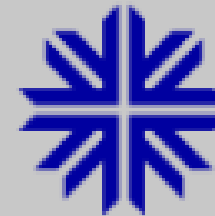


# PREPARING FOR CLIMATE-INDUCED FLOODING: A “WORK IN PROGRESS” FOR CANADA



**IUMI**  
International  
Union of  
Marine Insurance



**Dr. Blair Feltmate**  
Intact Centre on Climate Adaptation  
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June 17, 2021



**INTACT CENTRE**  
ON CLIMATE ADAPTATION

*Generously supported by*

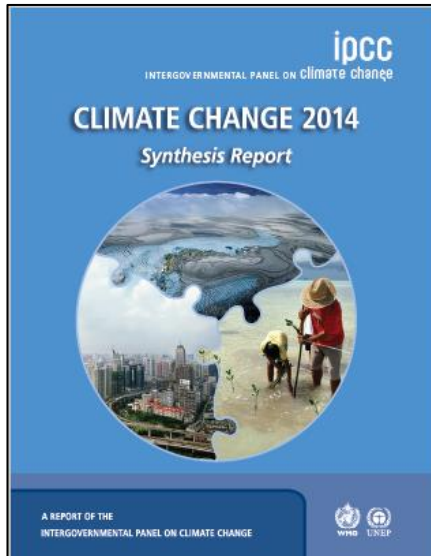


1. Climate change is effectively irreversible
2. Costs of climate change are going up
3. Adaptation standards & guidelines (to limit risk)
4. Need to accelerate adaptation

# CLIMATE CHANGE IS IRREVERSIBLE: SEVERITY OF WEATHER WILL INCREASE

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3



*It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century.*

IPCC 2014



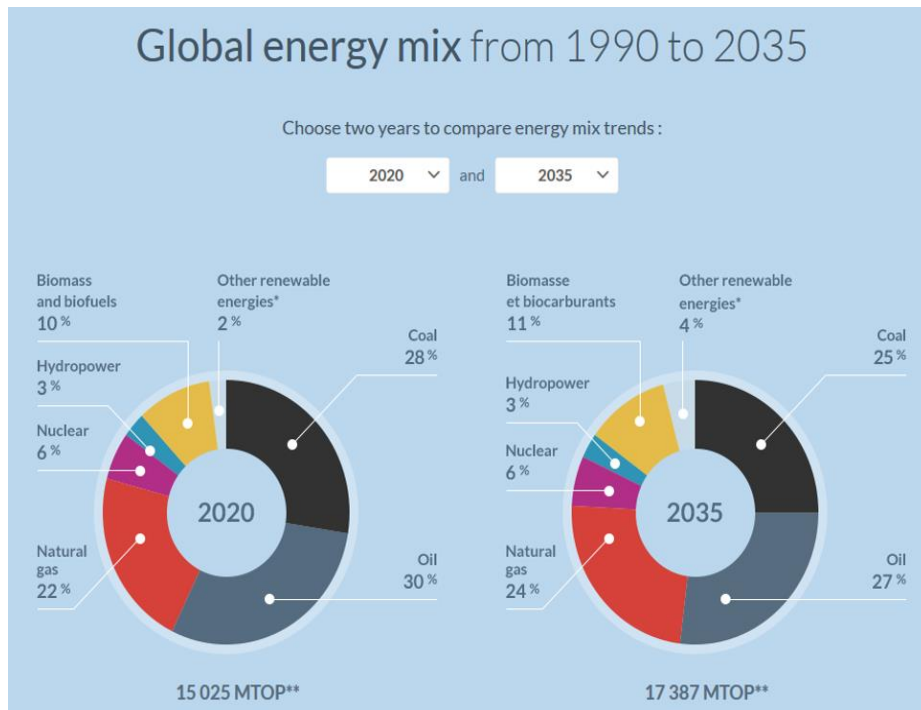
*Canada's climate has warmed and will warm further in the future, driven by human influence... this warming is effectively irreversible.*

