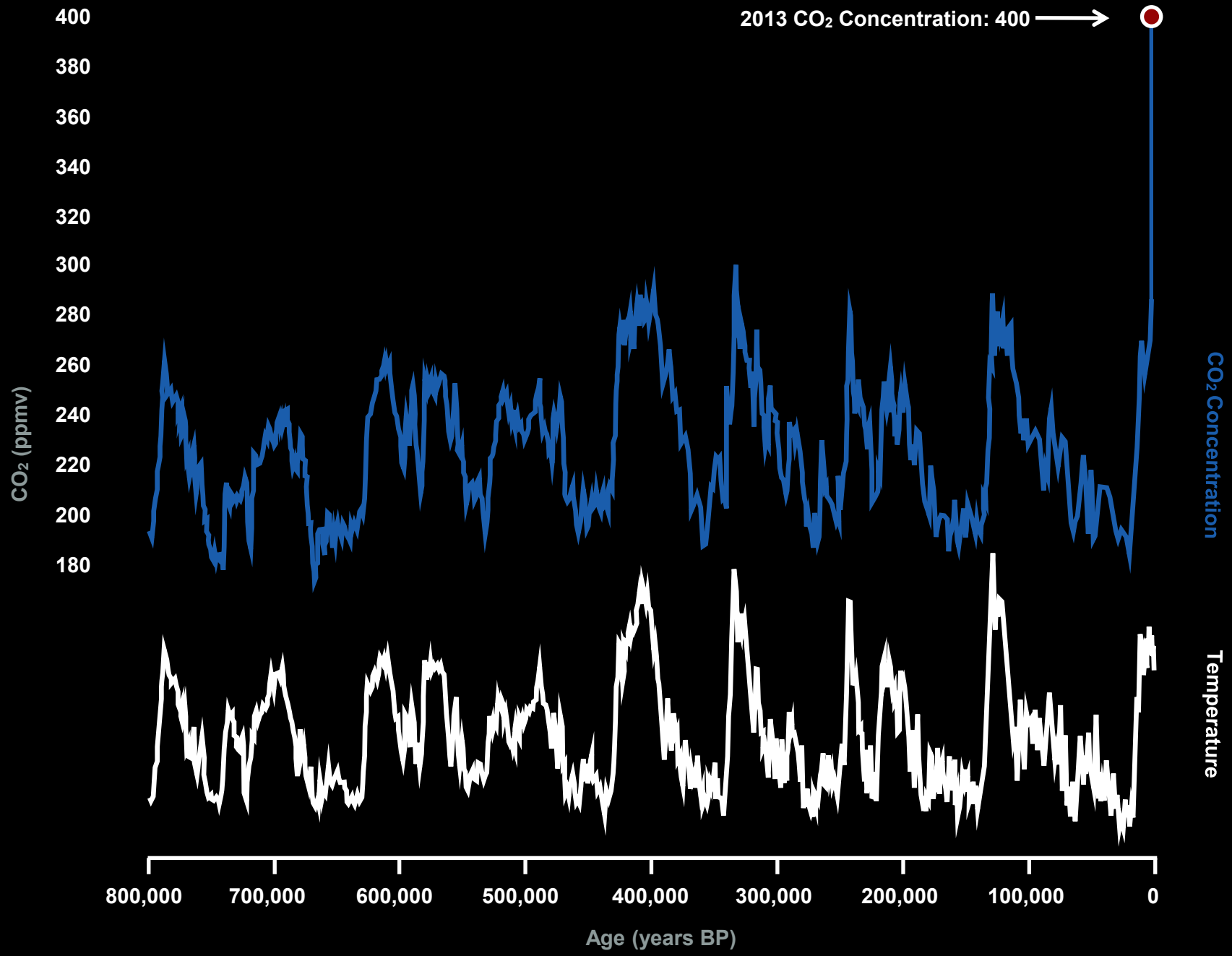

CITY OF NEWBURGH



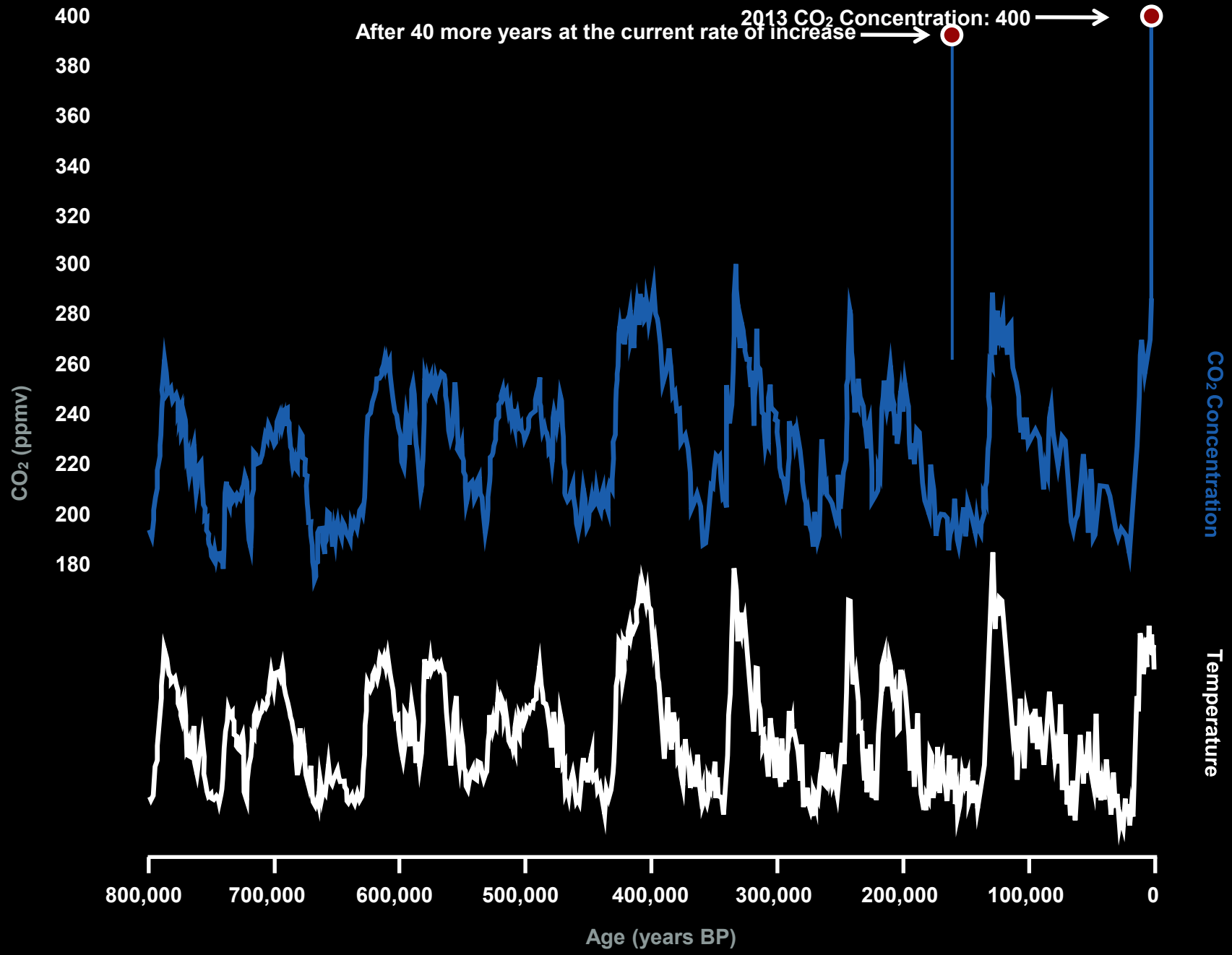
Source: National Climatic Data Center, NOAA



Source: National Climatic Data Center, NOAA



