

# **WELCOME** TO THE ULI COASTAL FORUM

Toronto | May 17, 2023



SPRING MEETING



# The Science Basis

## **Joanna Eyquem**

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# ULI Americas Coastal Forum

## The Science Basis

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- Climate Change and Coastal Communities
  - Global
  - United States
  - Canada
- Urgency (and Opportunity) for Adaptation
- Need to Tackle Multiple Objectives
- Leadership in Real-Estate and Urban Planning and Design



- Applied research centre on Climate Adaptation with a **national focus**
- Bilingual [resources](#)

## Two main goals:

- To influence the national conversation about climate change to address **climate adaptation**
- To help **residents, communities and businesses** to reduce risks associated with climate change and extreme weather events



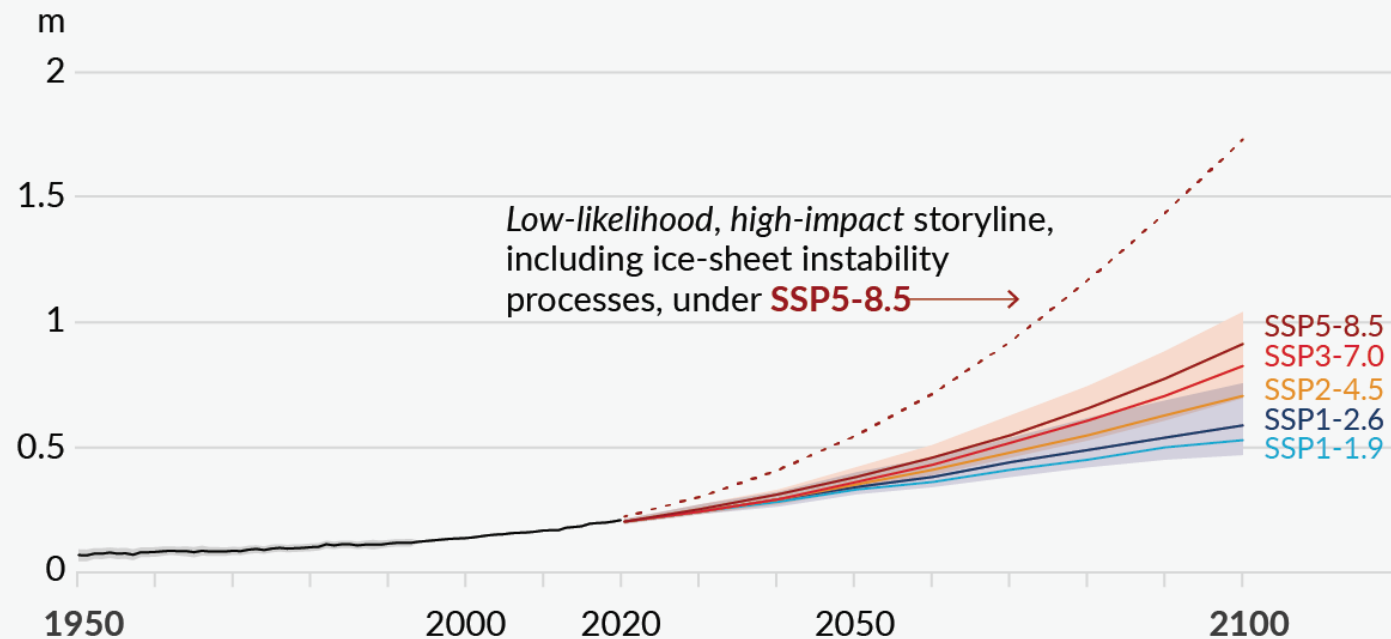
# IPPC 6th Assessment: Global Mean Sea Level Change

(e) Global mean sea level change in 2300 relative to 1900

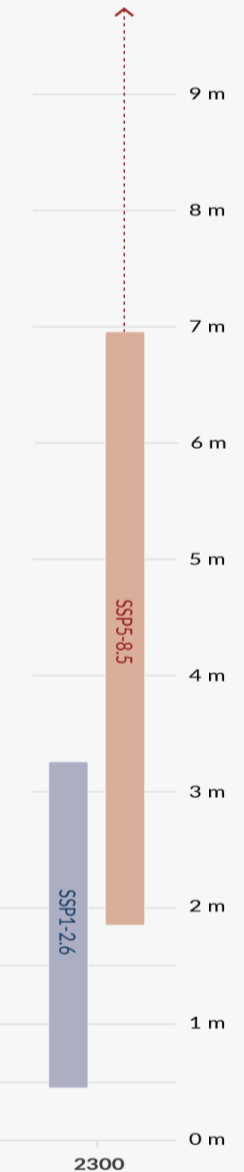
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- It is **virtually certain** that global mean sea level will continue to rise over the 21st century.
- Sea level is **committed to rise for centuries to millennia** due to continuing deep-ocean warming and ice-sheet melt and will remain elevated for thousands of years (*high confidence*).

(d) Global mean sea level change relative to 1900



Sea level rise greater than 15 m **cannot** be ruled out with high emissions





## SIXTH ASSESSMENT REPORT

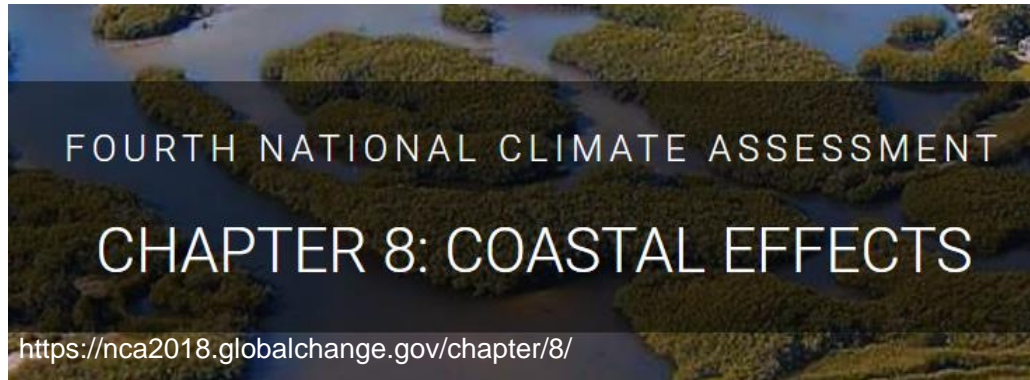
Working Group II – Impacts, Adaptation and Vulnerability

