Climate Change Risk Assessment and Adaptation Initiatives in PEI

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Outline

- Climate Change Risk Assessment
- New Coastal Hazard Data
- Using Coastal Hazard Data
- Challenges in Adaptation
- Development of a Provincial Adaptation Plan
- Conclusions and Q&A

CLIMATE CHANGE RISK ASSESSMENT

Project Overview

- The Government of PEI conducted a climate change risk assessment for the Island in response to Auditor General's 2017 report

- It identifies and prioritizes social, environmental, health, economic, and cultural risks related to climate change impacts

- The project team engaged virtually:
  - Federal, provincial, and municipal government stakeholders
  - Subject matter experts from external agencies
  - The Mi'kmaq communities in PEI

- The project was jointly funded by the Province of PEI and Natural Resources Canada. ICF Consulting Canada was the contracted consultant

Identify Climate Hazards

Climate Hazard	Scenario
Severe ice storm/freezing rain	Multi-day severe ice storm/freezing rain event in winter
Post-tropical storm	Multi-day post-tropical storm with heavy rain, storm surge, and wind; landfall in Queens County
Heavy precipitation and flooding	100mm of rain in 24 hours
Seasonal drought	Months-long severe summer drought affecting the entire province
Coastal erosion	Acceleration of the historic rate of erosion
Heat wave	Three consecutive days with temperatures above 29°C
Earlier, warmer springs	Earlier arrival of spring temperatures by two weeks affecting key species

Rate Likelihood

Likelihood	Rating	Criteria for Discrete Climate Hazards	Criteria for Ongoing Climate Hazards
Almost certain	5	Event is expected to happen about once every two years or more frequently (i.e., annual chance ≥ 50%*).	Event is almost certain to cross critical threshold.
Likely	4	Event is expected to happen about once every 3-10 years (i.e., 10% ≤ annual chance < 50%).	Event is expected to cross critical threshold. It would be surprising if this did not happen.
Possible	3	Event is expected to happen about once every 11-50 years (i.e., 2% ≤ annual chance < 10%).	Event is just as likely to cross critical threshold as not.
Unlikely	2	Event is expected to happen about once every 51-100 years (i.e., 1% ≤ annual chance < 2%).	Event is not anticipated to cross critical threshold.
Rare	1	Event is expected to happen less than about once every 100 years (i.e., annual chance <1%).	Event is almost certain not to cross critical threshold.

*Annual chance is the probability that an event will occur in a given year

Rate Consequences

Each consequence category was rated on a 5-point scale (1=insignificant, 5=catastrophic)

Health	Measure of impacts to public health and safety, specifically: • Loss of life • Morbidity, injury, disease or hospitalization • Mental health
Economy	Measure of impacts to economic activity, broken out into: • Tourism and recreation • Agriculture, Fisheries, and Aquaculture • Other industries
Environment	Measure of impacts to the natural environment such as wetlands, forests, conservation areas, vulnerable species and biodiversity
Social Stability	Measure of disruption to daily life, livelihoods, community institutions, sense of place
Infrastructure	Measure of impact/disruption to roads, bridges, water, wastewater/stormwater, energy and telecommunications, buildings and facilities, and other built infrastructure

Risk Assessment Approach

Climate Science

Literature Review

Local Expert Input

Rate Likelihood

(1) Rare → (5) Almost Certain

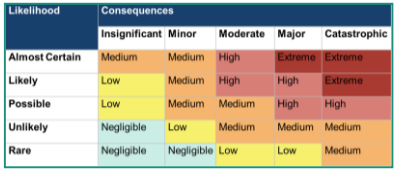
- Discrete hazards
- Ongoing hazards

Rate Consequences

(1) Insignificant → (5) Catastrophic

- Loss of life
- Morbidity, illness…
- Mental health
- Tourism and recreation
- Agriculture, fisheries…
- Other economic industries
- Environment
- Social stability
- Infrastructure

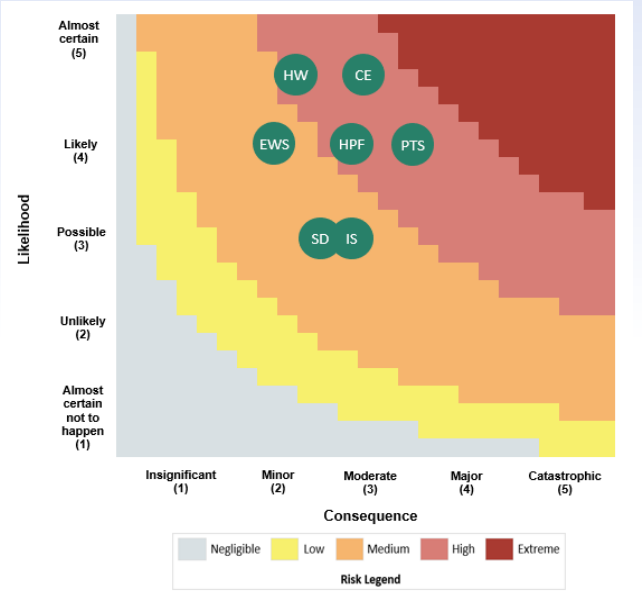
Rate Risk



Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	Medium	Medium	High	Extreme	Extreme
Likely	Low	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	High
Unlikely	Negligible	Low	Medium	Medium	Medium
Rare	Negligible	Negligible	Low	Low	Medium

