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Considering health in adaptation planning for sea level rise

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Presentation Outline:

1. CLIMAtlantic – an introduction
2. Project purpose and approach
3. Part 1 – overview of Canadian coastal communities exposed to SLR
4. Part 2 – literature review of health impacts of SLR
5. Part 3 – scan of community-based planning approaches
6. Part 4 – integrating adaptation planning for SLR & health
7. Overall Project findings
8. Questions



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Poll question...



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Enhancing Atlantic Climate Resilience

CLIMAtlantic facilitates access to data and information that supports adaptation to climate change in Atlantic Canada through collaboration, networking, and partnerships.

**Interactive
Networking Map**
Connect with others
working on climate
adaptation.

**Coastal Adaptation
Toolkit**
Explore how to
prepare for coastal
climate impacts.

**Networking and
Support Services**
Assistance on climate
vulnerabilities, risks,
and opportunities.

**Funding
Opportunities**
Leads on funding for
adaptation projects.



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Project purpose:

To gather and synthesize information on the public health risks associated with sea level rise, and to review approaches for integrating public health-driven mitigation measures into adaptation plans for impacted communities.





Approach:

1. Identify what areas of Canada are most exposed to SLR using Canadian resources and mapping information.
2. Identify the health impacts of SLR (both direct and indirect) through a semi-systematic literature review.
3. Review community-based approaches to adaptation planning by scanning documents from communities identified in Part 1 for consideration of SLR and health.
4. Conduct focus groups and key informant interviews to understand how health could be better integrated into community-based adaptation planning for SLR.



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PART 1:

Overview of Canadian coastal communities most exposed to SLR

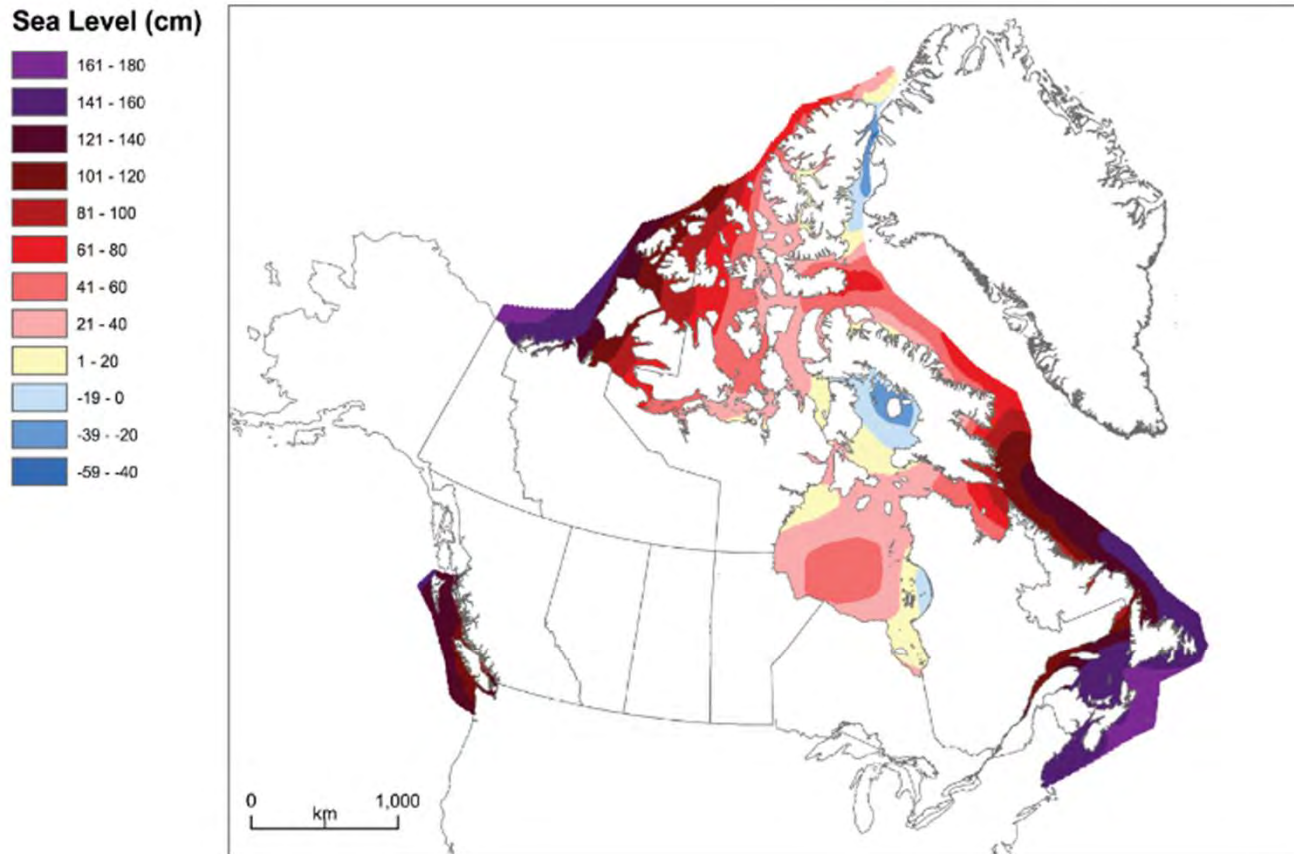


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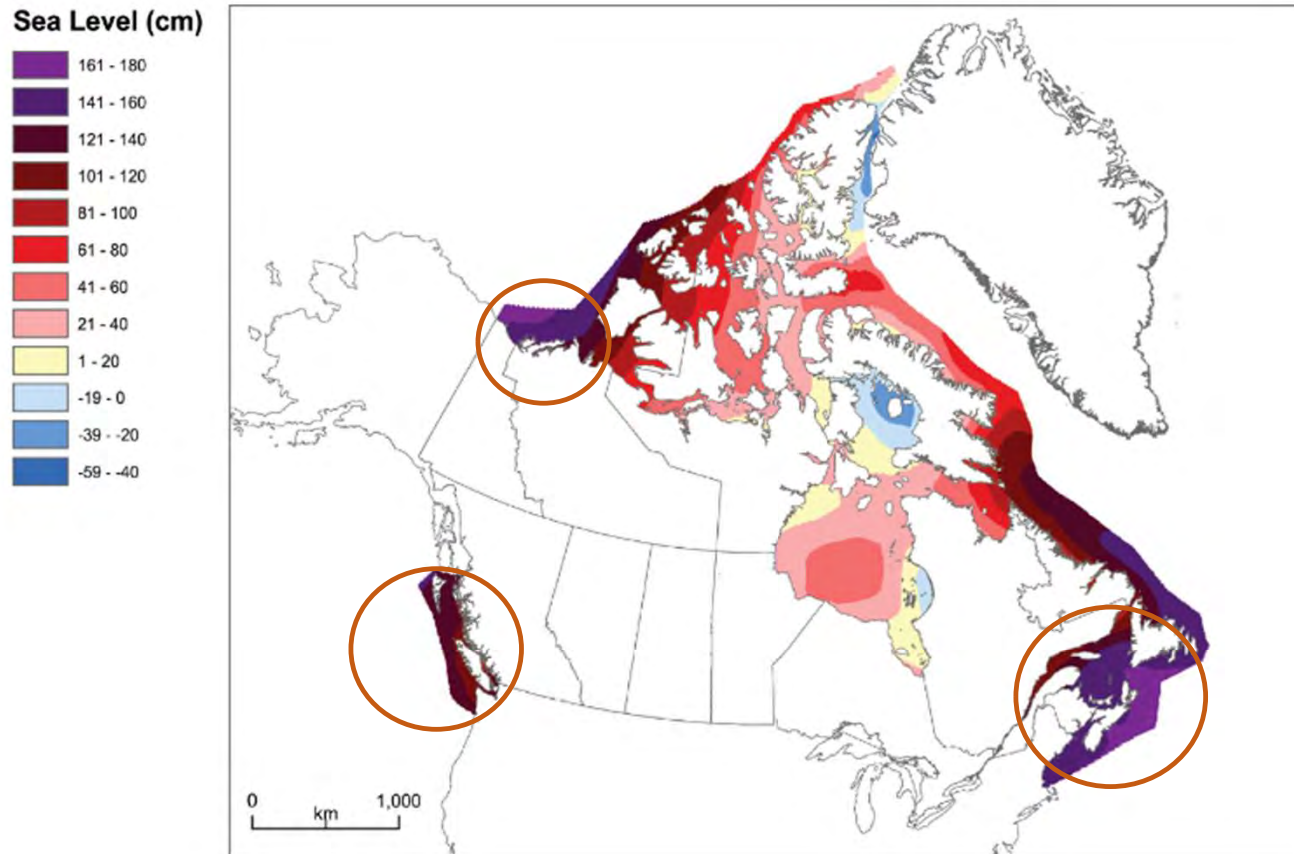
Part 1:

Identifying areas of Canada's coastline most exposed to SLR

What is
sea level rise?