Source: National Climatic Data Center, NOAA

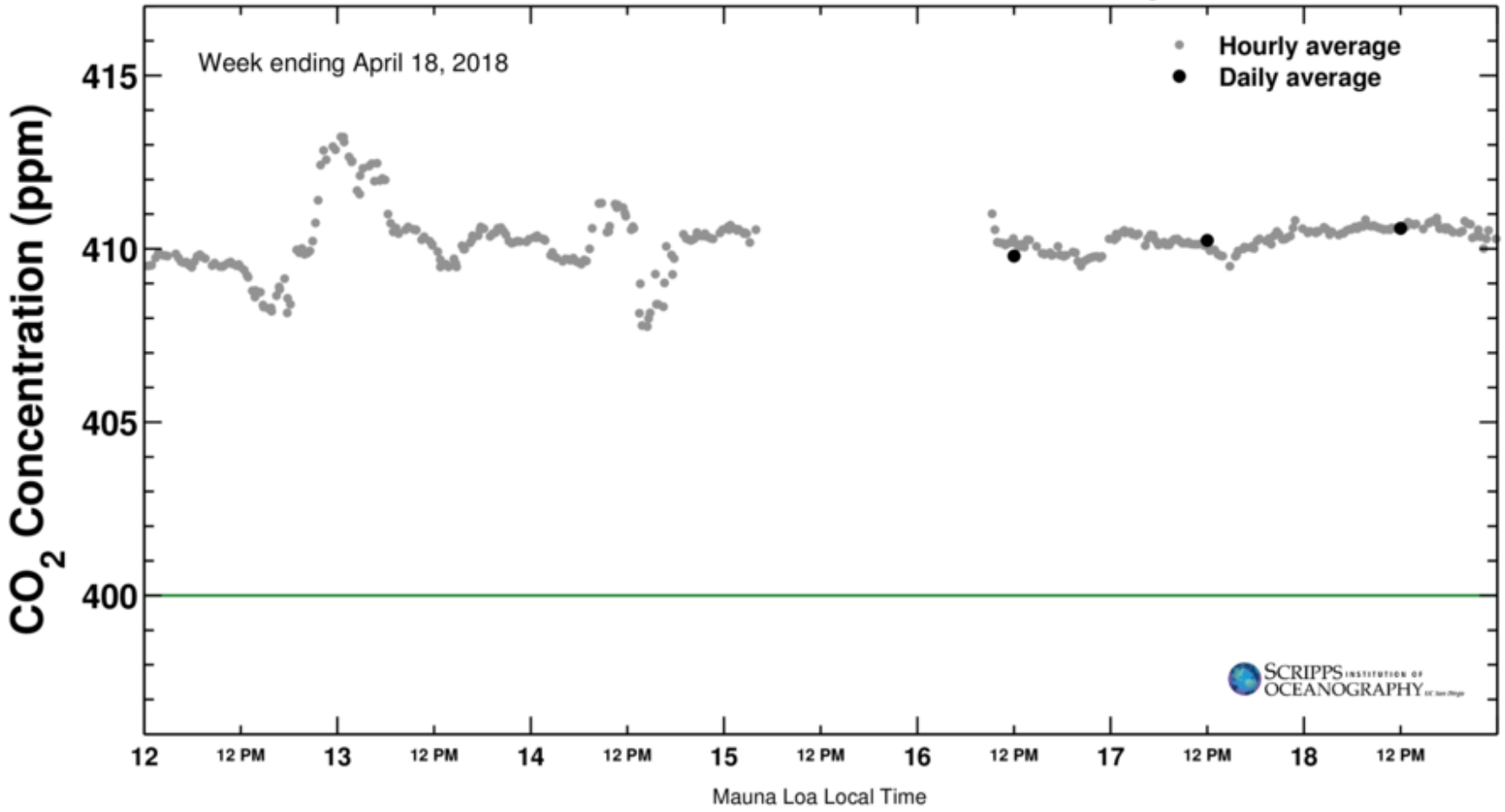


Source: National Climatic Data Center, NOAA

Keeling Curve
@Keeling_curve

Latest CO_2 reading
April 18, 2018

410.59 ppm



What can be done?