ECCC/CCCR 2019

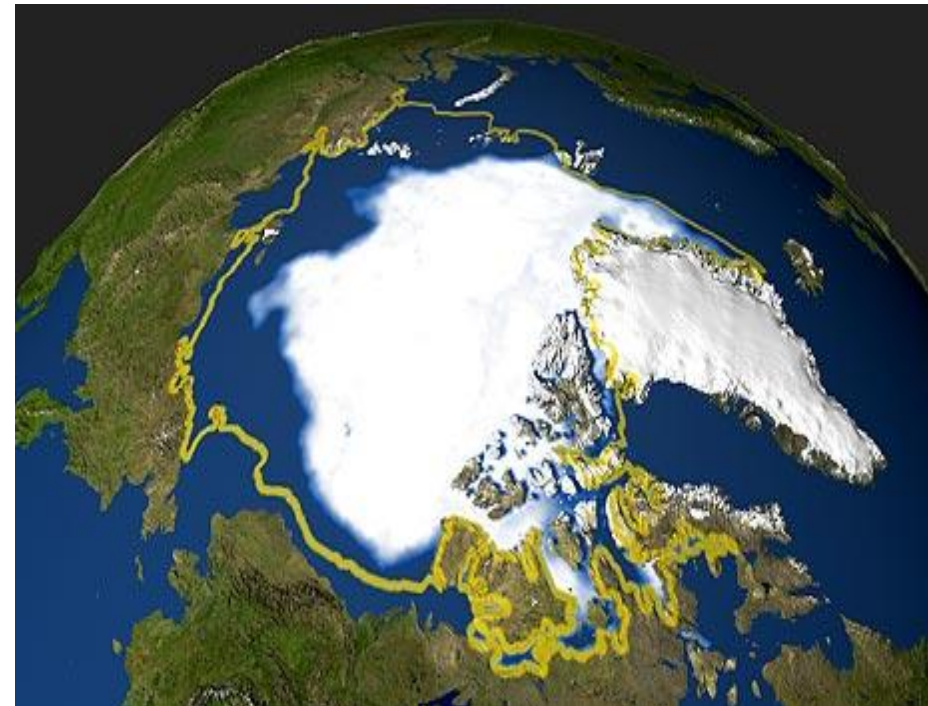
# WHY CLIMATE CHANGE IS EFFECTIVELY IRREVERSIBLE

4

- Global energy mix will remain fossil fuel dependent (International Energy Agency)
- Key GHG driver is population growth (net global increase is now **10,000 people/hour**)
- Climate change is driving climate change – three drivers (loss of ice, loss of permafrost, loss of algae from surface of oceans)



17.4 billion tonnes of oil equivalent by 2035





### Russian heatwave killed 11,000 people

Updated 17 Sep 2010, 9:24pm



### South Asia floods kill 1,200 and shut 1.8 million children out of school

Hundreds dead in India, Nepal and Bangladesh, while millions have been forced from their homes and 18,000 schools shut down across the region

AP | July 16, 2013, 10:48 AM

### India raises flood death toll reaches 5,700 as all missing persons now presumed dead

### Hurricane Maria death toll may be more than 4,600 in Puerto Rico

By John D. Sutter and Leyla Santiago, CNN  
Updated 7:33 PM ET, Tue May 29, 2018



CBS/AP | July 29, 2018, 2:04 PM

### Death toll rises to 91 in deadly Greece wildfire

### Largest Wildfire In CA History Nearing 400,000 Acres

New evacuation orders went out Sunday night. Cal Fire anticipates containment of the 398,862-acre Mendocino Complex fire by Sept. 1.