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INTERGOVERNMENTAL PANEL ON climate change



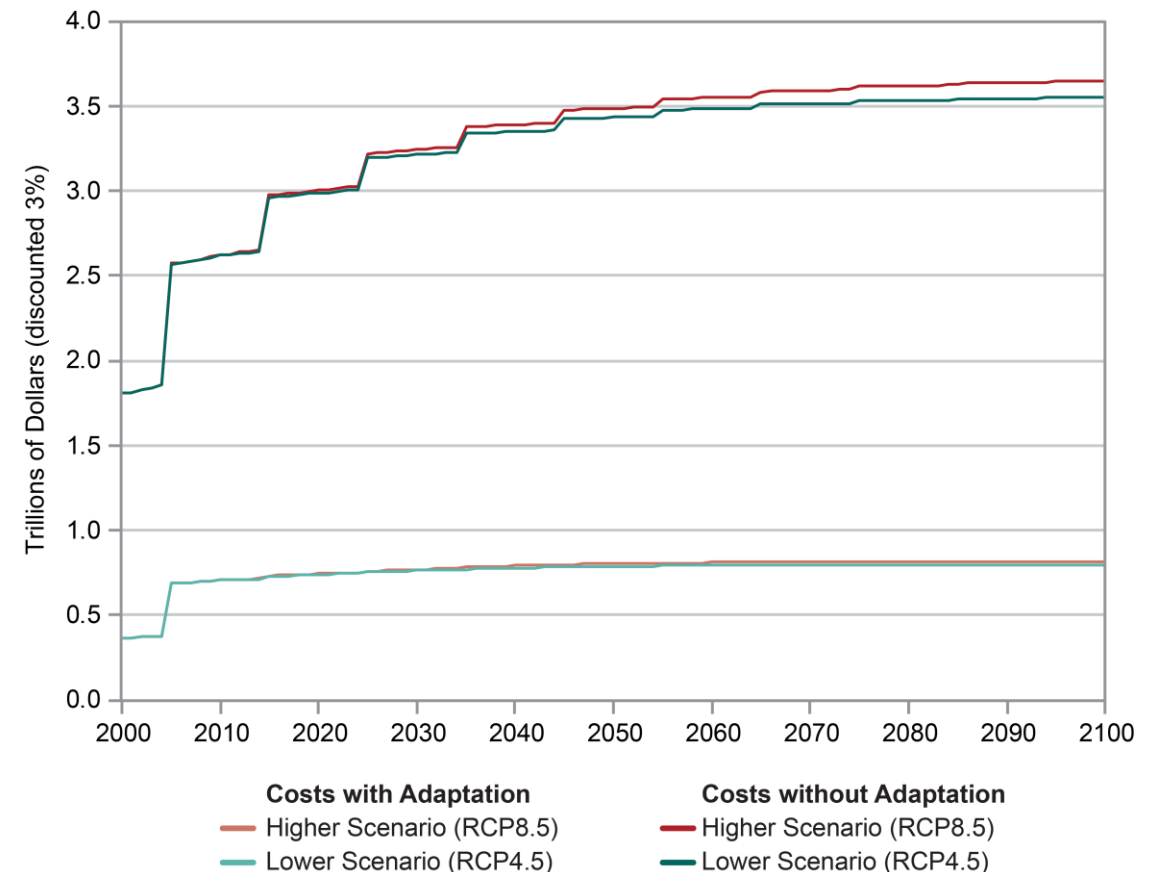
## Fact sheet - Cities and Settlements by the Sea

- Nearly **11% of the global population** (896M) are already living on low-lying coasts directly exposed to coastal hazards
- Population potentially exposed to a 100-year coastal flood is projected to increase by about 20% if global mean sea level rises by 0.15 m relative to 2020 levels; this **exposed population doubles at a 0.75m rise, and triples at 1.4m.**
- **Under all climate and socioeconomic scenarios, low-lying cities and settlements and deltaic communities will face severe disruption, as early as 2050 in many cases**



- **High tide flooding** is already forcing some East Coast cities to install costly pump stations to frequently clear floodwaters from the streets (e.g. Miami)
- The severity of **compound events—the coupling of surge, discharge from rivers, and heavy precipitation**—has increased in many coastal cities
- Modeling suggests that **tropical cyclone intensity** will increase, which would lead to greater damage upon landfall

## Cumulative Costs of Sea Level Rise and Storm Surge to Coastal Property



Note: The stepwise nature of the graph is due to the fact that the analysis evaluates storm surge risks every 10 years, beginning in 2005