- Loss prevention
- Risk transfer

Loss prevention

- Structural measures
- Non-structural measures
- Public awareness

Five-year plan

- Promote best practices to enhance the resilience of **existing homes** to damage from natural hazards
- Work with builders and others to champion resilient design and construction of **new homes**
- Partner with municipalities to advance homeowner **basement flood** risk reduction efforts
- Identify options to expand the role of private **insurance**

Hazard research

- Concentration on five main hazard areas
  - Wildfire
  - Earthquake
  - Wind
  - Hail
  - Water

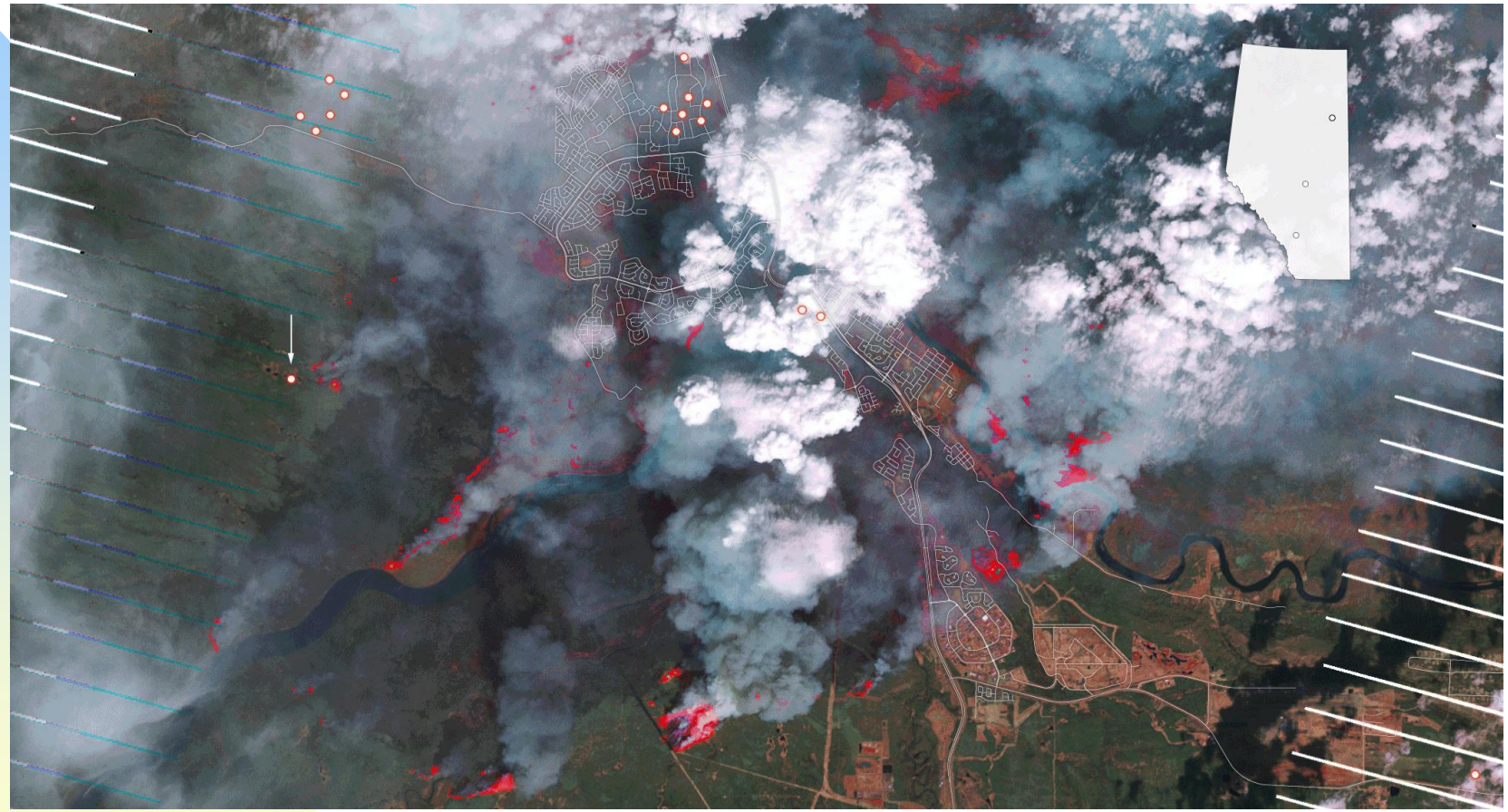
Wildfire

- Two main ways of addressing wildfire risk in an institutionalized manner
  - Planning legislation
  - Building code
- Planning – where we allow construction
- Building code changes would have to relate to
  - Roofing materials (eg. No untreated wood shakes)
  - Siding materials (eg. AB requirement for fire resistant ply-board under vinyl siding on side exposures)
  - Building materials for decks etc
  - Venting grate size