Key Findings

- The greatest levels of risk to PEI by 2050 result from:
  - coastal erosion,
  - post-tropical storms,
  - heat waves, and
  - heavy precipitation and flooding.
- Other climate hazards that have the potential to result in significant consequences include severe ice storm/freezing rain, earlier warmer springs, seasonal drought.
- All scenarios evaluated would have high-risk, province-wide consequences in at least one category.



Overall risk rating matrix. Hazard legend:

CE = coastal erosion
PTS = post-tropical storm
HW = heat wave
HPF = heavy precipitation/flooding
IS = ice storm/freezing rain
EWS = earlier/warmer spring
SD = seasonal drought

Overall Risk Assessment Results*

Climate Hazard	Scenario	Current Risk Rating (Score)	2050 Risk Rating (Score)
Coastal erosion	Acceleration of the historic rate of erosion	Medium (9.2)	High (15.3)
Post-tropical storm	Multi-day post-tropical storm with heavy rain, storm surge, and wind making landfall in Queens County	High (14.1)	High (14.1)
Heat wave	Three consecutive days with temperatures over 29°C	Medium (7.0)	High (11.7)
Heavy precipitation and flooding	100 mm rain event in 24 hours	Medium (8.4)	High (11.2)
Severe ice storm/freezing rain	Multi-day severe ice storm/freezing rain event in winter	High (12.3)	Medium (9.2)
Earlier, warmer springs	Earlier onset of spring temperatures by two weeks affecting key species	Low (4.4)	Medium (8.8)
Seasonal drought	Months-long severe summer drought affecting the entire province	Medium (7.4)	Medium (7.4)

*Note: **Coastal flooding and storm surge are acknowledged as posing a significant threat now and in the future for Prince Edward Island.** However, these hazards were being addressed through an independent yet parallel coastal hazard assessment and were therefore omitted as a standalone climate hazard scenario in this risk assessment.

Risk scores by consequence category

Risk Score (low end inclusive)	Rating
0 – 3	Negligible
3 – 5	Low
5 – 11	Medium
11 – 18	High
18+	Extreme

Hazard	Consequence Category									
	Health			Economy			Environment	Social Stability	Infrastructure	Overall Risk Rating
	Potential loss of life	Potential Morbidity, injury, disease, or hospitalization	Mental health	Tourism and recreation	Agriculture, fisheries, aquaculture	Other industries				
Coastal Erosion	5	5	15	15	10	15	20	15	20	**15.3**
Post-tropical storm	12	12	8	12	16	8	16	12	20	**14.1**
Heat wave	15	20	10	5	15	5	10	10	15	**11.7**
Heavy precipitation and flooding	8	12	8	8	16	8	12	8	16	**11.2**
Severe ice storm/freezing rain	12	12	6	3	6	9	9	6	15	**9.2**
Earlier, warmer springs	4	4	4	8	12	4	16	4	12	**8.8**
Seasonal drought	3	6	12	3	12	3	9	9	6	**7.4**

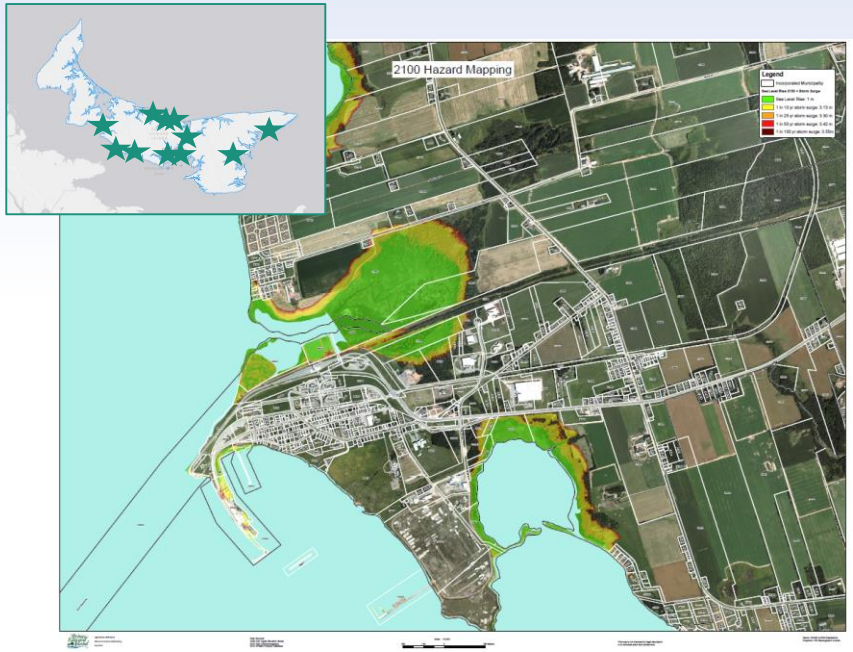
Climate Change Risk Assessment Conclusions