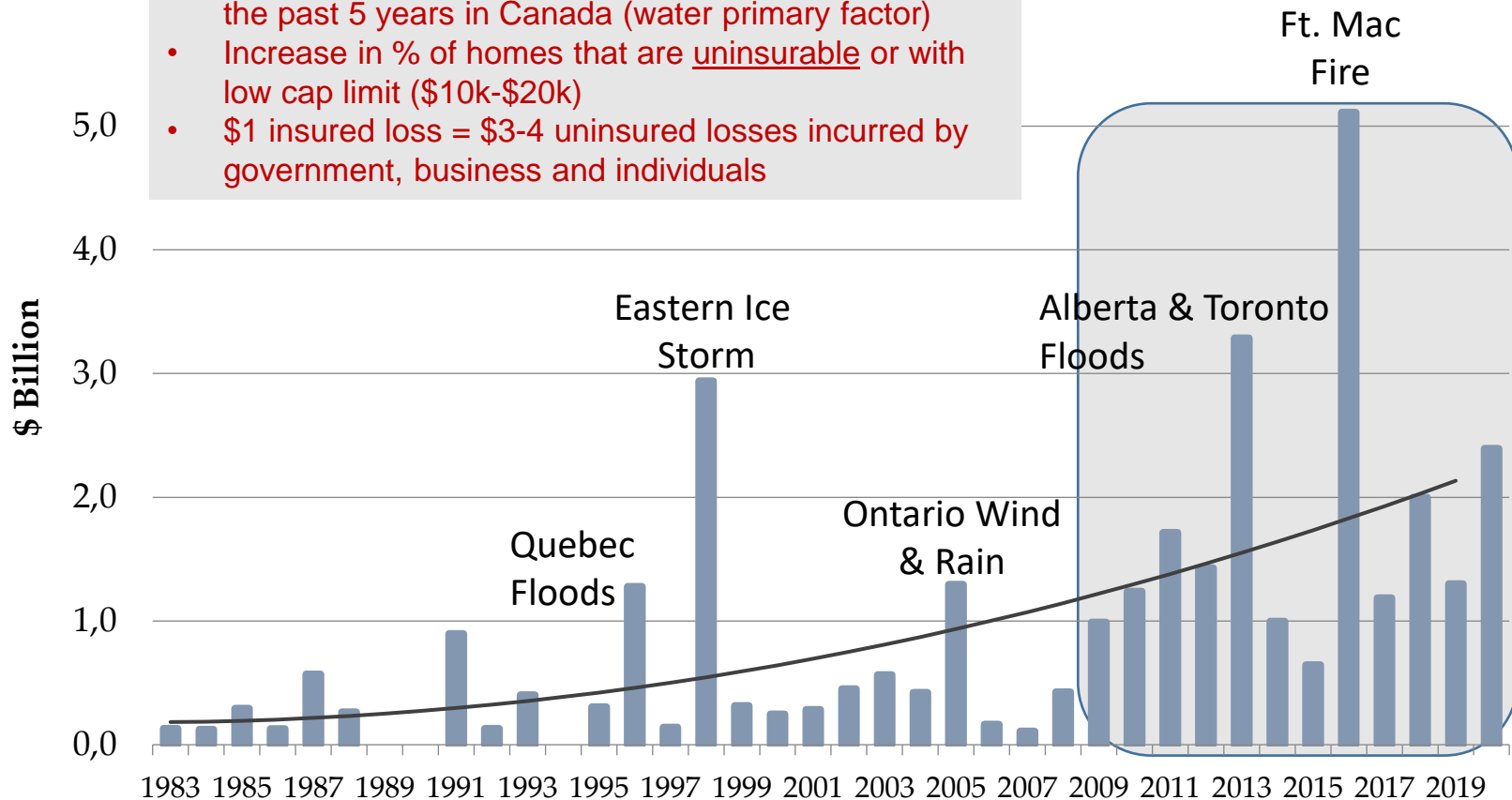
By Maggie Avants, Patch Staff | Aug 20, 2018 3:14 pm ET | Updated Aug 20, 2018 5:31 pm ET

### The Final Numbers Are In: Over 300 Million Trees Killed By the Texas Drought

# COSTS OF EXTREME WEATHER: CATASTROPHIC INSURABLE LOSSES (\$CAD)

6

- Annual home insurance premiums up 20-25% over the past 5 years in Canada (water primary factor)
- Increase in % of homes that are uninsurable or with low cap limit (\$10k-\$20k)
- \$1 insured loss = \$3-4 uninsured losses incurred by government, business and individuals



Loss + Loss Adjustment Expenses

\$2020 - total natural-catastrophe losses normalized by inflation and per-capita wealth accumulation