The day ‘everything’ changed…

- Horse River Wildfire (May 3-19, 2016)
- Fort McMurray, Alberta
- Human caused (likely accidental)
- ~2,400 structures lost (less than 10% of town)
- ~45,000 claims filed
- Insured damage estimate $3.67b
  - Largest insured loss in Canadian history
  - Included in the Top 50 costliest insured catastrophe losses of all time

Fort McMurray




63
Franklin Ave
Clearwater River
Fort McMurray
RIVER VIEW HEIGHTS
Bell
HILLTOP ESTATES
Franklin Ave
ASPEN GARDENS
63
Hospital St
RAVINE PARK
ARSENAULT / ADRIAN
ABASAND HEIGHTS
HANGINGSTONE PLACE
PATIO HOMES EAST
GRAYLING TERRACE


Fort McMurray
International Airport
63
63
63


J. Howard
Pew Memorial
Family Park
Clearwater River
BEACON
HILL NORTH
BEACON
HILL CENTRE
BEACON
HILL SOUTH
WATERWAYS


21/05/2016 09:01AM

Why do homes ignite?

- ‘Why some homes survived: Learning from the Fort McMurray wildfire disaster’
- Why did some homes survive this wildland/urban interface disaster with little or no damage, while others were vulnerable to ignition and destroyed?
- “…wind-driven embers were the most probable cause for the majority of early home ignitions…”
- Preliminary findings at www.iclr.org
- Final report due out in 4Q

Why do homes ignite?

[Photo Credits: Bill Bereska]

[John Gibbins/U-T San Diego/ZUMA Press]

Why do homes ignite?

- Not all homes with key vulnerabilities (eg. vinyl siding) ignited
- Positive structural features and absence or low levels of combustibles (eg. vegetation) can prevent ignition by embers

Why do homes ignite?

- Old stucco siding beneath new vinyl siding, fire resistant asphalt roofing and landscaping choices were key reasons for survival of this home

Why do homes ignite?

- Long-lasting sources of intense heat frequently lead to ignition of adjacent structures
- Firewood pile beside wooden shed next to home

Why do homes ignite?

- High correlation between home destruction and the presence of easily ignited, highly combustible shrubbery (eg. juniper, cedars) located in close proximity to decks and balconies

Why do homes ignite?

- Combustible ground covers allowed fire to spread into contact with homes, while non-combustible ground covers blocked fire pathways

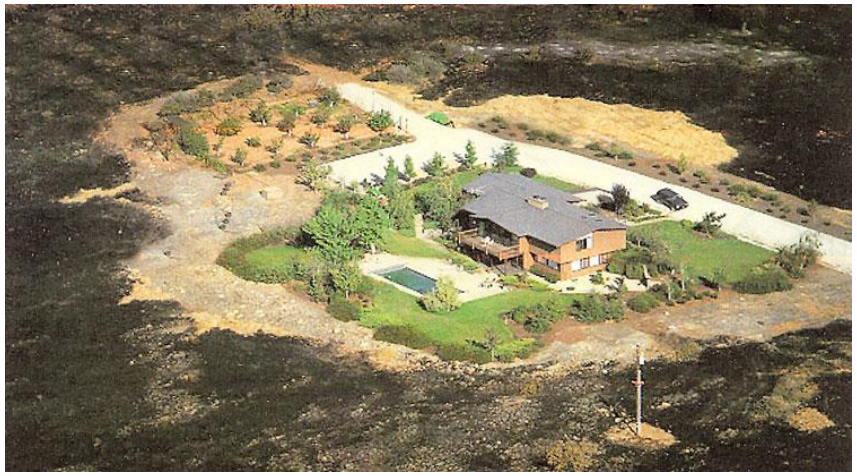
Why do homes ignite?

- Some owners thinned forest/reduced fuel, others did not (Saprae Creek Estates)

Why do homes ignite?

- Homes that adopted FireSmart survived much more frequently
- Home survival is not random or a matter of luck. FireSmart works
- Home survival depends on conditions in the home ignition zone, for which homeowners are responsible
- While total hazard rating is important, a single critical weakness can lead to home loss

Creating defensible space



Wildfire

- As with all hazards, risk and mitigation communication to stakeholders is crucial

Earthquake

- 3,000 to 4,500 earthquakes a year, most undetectable without instruments
- A ‘felt’ earthquake occurs about once a week
- Primary concern for the insurance industry (west coast and the Ottawa/Montreal corridor)
- When (not if) a major earthquake strikes the west coast, damage will likely be severe
- Damaging quakes occur decades apart, major events on the west coast every 500 years or so
- 13 great earthquakes along this fault in the last 6,000 years
- Seven richter 7+ events in the last 130 years in southwest B.C. and northern Washington state
- Seattle earthquake, February 28, 2001, M6.8
- Haida Gwaii earthquake, October 27, 2012, M7.8
- Will happen again, just a matter of when
- Are we ready?