- Climate hazards will have broad impacts in many sectors and thus will require **urgent, coordinated, cross-sectoral response**
- Risks across hazards and consequence categories are **interconnected**
- Climate change impacts will **affect some people more than others**
- **The climate risks PEI faces through 2050 are not fixed;** the results of the risk assessment process are likely to change as hazards are revisited, research progresses, and adaptation strategies are implemented

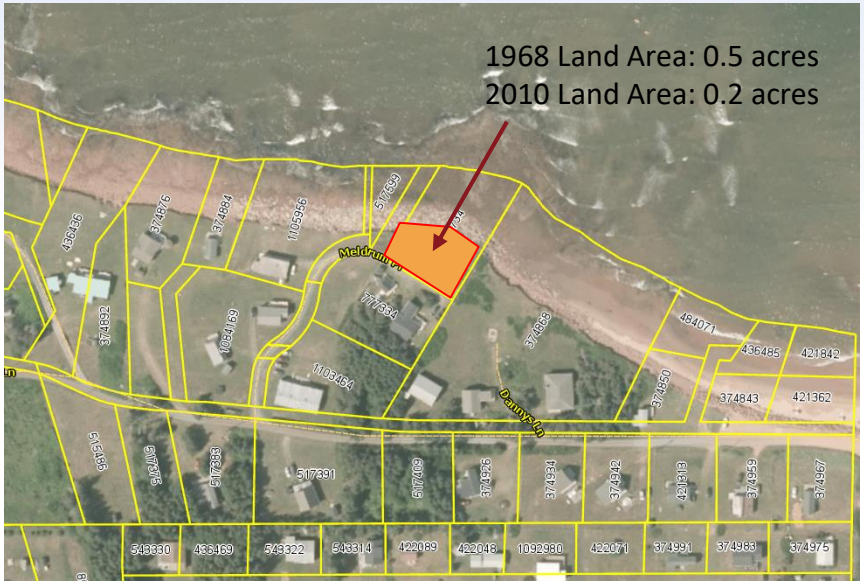
NEW COASTAL HAZARD DATA

Updated data and maps

IN PEI, COASTAL HAZARDS INCLUDE COASTAL FLOODING AND COASTAL EROSION.



Until last year, coastal flood data for the province was based on studies on 11 communities.