Excluding events when loss < \$25 M, 2008 onward

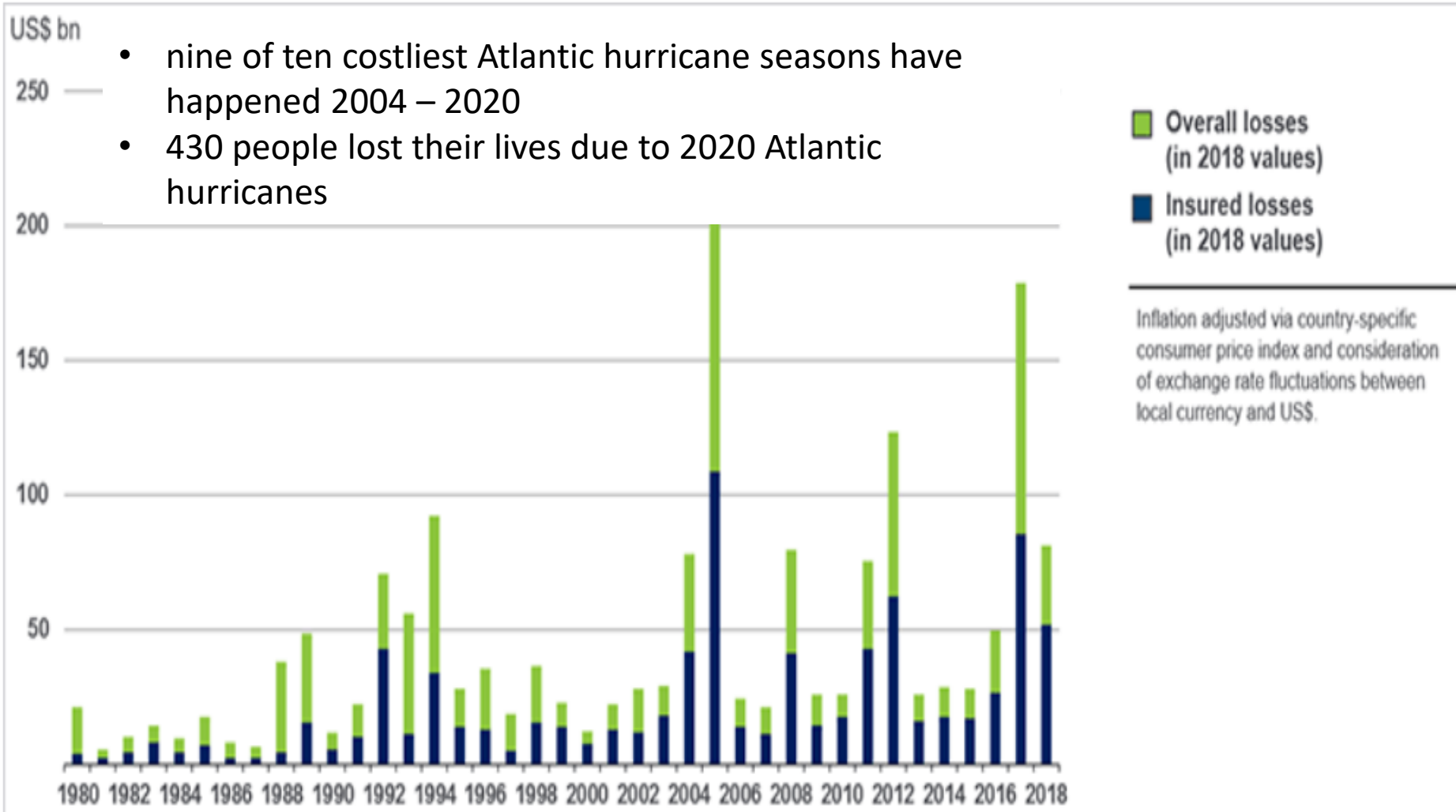
2020 January to November CAT events

Source: CatIQ, PCS, IBC Facts Book, Statistics Canada, IMF WEO Database



# US INSURED CATASTROPHIC LOSSES (\$US)

8





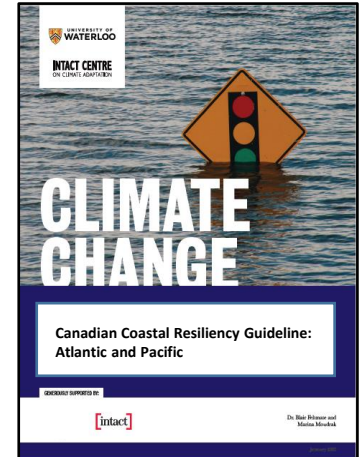
# GUIDELINES TO LIMIT FLOOD RISK

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Home



Sea Level Rise



New Community