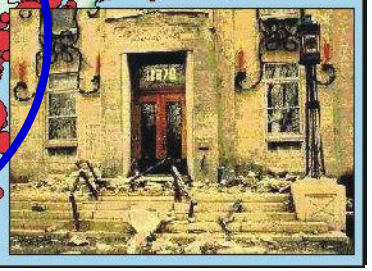
EARTHQUAKES IN CANADA
TREMBLEMENTS DE TERRE AU CANADA

www.seismo.nrcan.gc.ca

1663 M7.0, and
1925 M6.2
Charlevoix

1935 M6.1 Timiskaming earthquake

1949 M8.1 Vancouver Island; Canada`s largest historical quake



Magnitude

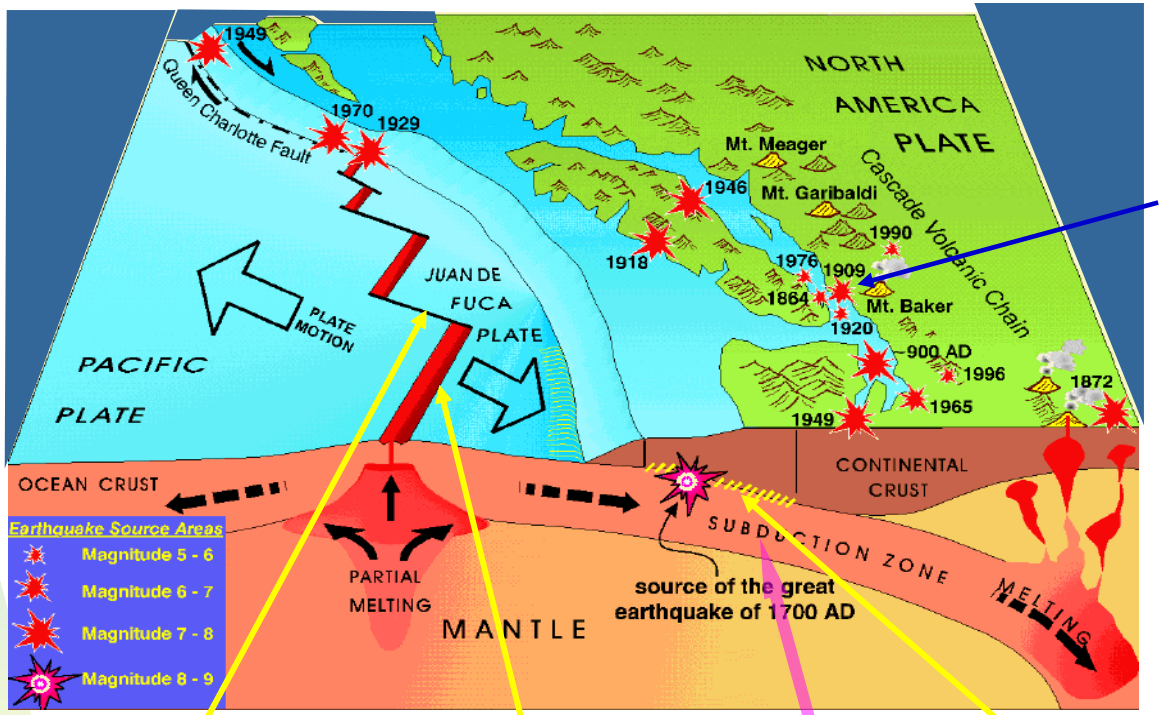
2.5 - 3.9
5.0 - 6.4
4.0 - 4.9
≥ 6.5

Canada

Tectonic context of Canada's west coast

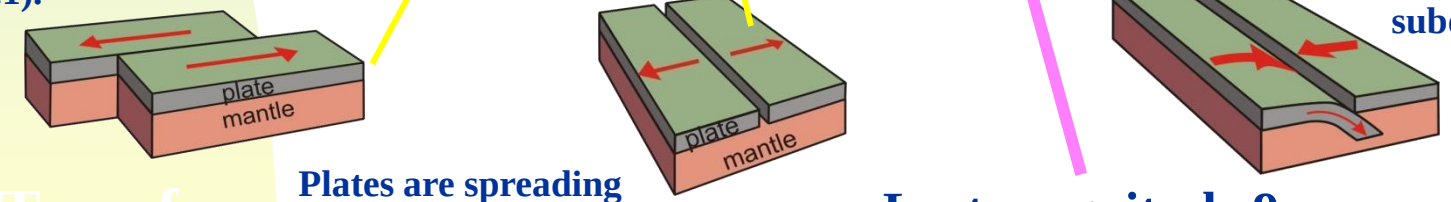
One of the few regions of the world to exhibit all three of the major types of plate motion that cause significant seismic activity

- The Queen Charlotte fault, an active transform fault in which the plates are moving sideways in relation to one other.
- Canada's equivalent of the San Andreas fault.
- The nation's largest recorded earthquake (1949, M8.1).



Vancouver

The Juan de Fuca plate is subducting beneath the North American plate to form the Cascadia subduction zone