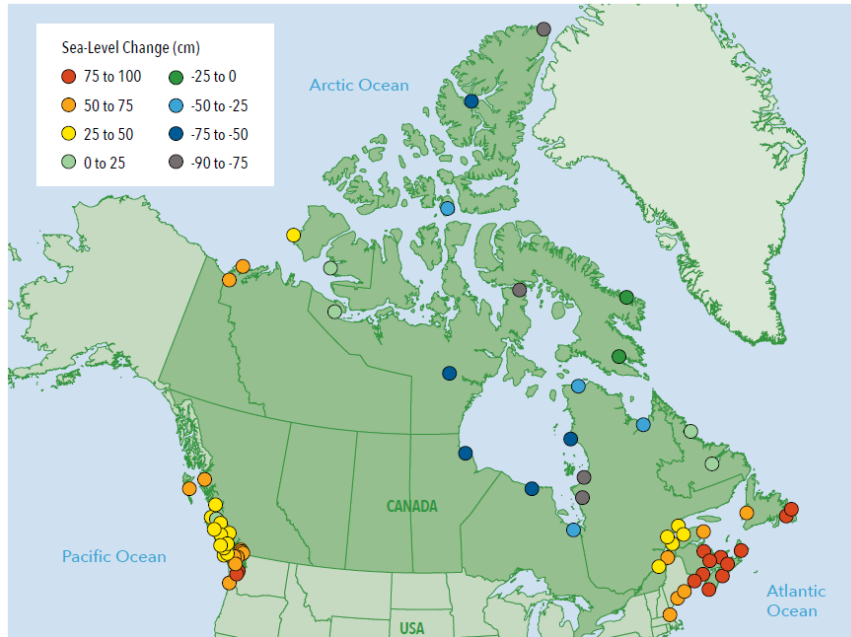




1. Canada's climate **has warmed and will warm further** in the future, driven by human influence.
2. Both past and future warming is on average **about double** the magnitude of global warming.
3. Warming is **effectively irreversible**.

## Climate Impacts

- More extreme heat / less extreme cold
- Shorter seasonal coverage of snow and ice
- Melting of glaciers and permafrost
- **Rise in sea level**
- **+ Intensification of certain extremes:**
  - Intense rainfall and urban flooding
  - **Coastal flooding**
  - Severity of heat waves
  - Risk of drought and forest fire



## Great Lakes

- More extreme variation in water levels (high and low)
- Frequency and intensity of severe storms has already increased (1951-2017)
- Drought, severe storms, and flooding may amplify erosion, sewage overflow, interference with transportation, and flood damage.



## Marine Coasts

- Relative sea-level change
- Storm surge
- Changing sea ice conditions

- Coastal erosion

Dynamics are changing

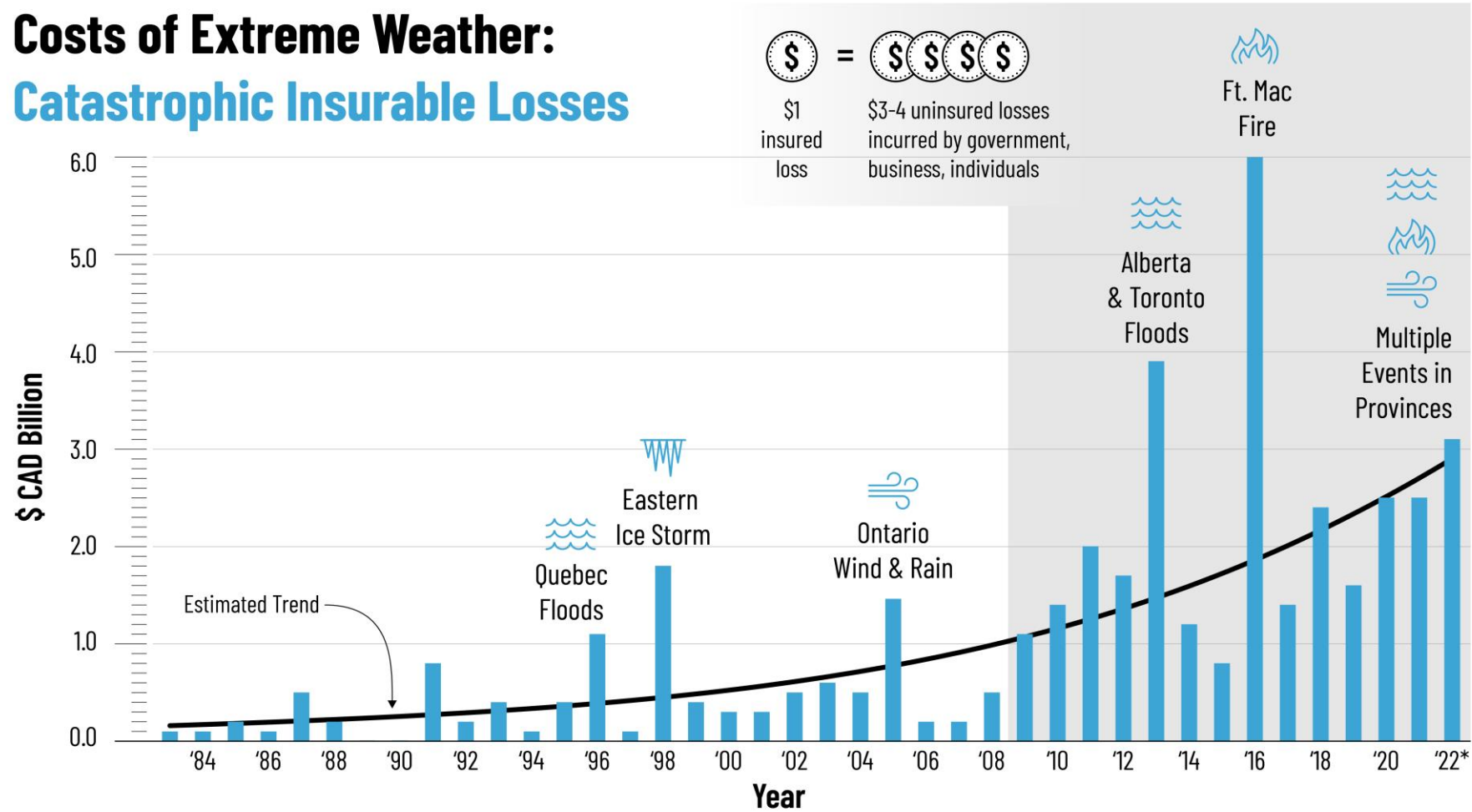
May also be caused by human intervention