Existing Community



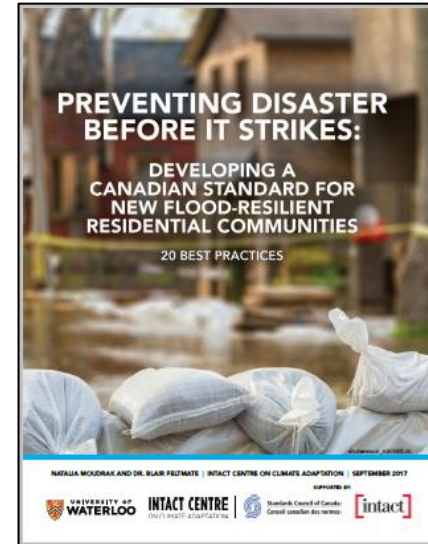
Commercial Real Estate



Natural Infrastructure

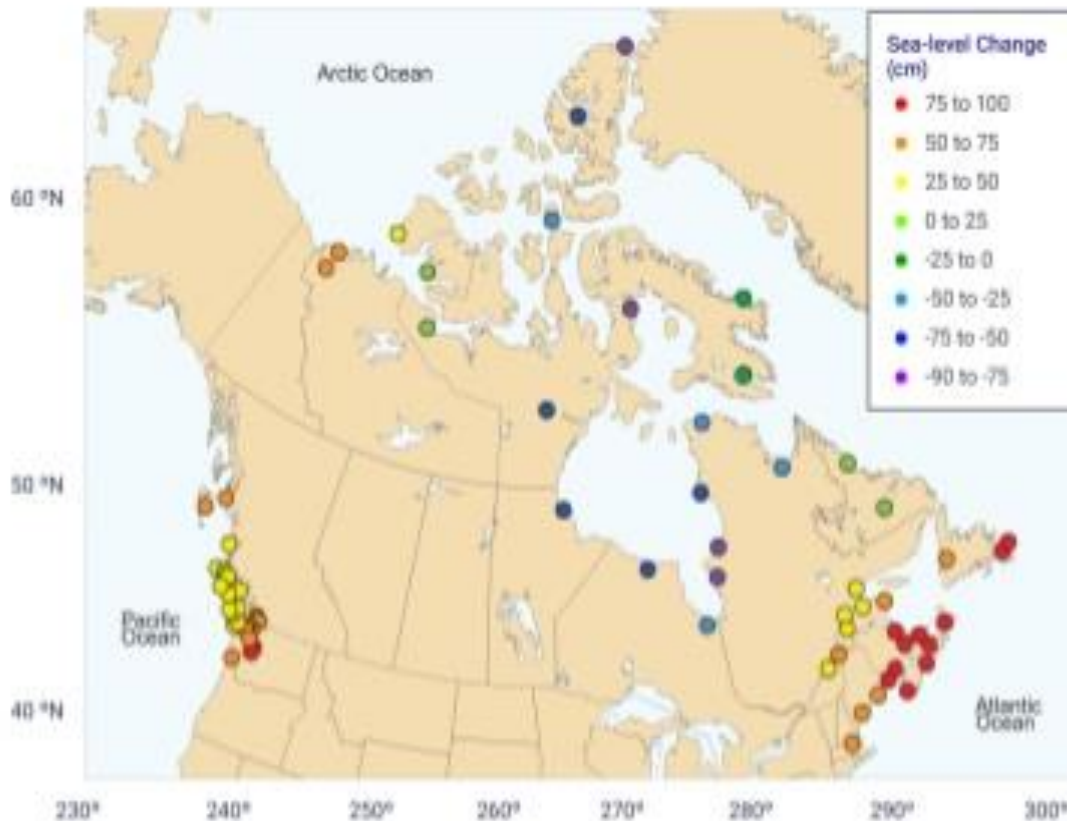
A multitude of actions can be engaged to limit flood risk (applicable to new and existing communities):

1. Flood walls
2. Berms
3. Diversion channels
4. Holding ponds
5. Cisterns/storage tanks/  
tunnels
6. Sewer separation projects
7. Naturalized areas