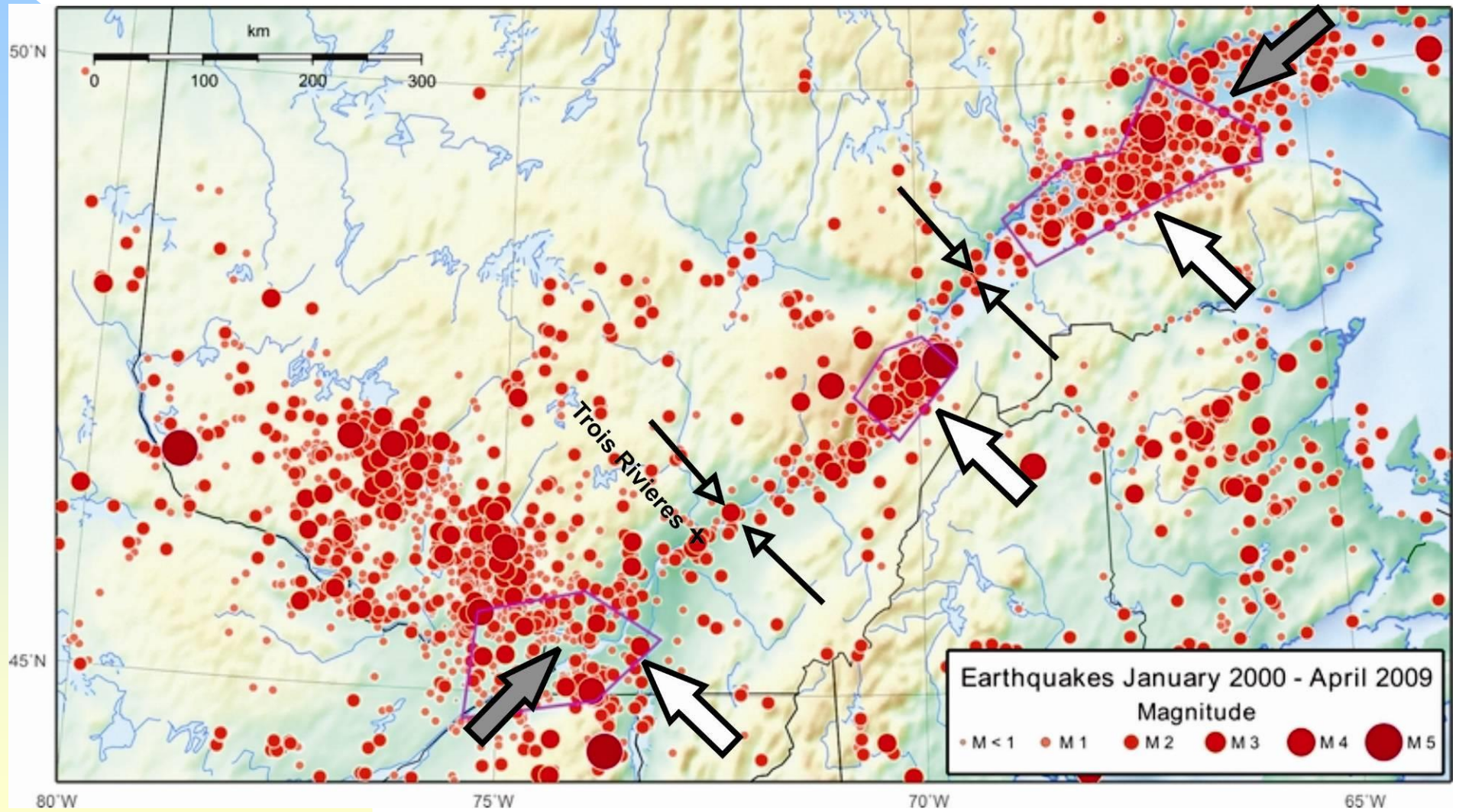
Transform

Plates are spreading apart along the Juan de Fuca ridge

Last magnitude 9 earthquake 1700 AD

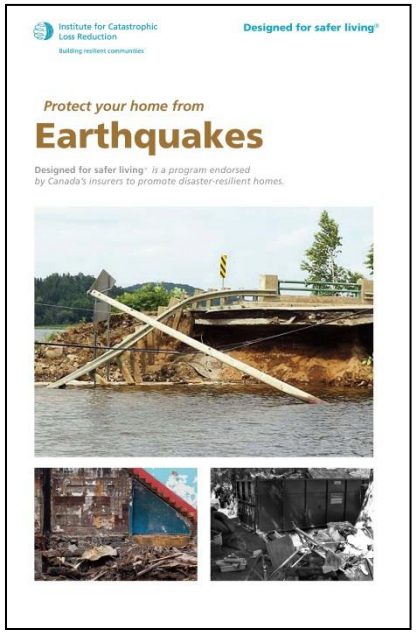
J Cassidy, GSC

Small earthquakes outline the entire rifted margin



Earthquake

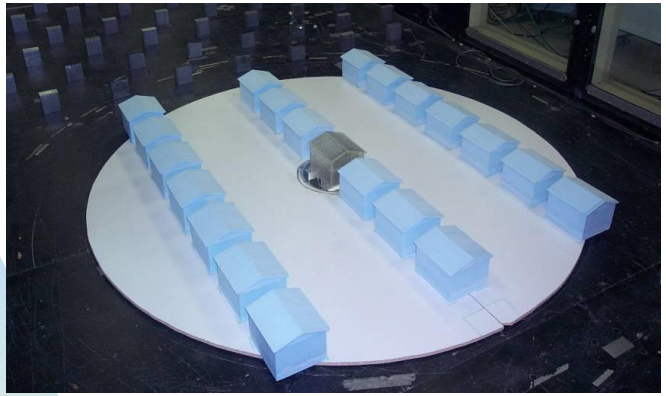
- As with all hazards, risk and mitigation communication to stakeholders is crucial

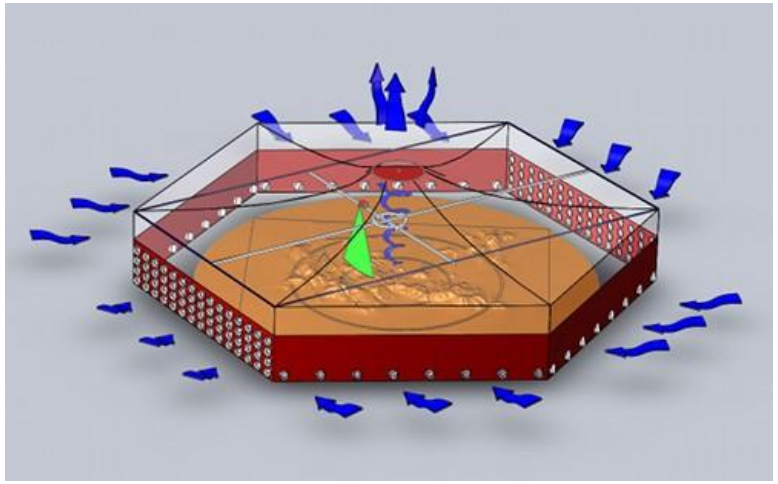


Wind

- Flat line, tornadoes, hurricanes, downbursts/ microbursts etc
- Probably the second largest driver of property claims in Canada, after water
- Tornado risk rising, not due to climate change or any other change in the hazard, but due to change in the risk (i.e. development)