- Category 4 Atlantic hurricane
- **Costliest and most intense tropical or post-tropical cyclone to hit Canada on record.**
- Major flooding in Quebec's Magdalen Islands, southeastern New Brunswick, Prince Edward Island, northeastern Nova Scotia, and southern Newfoundland.
- Over \$800M CAD in insured damages
- More than 500,000 customers left without power, including 80% of all Nova Scotia customers and 95% of Prince Edward Island customers





## Costs of Extreme Weather: Catastrophic Insurable Losses

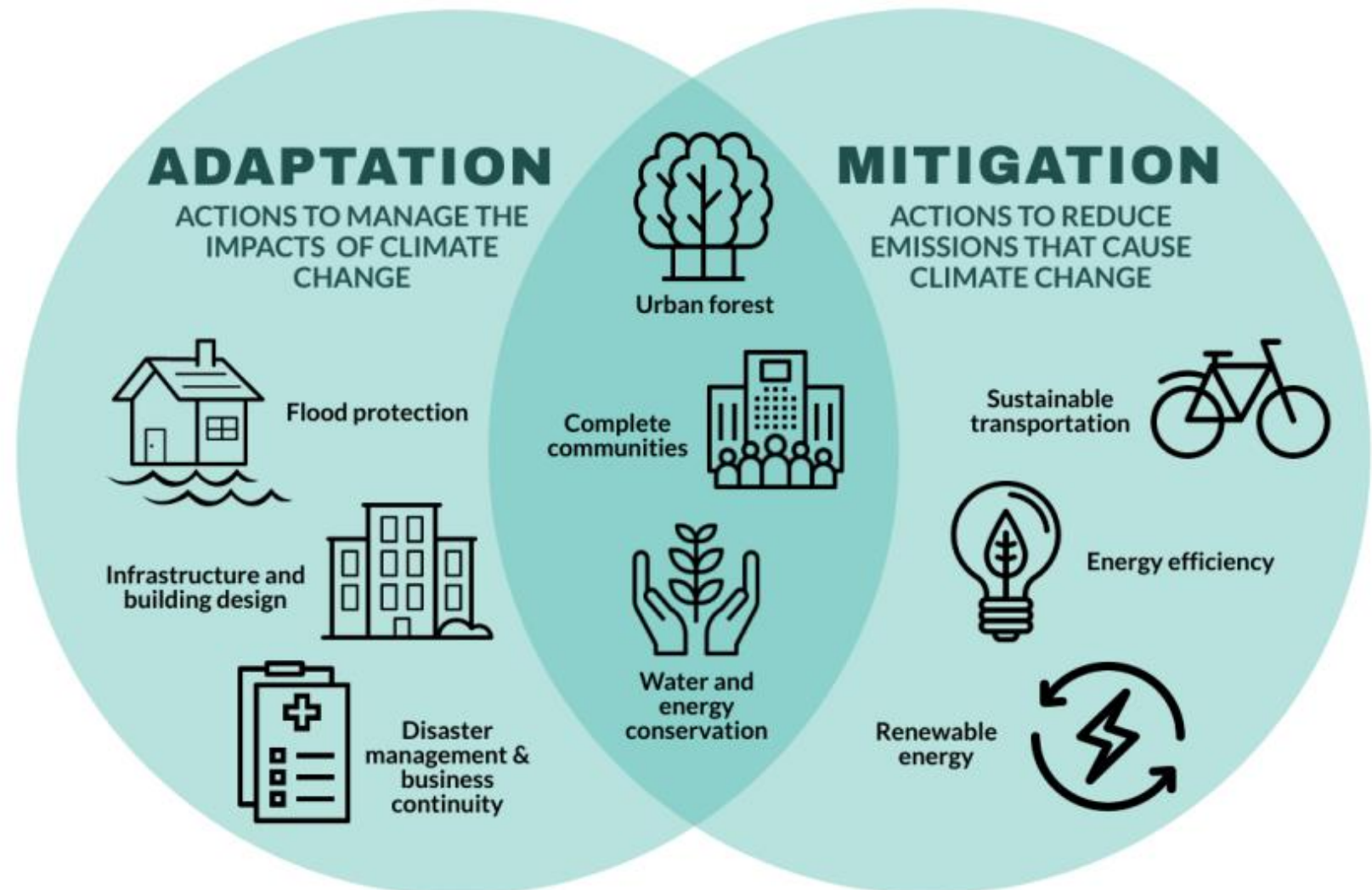


- Most recently over \$2 billion insured losses
- Most losses are not insured.
- Catastrophic losses are not all “financial”, particularly with extreme heat