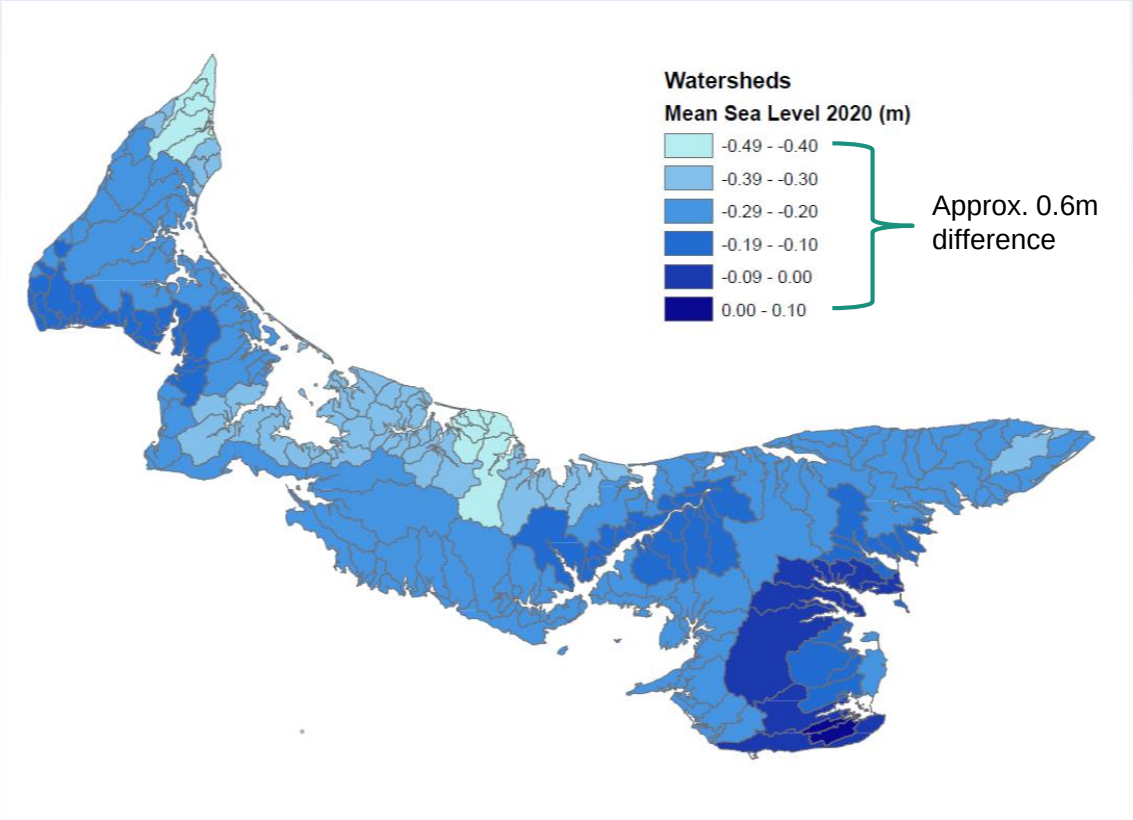


Coastal erosion data is based on coastal change between 1968-2010. Updates to the coastal change data are ongoing.

THE NEW DATA IS MORE PRECISE AND IS LOCALLY SPECIFIC

The new data covers all **286 watersheds** accounting for the differences in coastline characteristics and water depth.

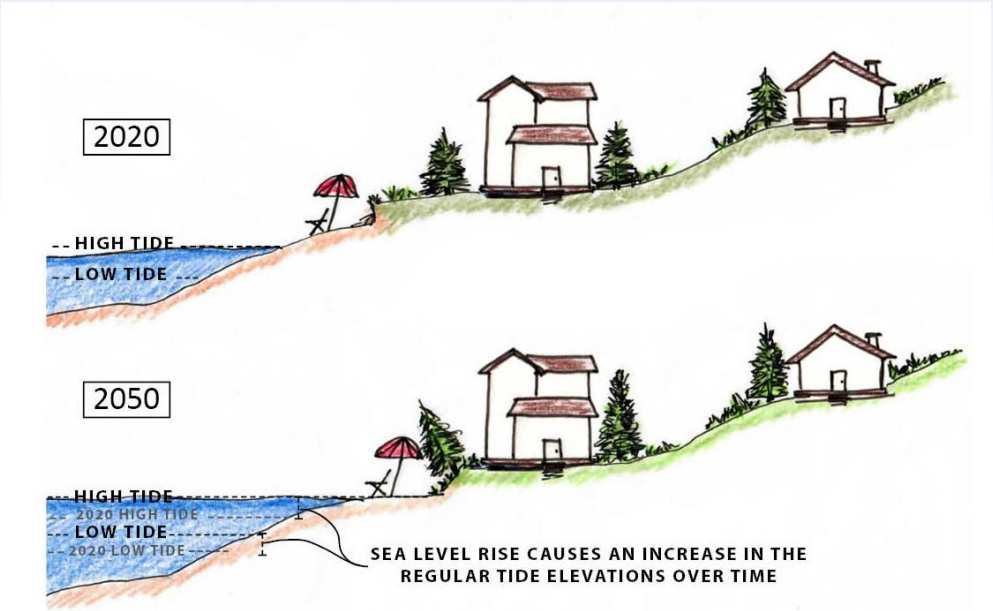
In some areas flood waters reach higher elevations. We now have the data to support this.



THE NEW FLOOD HAZARD DATA INCLUDES:

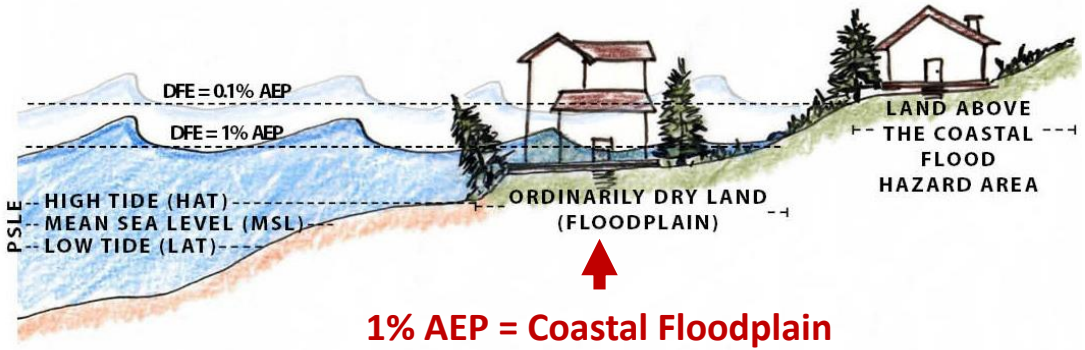
1. Projected sea level rise for each decade (2020 to 2100):

- Low tide (LAT and MLLW)
- Mean sea level
- High tide (HAT and MHHW)



THE NEW FLOOD HAZARD DATA INCLUDES:

2. Storm surge flood water elevations for 2020, 2050 and 2100 for a range of storm intensities.



A storm surge is expressed in terms of probability
(how likely it will occur in any given year).
Storm surge flood water will gradually reach further inland
as sea level continues to rise.