James T, Robin C, Henton J, Craymer M. Relative sea-level rise projections for Canada based on the IPCC Fifth Assessment Report and the NAD83v70VG national crustal velocity model. [Internet]. Geological Survey of Canada; 2021. Available from: <https://doi.org/10.4095/327878>




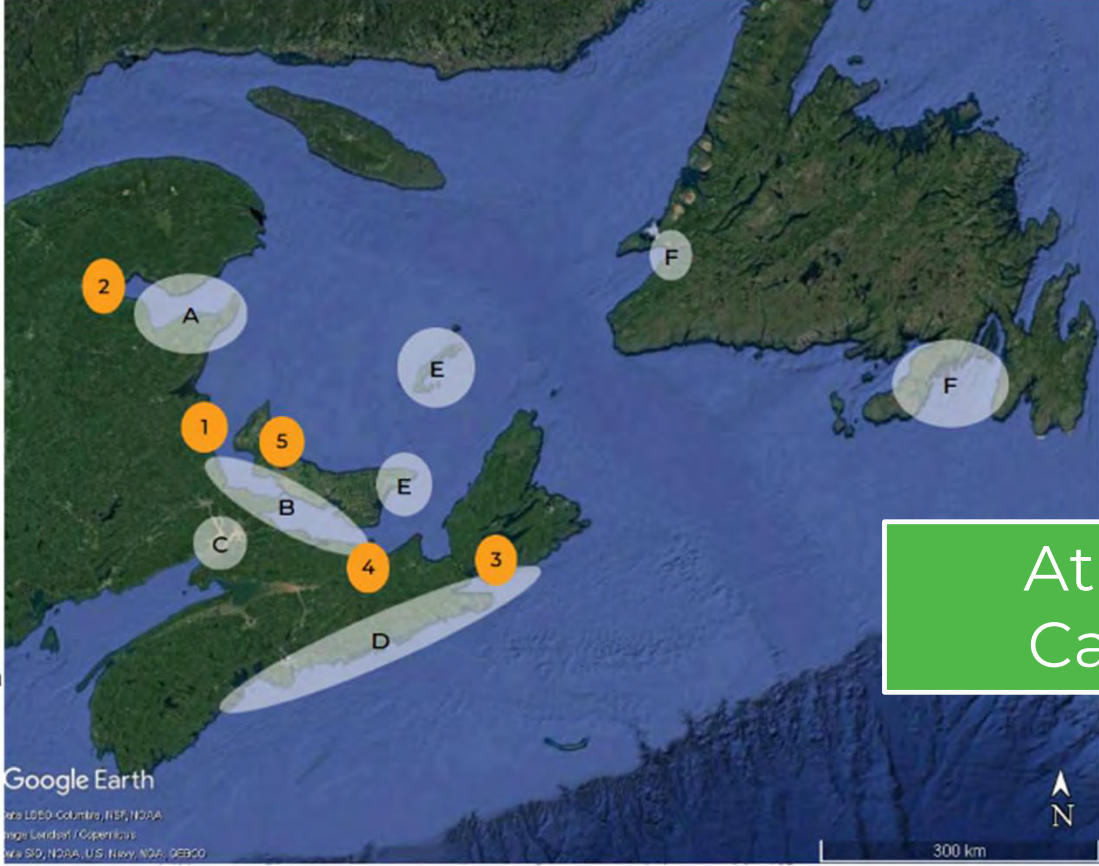
James T, Robin C, Henton J, Craymer M. Relative sea-level rise projections for Canada based on the IPCC Fifth Assessment Report and the NAD83v70VG national crustal velocity model. [Internet]. Geological Survey of Canada; 2021. Available from: <https://doi.org/10.4095/327878>

- (A) Acadian Peninsula and Chaleur region
- (B) Northumberland Strait
- (C) Chignecto Isthmus
- (D) Atlantic Coast
- (E) Gulf of St. Lawrence
- (F) Newfoundland coasts

- 1 L'nui Menikuk First Nation
- 2 Ugpi'ganjig First Nation
- 3 Potlotek First Nation
- 4 Pictou Landing First Nation
- 5 Lennox Island First Nation