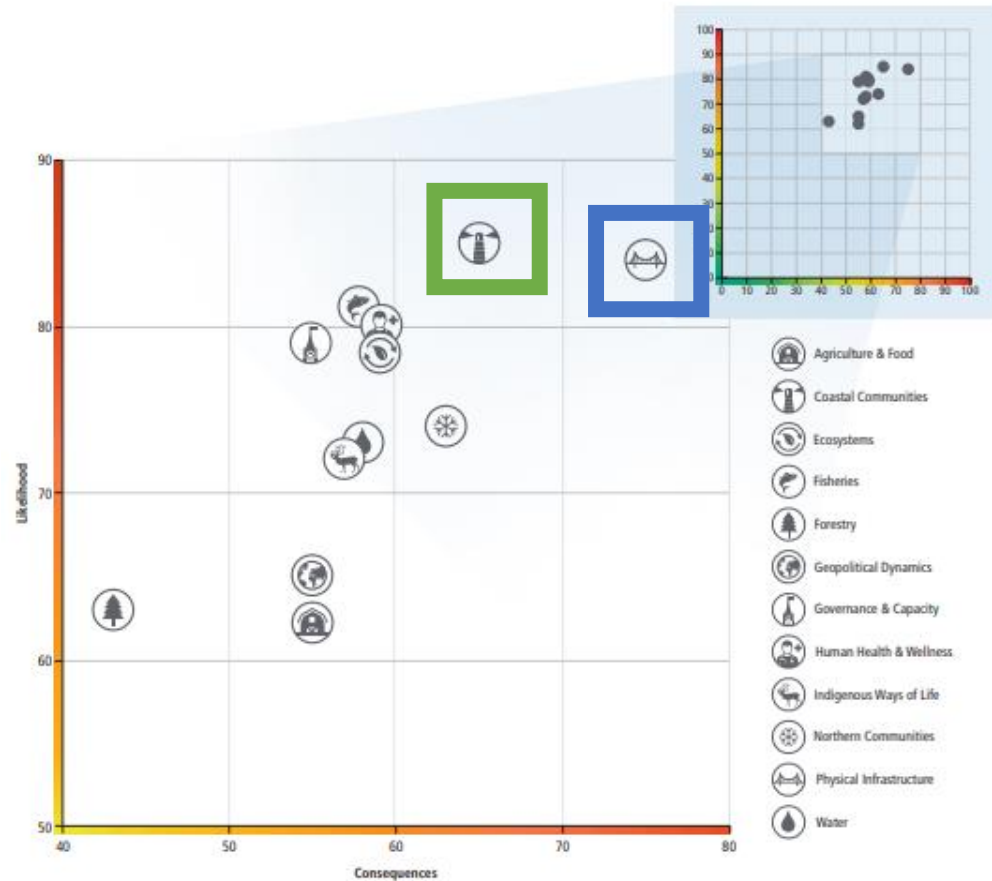
Source: IBC Facts Book, PCS, CatIQ, Swiss Re, Munich Re & Deloitte

\*2022 preliminary values in 2022\$ CAN, corrected for inflation and per capita wealth accumulation.

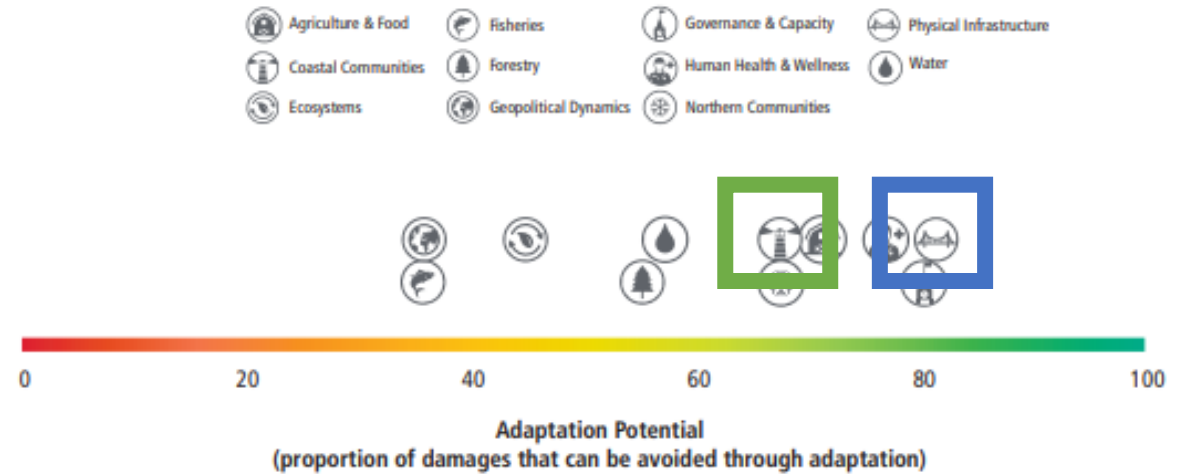
- **Adaptation** is managing the unavoidable
- **Mitigation** is avoiding the unmanageable
- It is not a choice



## Principal risks (Probability x Consequence)



## Potential for Adaptation



**Figure 3.1**

### Panel Assessment of Adaptation Potential by Risk Area

This graph illustrates the ascribed results of the adaptation potential assessment by risk area. The Panel could not produce a defensible evaluation of the adaptation potential of Indigenous ways of life due to the lack of Indigenous members on the Panel and limited inclusion of Indigenous knowledge in the assessment.



# Adapt-action is required at different scales

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## Focus of Flood Resilience Guidance and Standards in Canada