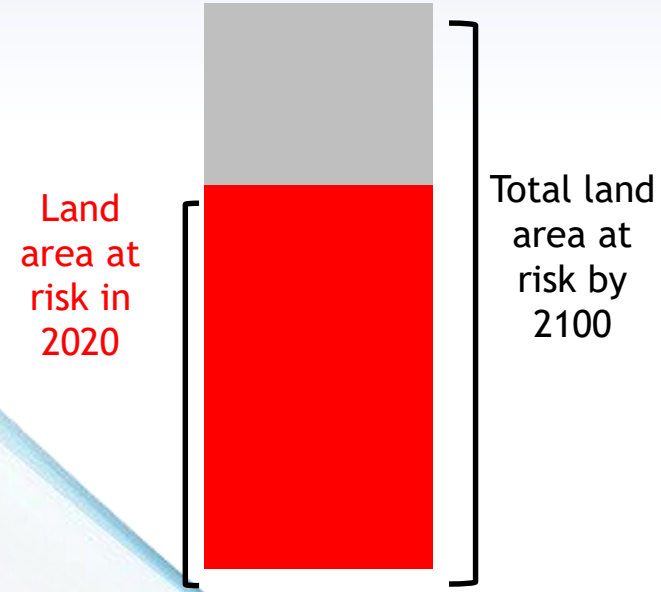
The coastal floodplain is the area of land that will be affected by a flooding event with a 1% chance of happening each year (the 1-in-100-year storm).

Coastal Floodplain (2020) — **High hazard**

Coastal Floodplain (2050) — **High-moderate hazard**

Coastal Floodplain (2100) — **Low-moderate hazard**

Of the total land area at risk of coastal flooding in 2100,
68% is already at risk today.



USING COASTAL HAZARD DATA

Data sharing, decision making, disclosure, and warning systems

Strategic Rollout of Coastal Flood Data

Internal Distribution

Over 20 presentations delivered across government departments and divisions

External Distribution

Targeted outreach to external groups is ongoing, including First Nations, municipalities, and professional associations

Public Distribution

The data has been available upon request to the general public since spring 2021.

A new coastal hazard website with tools and resources was released to the public in mid-November

New coastal hazard tools

1. **Coastal Hazards Information Platform (CHIP)**
   Publicly accessible, interactive online map

2. **Coastal Hazard Assessment**
   Property-specific assessment, completed upon request

3. **Watershed Flood Projections Reports**
   Technical guidance for developers and design professionals

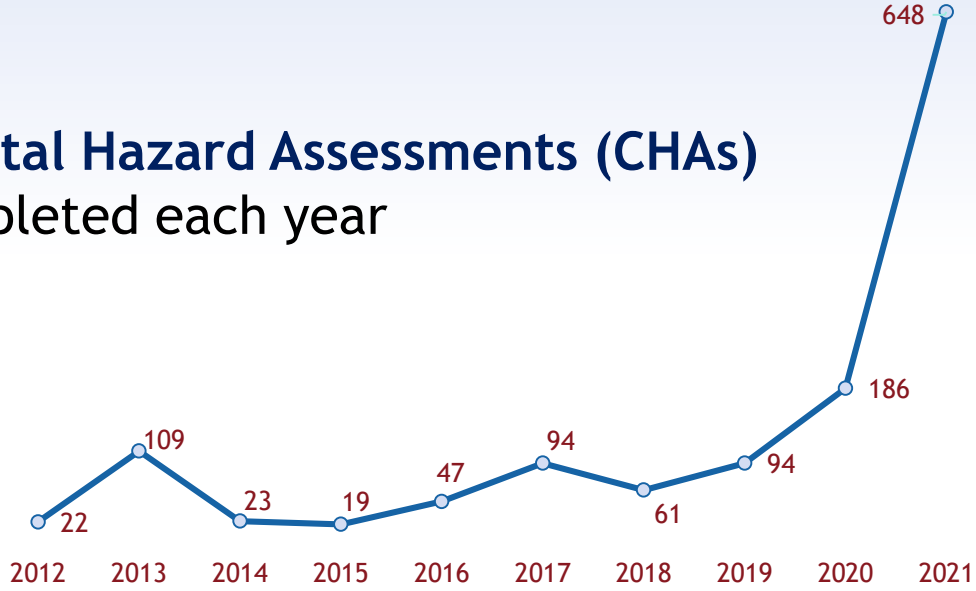
4. **FREE online course** through UPEI ClimateSense program
   Protecting PEI Homes from Flooding and Erosion (5 hours)