Lab work:
World-class research





Lab findings

- To date, have completed a great deal of research into
  - Roof type (hip, gable end, complex)
  - Building height (number of storeys)
  - Roof slope
  - Sheathing thickness
  - Fastener (i.e. nail) patterns
  - Fastener type

Field work

Bornham, Ontario tornado

- May 2007
- The team’s first

Elie, Manitoba tornado

- June 22, 2007
- Canada’s first F5 tornado

Vaughan, Ont. tornadoes

- August 20, 2009
- Two F-2s

Goderich, Ontario tornado

- August 21, 2011
- F3 tornado

Angus, Ontario tornado

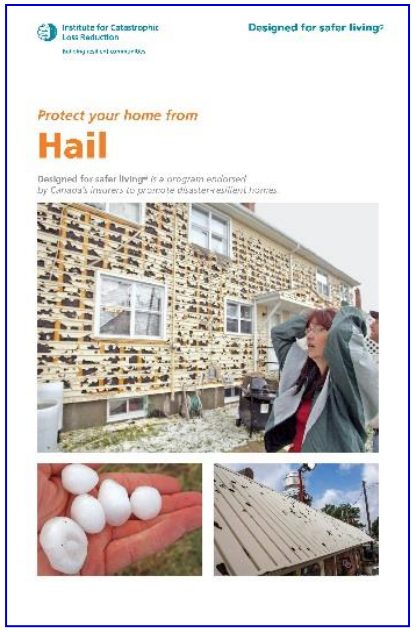
- June 17, 2014
- EF2 tornado

Wind

- As with all hazards, risk and mitigation communication to stakeholders is crucial

Hail

- As with all hazards, risk and mitigation communication to stakeholders is crucial

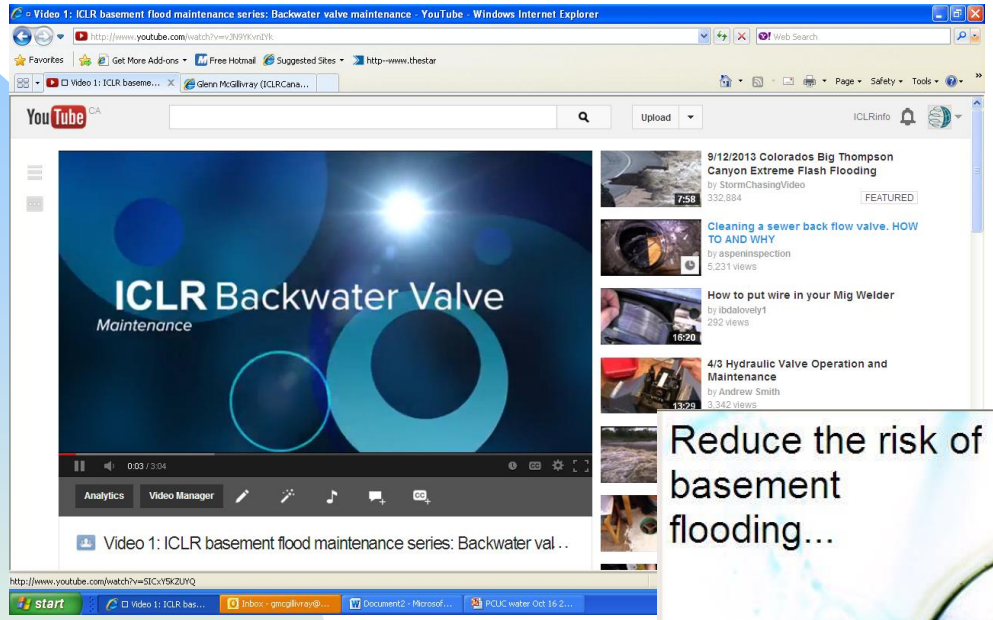


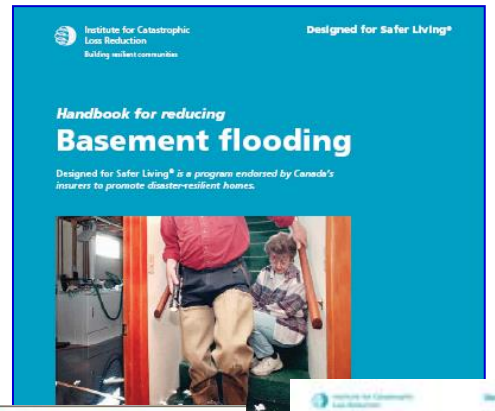
Water

- Water is the new fire
- Water losses surpassed fire losses a few years ago
- We now have a fire insurance policy that is increasingly responding to water losses
- For a number of reasons, water losses will continue to rise
  - Aging infrastructure
  - Increasing urbanization
  - Climate change
  - Changing usage of basements with no underlying change in how we construct homes with basements
  - Homeowner ignorance