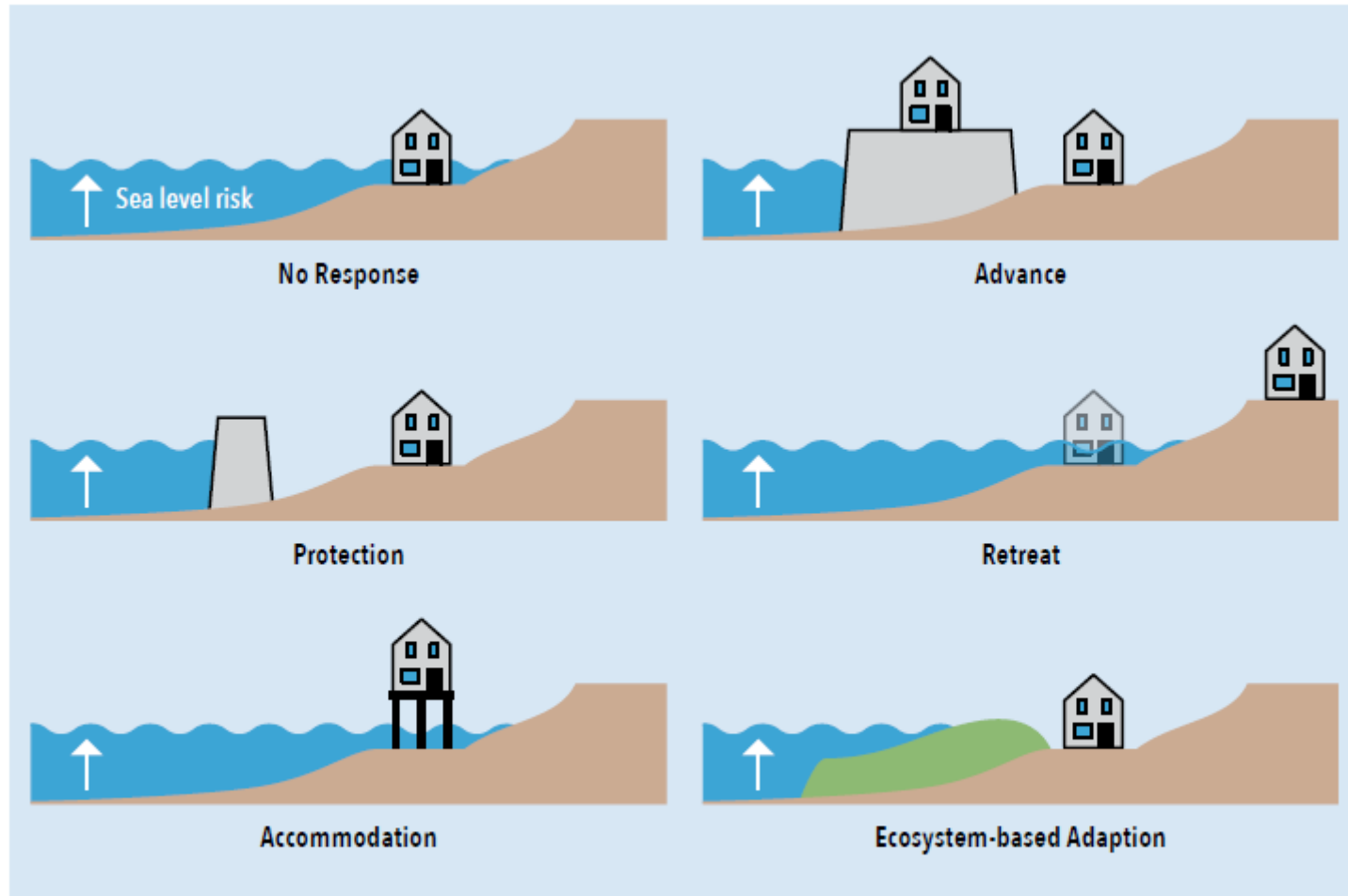


Figure 3 : Different types of responses to coastal risk and sea level rise (Source: Oppenheimer, et al. 2019)<sup>37</sup>

<https://www.ipcc.ch/srocc/chapter/chapter-4-sea-level-rise-and-implications-for-low-lying-islands-coasts-and-communities/>

## SIXTH ASSESSMENT REPORT

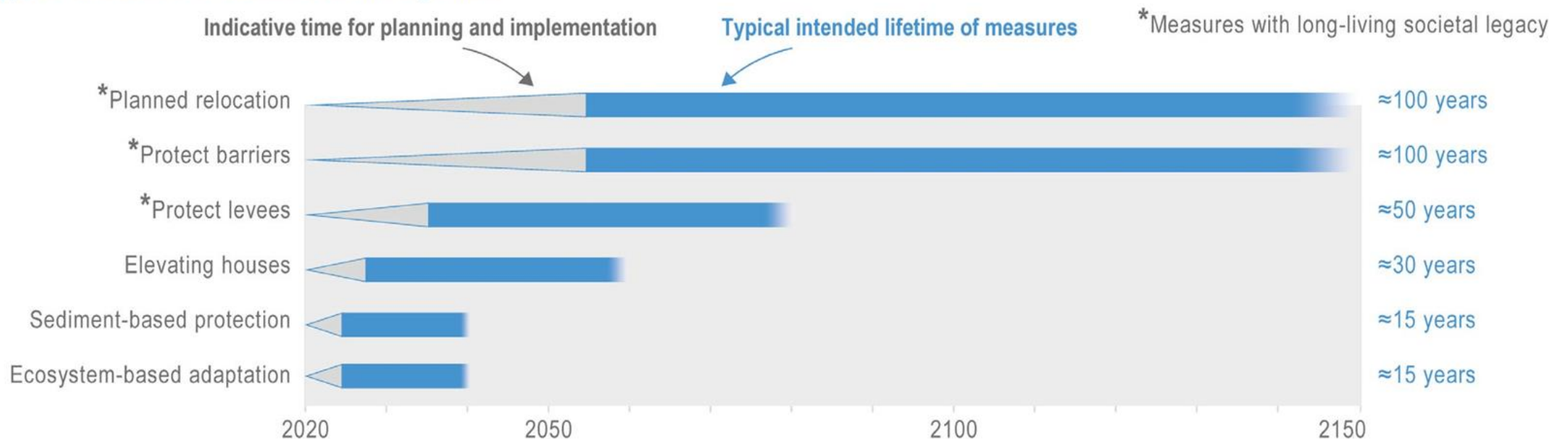
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# Fact sheet - Responding to Sea Level Rise