ClimateSense

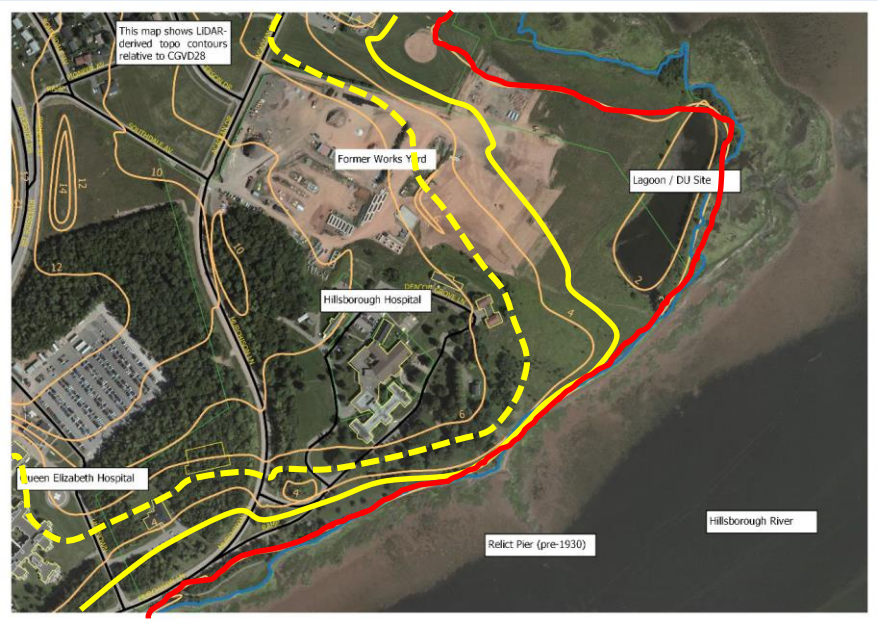
www.princeedwardisland.ca/coastalhazards

Information sharing upon request

Coastal Hazard Assessments (CHAs)
completed each year



Using Coastal Hazard Data in Decision Making



No Critical infrastructure below the dashed line

0.1% AEP, 1 in 1000 yr storm surge event

Only risk-tolerant infrastructure and land uses below the yellow line

1% AEP 2100 (future) floodplain

No infrastructure below the red line

1% AEP 2020 (current) floodplain

The new data influenced the site design of the new Hillsborough Hospital

Flood Hazard Disclosure

The Province discloses flood hazard information in the subdivision and development approvals process by including a Coastal Hazard Assessment for all applications on coastal properties.

Flood Hazard Disclosure

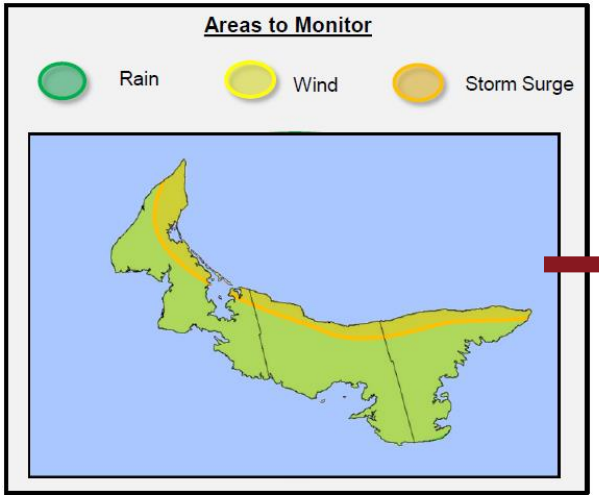
https://ctmirror.org/2015/05/04/flood-insurance-hikes-arriving-at-a-waterfront-near-you/

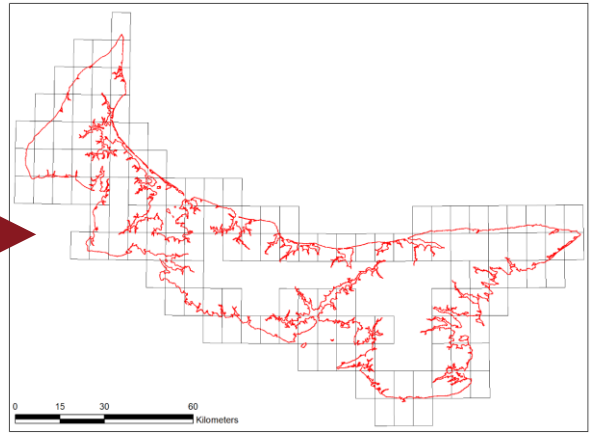
Public Safety Canada's guidelines state that "any **new development located within the floodplain will not be eligible** for Disaster Financial Assistance Arrangements (DFAA) unless specifically designed to withstand a 1-in-100 year flood".

Note. They do not say all development is prohibited, but only INFORMED and DESIGNED DEVELOPMENT will be covered.