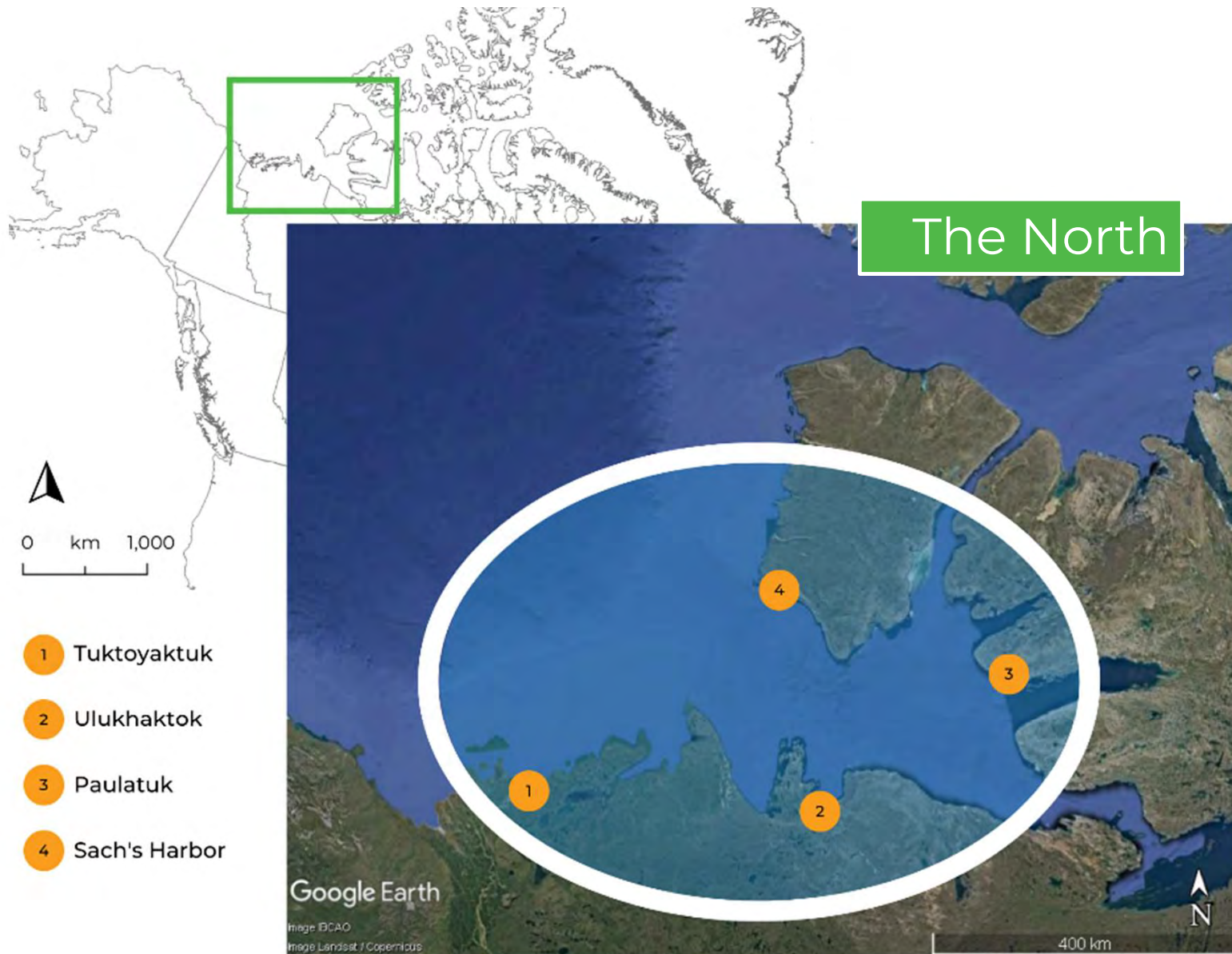
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 First Nations