Typical timescales of coastal risk management

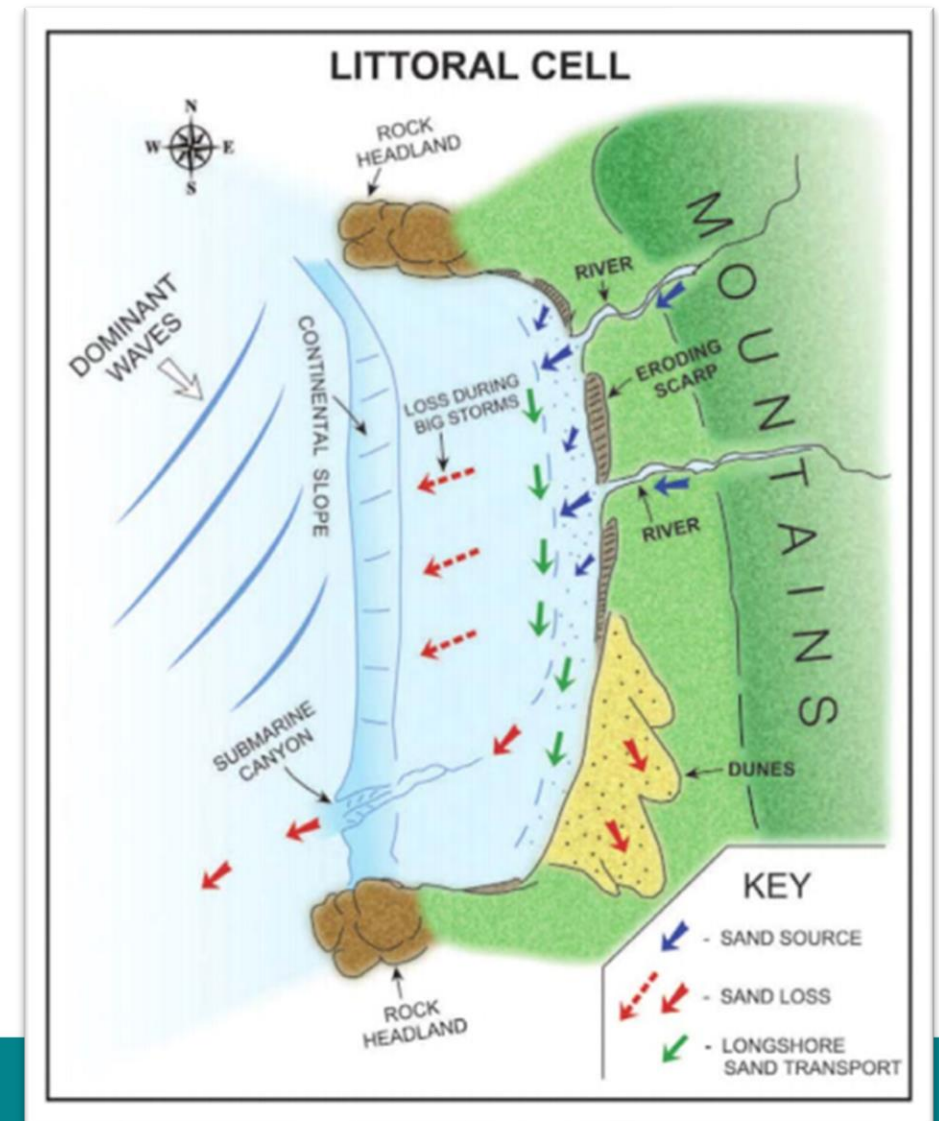


SI **Figure 1:** Typical timescales for the planning, implementation (grey triangles) and operational lifetime of current coastal risk-management measures (blue bars). {Figure CCB SLR.1a}

[https://www.ipcc.ch/report/ar6/wg2/downloads/annex/AR6\\_WGII\\_FactSheet\\_SLR.pdf](https://www.ipcc.ch/report/ar6/wg2/downloads/annex/AR6_WGII_FactSheet_SLR.pdf)



- Recognition of need to consider climate risks in tandem with **people** and **nature**.
- International movement towards solutions that:
  - are strategic and long-term (100yrs)
  - work with natural processes, at the functional scale (littoral cell), rather than fighting them
  - combine structural and non-structural measures (e.g. planning)
  - combine grey and natural infrastructure



An aerial view of Point Deroche, Prince Edward Island is seen here in October 2022, in this handout photo provided February 1, 2023. Prince Edward Island's government is imposing a moratorium on new shoreline-protection projects after a large, rock breakwater was built around a private, beachfront home. **HO-PERRY WILLIAMS \*MANDATORY CREDIT\* / THE CANADIAN PRESS**



- New coastal development in Prince Edward Island is prohibited until a coastal zone policy is developed.
- Environmental protection order prohibits new development in the buffer zone and associated erosion control activities in the watercourse and/or wetland boundary.

<https://www.thestar.com/news/canada/2023/02/01/after-controversial-development-pe-is-suspends-new-shoreline-protection-projects.html>



## Societal Options for Resource Allocation in a Changing Climate



Current Conditions and Resources



Equal Distribution of Resources



Equitable Distribution of Resources

## CONVENTIONAL APPROACH



“Language changes our design thinking”

DEREK LEE, PRINCIPAL, PWL PARTNERSHIP,  
SEA2CITY DESIGN TEAM LEAD



Sea2City FALSE CREEK

## NEW APPROACH



**ACKNOWLEDGE:** spaces are retrofitted or relocated over time to improve their resilience and better care for and steward natural systems.

• **HOST:** a dynamic place where water, nature, and culture are welcomed and stewarded. Human uses are flexible, adaptable, and leave a light-touch. Infrastructure works with nature to enhance resilience.

• **RESTORE:** a revitalized and rehabilitated shoreline that restores natural functions, features, and ecosystems and includes improved flood protection for upland communities.

<https://vancouver.ca/green-vancouver/sea2city-design-challenge.aspx>



What if we approached tackling climate change by focusing on different ways we can **make life better** while also reducing risk?