Improved Flood Hazard Warning System
(in collaboration with Environment and Climate Change Canada)

As part of the 2019 *Emergency Management Strategy for Canada*, led by Public Safety Canada, ECCC received funding to "**expand flood forecasting capacities in all coastal regions and include coastal water level forecasts for the Great Lakes and the St. Lawrence**".





CHALLENGES IN RISK REDUCTION

Key challenges in risk reduction

Challenge #1: Insufficient or outdated information

- Sound decision-making relies on sound data
- In order to adapt properly to a changing climate, we need good information about current and future risk:
  - Coastal flooding (sea level rise / storm surge)
  - Coastal erosion
  - Post-tropical storms
  - Inland flooding (heavy rainfall)
  - Extreme heat
  - Ice storms

Key challenges in risk reduction

Timeline of key risk reduction efforts since 2010

(2010) Coastal change (erosion) data

(2011) SLR and storm surge flood scenarios

(2011) Shoreline classification

(2011) Community-based vulnerability assessment

(2012) Inland flooding vulnerability assessment of Hillsborough Watershed

(2012-2016) Capacity building, training, workshops

(2016) Adaptation 'Decision Tree' Tool

(2016) Cost-Benefit Analysis of impacted sites

(2016) PEI Coastal Property Guide

(2018) PEI Climate Change Action Plan

(2019-2021) ClimateSense

(2020-2021) Climate Change Risk Assessment

(2021) Island-wide coastal flood maps

Key challenges in risk reduction

Lots of good information, and yet…

- Limited **urgency**
- Limited **capacity**
  - Financial (Project-based funding vs annualized funding)
  - Human resources (full-time, dedicated staff)
  - Knowledge and training (sector-specific impacts and linkages)
- Limited **access**

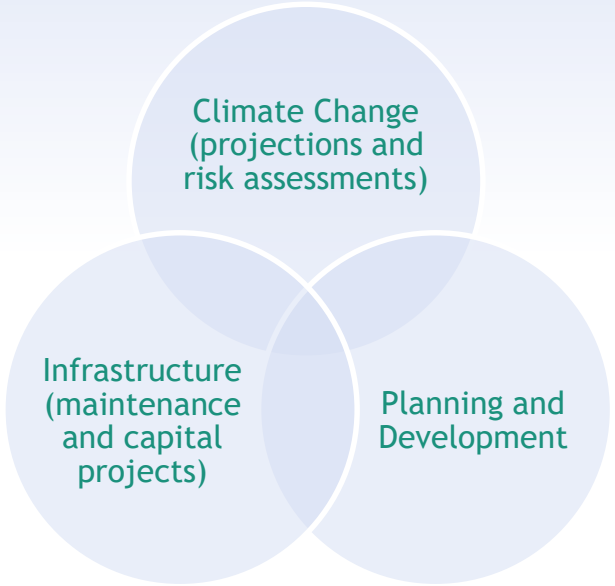
Credit: DE Jardine

Key challenges in risk reduction

Challenge #2: Overcoming silos

(a.k.a. ‘mainstreaming’)

- Not all disciplines / departments / sectors work seamlessly together
- Integrating climate considerations into decision-making is easier for some than others
- Our challenge regarding climate information:
  - Sell it (i.e. here’s how it affects you)
  - Translate it (i.e. here it is in language you speak)
  - Support it (i.e., how can we help)



Example. Government departments working together to build resilience

Key challenges in risk reduction

Challenge #3: Measuring progress

- Climate impacts are localized therefore adaptation tends to be localized
- There are few consensus adaptation targets
- How do you know if you're making a difference?
- How do you know when you're done