## Relative Sea-Level Change in Canada



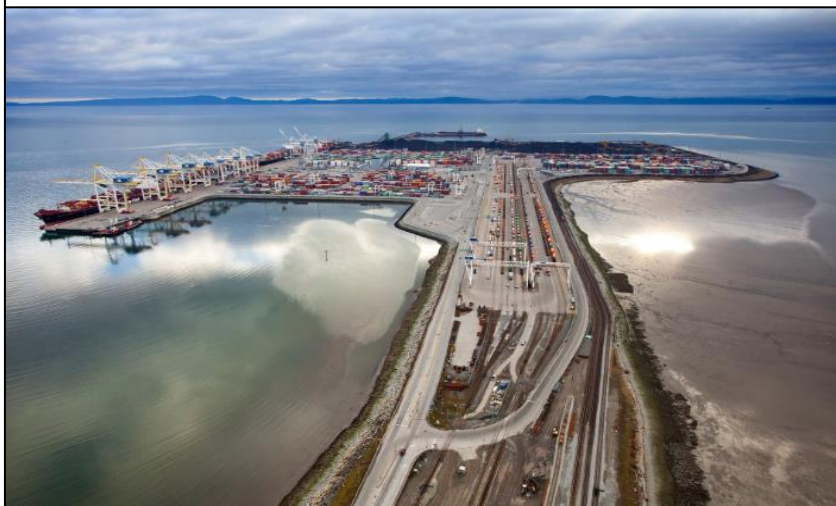
- End-of-century projected relative (local) sea-level change under a high emission scenario, relative to 1986-2005 reference period
- Global mean sea level is projected to rise, but along Canada's coastlines, sea level will rise in some places, fall elsewhere.
- Much of Hudson Bay and the Canadian Arctic Archipelago are projected to experience continuing sea-level fall, while the rest of Canada is projected to experience sea-level rise.

### SEA CHANGE

## For Port of Vancouver, underestimating Pacific sea-level rises could come at a high price

B.C.'s Lower Mainland is a busy and constantly growing centre of Pacific commerce, but as oceans rise, storm surges could leave many of the biggest facilities under water, **Matthew McClearn** reports

**MATTHEW MCCLEARN**  
VANCOUVER  
PUBLISHED MAY 13, 2018



## Hurricane, floods cripple Texas ports, freight networks

Joseph Bonney | Aug 27, 2017 10:02PM EDT

## Climate change will hurt shipping sector, says Canada

## From diverted ship traffic to delayed shipments, here's how Hurricane Harvey is impacting South Louisiana businesses

BY TIMOTHY BOONE AND RICHARD THOMPSON | TBOONE@THEADVOCATE.COM RTHOMPSON@THEADVOCATE.COM AUG 28, 2017 - 4:19 PM (...)

# High water levels threaten St. Lawrence shipping

## OmniTrax can't afford to fix Churchill railway, says president



Federal and provincial governments must get involved, says Mervin Tweed

Laura Glowacki - CBC News - Posted: Jun 16, 2017 7:48 PM CT | Last Updated: June 16, 2017



OmniTrax officials says there are 24 known breaks along the Hudson Bay Railway between Gillam and Churchill. (OmniTrax)

## British Columbia fires disrupt Rocky Mountaineer

By Bob Johnston | July 11, 2017

## Train to Churchill suspended after 'catastrophic' flood damage to track



OmniTrax says the future of the track could be in jeopardy, suspension could last until next spring

CBC News - Posted: Jun 09, 2017 2:38 PM CT | Last Updated: June 12, 2017

CANADA

January 13, 2018 6:21 pm

Updated: January 13, 2018 6:25 pm

## Surging water levels wash away part of railway bridge in Sherbrooke

By The Canadian Press

## 'It felt like a sinking boat': Police rescue 1,400 passengers from waterlogged commuter GO train

*A five year old girl and a seven-month pregnant woman were among passengers who were rescued after record breaking rain left portions of a GO train under water*

## August downpour floods many streets, Union Station

August 17, 2018



## Fundamentals of coastal resiliency:

- Sea level rise, storm surge and King Tides produce synergistic impacts
- Coastal adaptation must consider flooding and erosion risk in tandem
- There is international movement towards solutions that:
  - combine grey and natural infrastructure
  - nature-based solutions emerging in Canada

# COASTAL RESILIENCY: NEXT STEPS

- **Avoidance:** prevent development in vulnerable areas – e.g., based on current and future focused flood risk maps
- **Protection:** includes erecting barriers such as dikes, seawalls & utilizing natural infrastructure
- **Accommodation:** build structures with understanding that flooding will occur
- **Managed Retreat:** strategic retreat from areas not worth saving
- **Dependencies:** check the resiliency of sectors your sector depends on (e.g., railway terminals/access)

## The Adaptation “Bonus Plan”

- Adaptation is local
- Adaptation is the “gift that keeps on giving”
- Building right costs (about) the same as building wrong
- What’s missing... **URGENCY!**