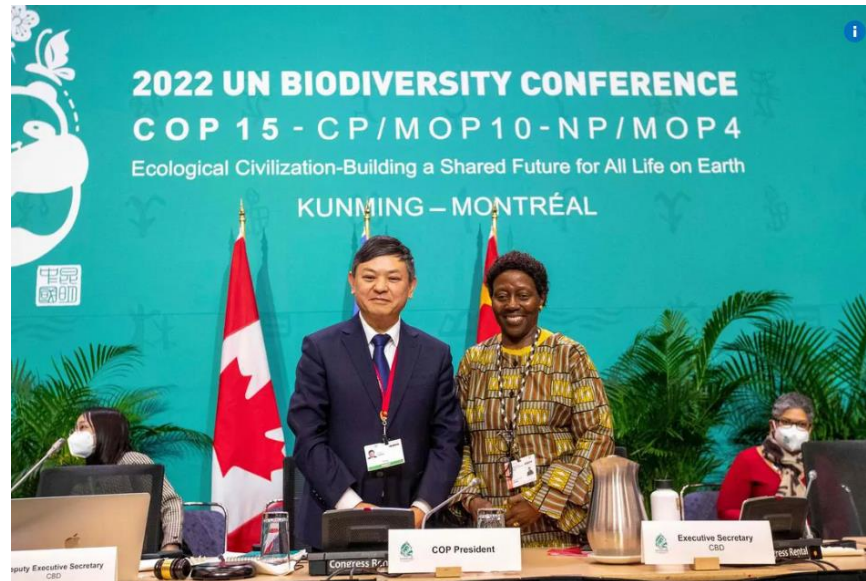


Opinion | What if climate change meant not doom — but abundance?

[washingtonpost.com](https://www.washingtonpost.com) • 4 min read

# Kunming-Montreal Global Biodiversity Framework

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Key opportunities for multiple wins:

- Nature
- Climate adaptation
- Climate mitigation
- Health
- Equity
- Reconciliation...

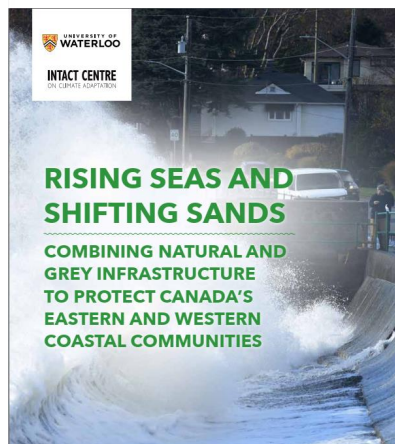
## TARGET 11

Restore, maintain and enhance nature's contributions to people, including ecosystem functions and services, such as regulation of air, water, and climate, soil health, pollination and reduction of disease risk, as well as protection from natural hazards and disasters, through nature-based solutions and ecosystem-based approaches for the benefit of all people and nature.

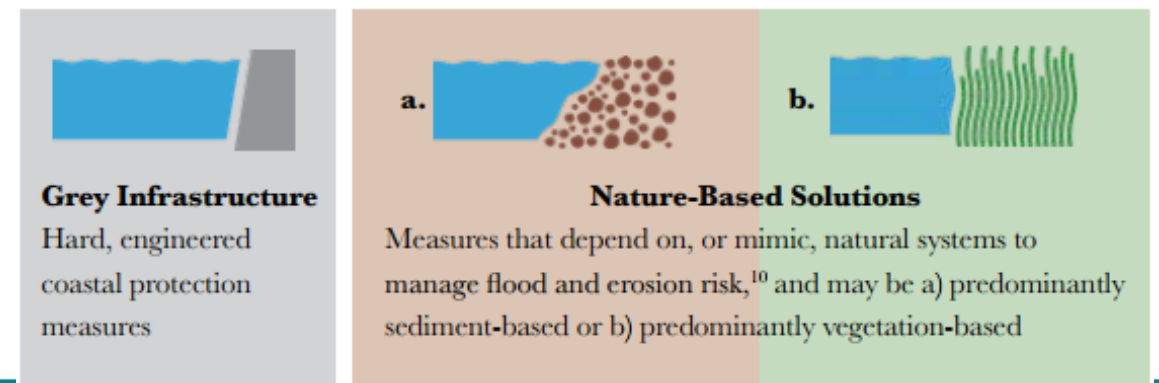




- Ground decisions in climate-smart data;
- Design for the future;
- Invest equitably across cities and neighborhoods;
- Tap into the community as park co-creators and operators;
- Embrace nature;
- Make every dollar multitask;
- Convene diverse public and private partners to plan, fund, and manage parks; and
- Learn from past experiences to budget accurately.



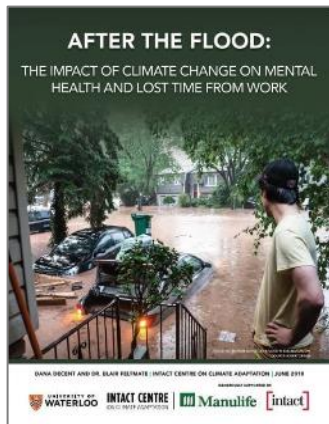
- Opportunity to combine natural and grey infrastructure



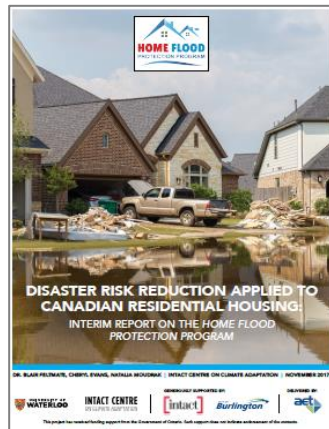
# Tools Already Available to Reduce Risk

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National guidelines and standards developed to reduce climate risk



Citizens



Homes



Commerical Real-Estate



Communities



Coastal Protection



Wildfires



Extreme Heat

Role of Natural Infrastructure

**Need to be applied to make a difference!**

**Improve quality of life!**





1. Coastal communities are on the **frontlines** of climate change.
2. There is **no going back** to normal.
3. Urgency is required to **adapt** to reduce inevitable risks (alongside reducing GHG) – this is a top financial and social issue.
4. Our dollars should be **multi-tasking**.
5. Real-estate and landuse planners have a **central role** to envision, transform and craft resilient coastal regions and communities.



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Intact Centre - Tools and Guidance:  
<https://www.intactcentreclimateadaptation.ca>