Key challenges in risk reduction

Challenge #4: Disproportionate impacts

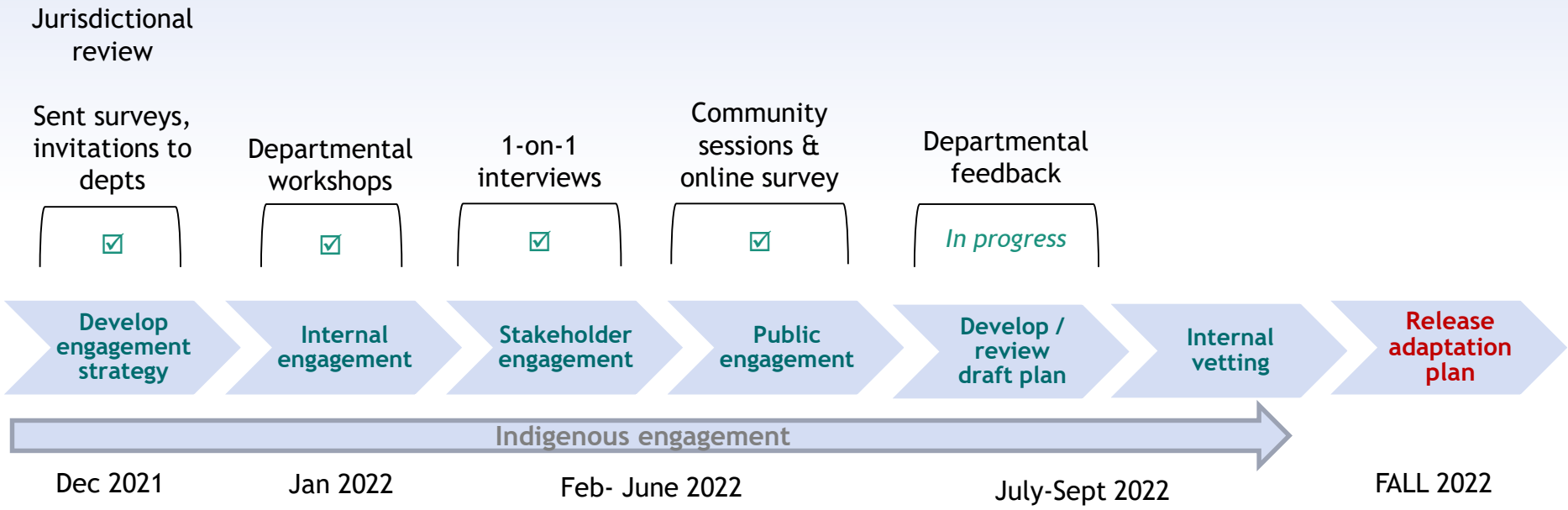
Numerous factors can increase the vulnerability of groups and individuals

- Income
- Health
- Age
- Gender
- Location
- Housing
- Indigeneity
- Intergovernmental dynamics
- Access to resources (human, financial, and others)

Figure 26. Spatial distribution of example vulnerability drivers in PEI by Census District [1].

DEVELOPMENT OF A
PROVINCIAL CLIMATE ADAPTATION PLAN

Development of a PEI's Climate Adaptation Plan



Draft framework

5 themes

Protect habitat and biodiversity

Build resilient communities

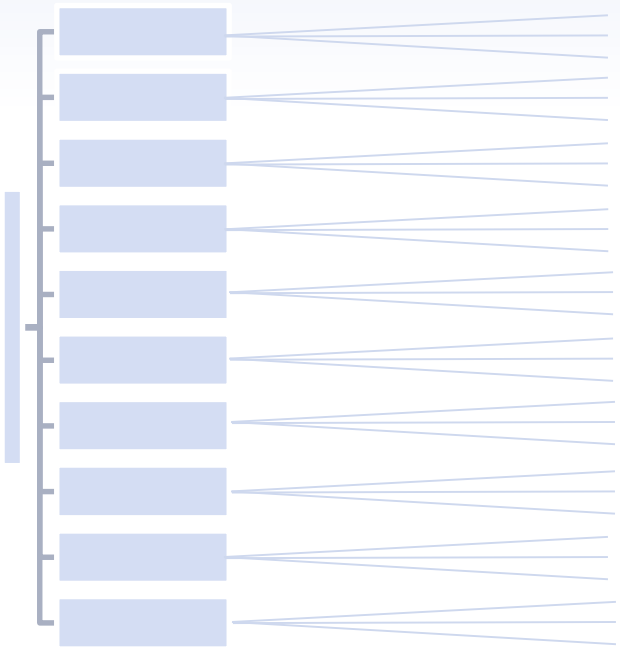
Advance health and mental resilience

Develop knowledge and capacity

Foster an adaptive economy

10 objectives

~30 actions



10 Draft Objectives

1. **Increase awareness** of climate impacts and ways for people to adapt
2. Build adaptive capacity through **expanded partnerships**, professional training, and knowledge sharing
3. Build resilient communities through **evidence-based policy, planning, and standards**
4. Expand **research** across all sectors to monitor, project, and adapt to climate impacts
5. Explore opportunities to **transition PEI's economy** toward climate readiness
6. Identify and address climate-related impacts to **mental health and wellbeing**
7. Increase resilience of **government operations**, services, and supply chains
8. Increase resilience of **public and private infrastructure** through enhanced design and policy
9. Restore, enhance, and protect our **natural assets** including water, wetlands, and other sensitive habitat
10. Increase preparedness for **extreme heat** through enhanced policy and natural infrastructure

Next Steps – Provincial Climate Change Risks

- Build on what we've learned and gain a better understanding of the risks facing PEI
  - Provincial Crop Study
  - Provincial Critical Coastal Infrastructure Vulnerability Assessment
  - Maritime Electric Risk Assessment
- Develop Island-wide inland flood maps
- Release the provincial climate adaptation plan in Fall 2022

Thank you!

Any questions?

"There is only one big risk you should avoid at all costs, and that is the risk of doing nothing."

-Denis Waitley

Prince Edward Island
CANADA