Encouraging homeowner action

ICLR resources

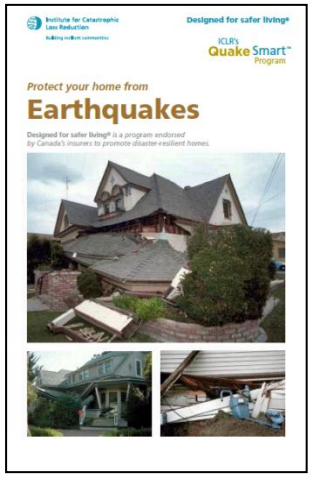


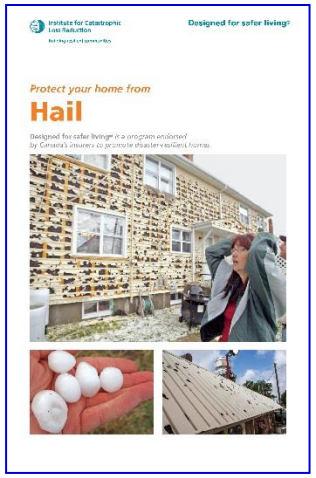


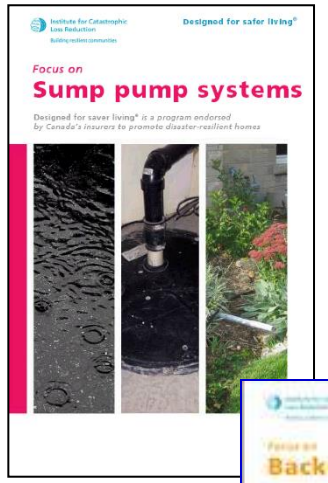
Water

- As with all hazards, risk and mitigation communication to stakeholders is crucial

Loss control information

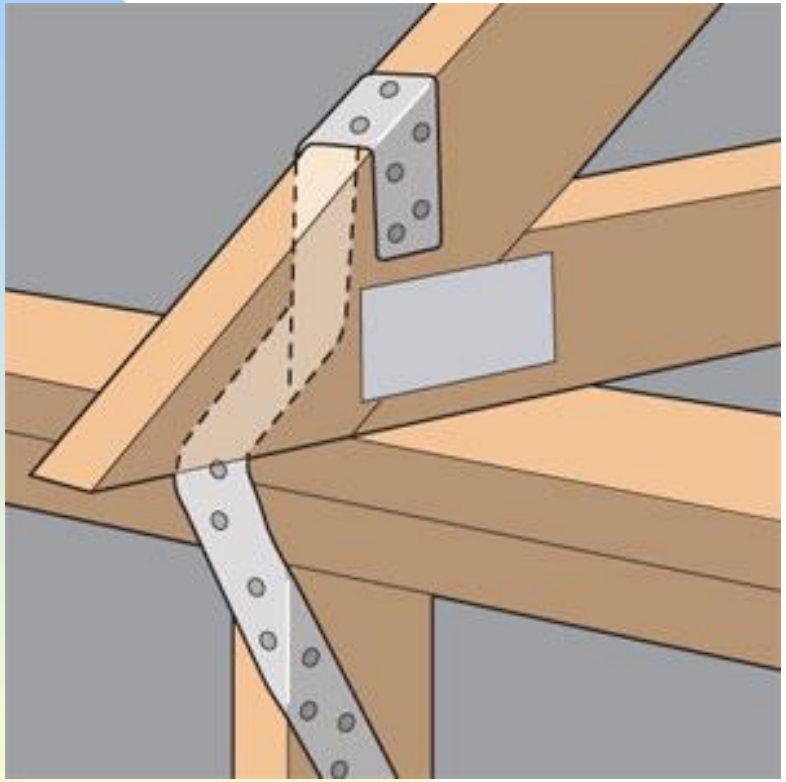


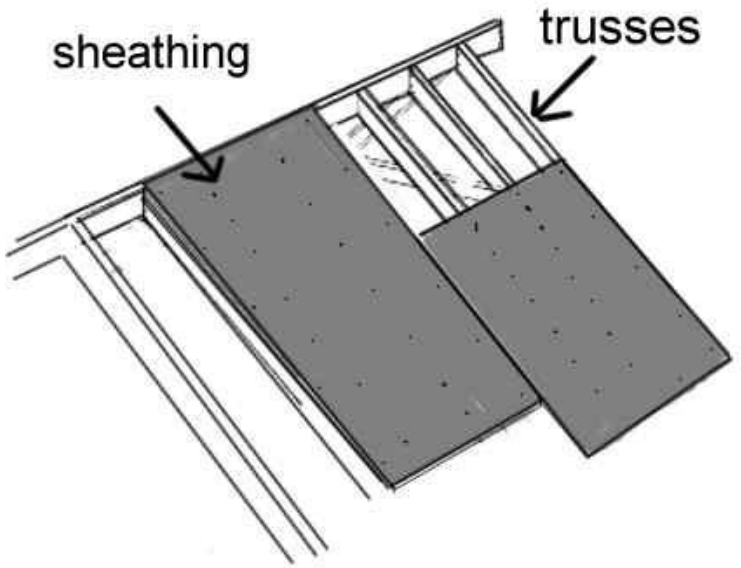




Wind & Water

Building code work





To recap

- Natural disasters are increasing in frequency and severity, both worldwide and in Canada
- Since 2009, Canada has seen unprecedented growth in disaster-related costs and impacts
  - Water damage is seeing the most growth
- Though there are many reasons for the international/national trend, increased urbanization, degraded infrastructure and climate change are the top three drivers
- ICLR is conducting research into resiliency on behalf of the Canadian p&c industry and society at large
- ICLR has loss control info that can be used by insureds

Institute for Catastrophic Loss Reduction
Building resilient communities

Institut de Prévention des Sinistres Catastrophiques
Construction de resilient communities

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