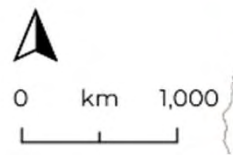
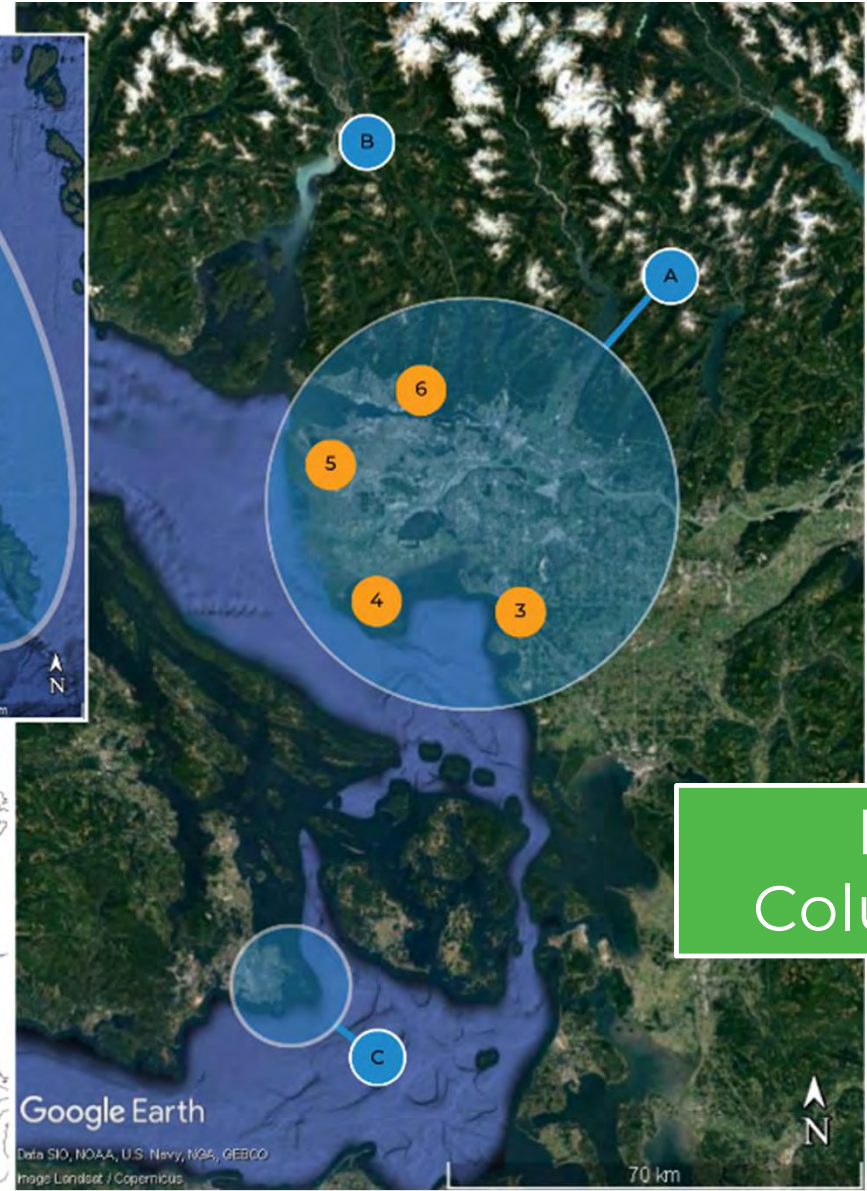


Atlantic
Canada





- A Census Metropolitan Area of Vancouver
- B Squamish
- C Southern Vancouver Island
- D Haida Gwaii
- 1 Old Massett Village
- 2 Skidagate
- 3 Semiahmoo
- 4 Tsawwassen
- 5 Musqueam
- 6 Tsleil-Watuth



British Columbia



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Poll question...



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PART 2:

Potential health impacts of SLR in
literature



How can public health be impacted by the slow-onset of sea level rise?



Health risk	Linkage to SLR	Potential health outcomes
Increased risk of physical injury or mortality	Coastal inundation during storm events, flooding, and coastal erosion are made worse by sea level rise.	<ul style="list-style-type: none">• Deaths due to drowning, suffocation• Injury such as fractures, concussions, other wounds
Increased risk of infectious disease	Bacterial contamination of recreational and drinking water sources resulting from damaged or inundated wastewater systems Bacterial contamination of coastal shellfish or other food harvesting areas	<ul style="list-style-type: none">• Gastrointestinal illness• Fecal-oral disease• Skin rashes• Skin and soft tissue infections• Vibriosis
Increased risk of exposure to harmful substances	Saltwater intrusion in drinking water sources Rising water table increases risk of groundwater contamination from various sources (industrial uses, landfills, underground storage tanks)	<ul style="list-style-type: none">• Chronic illnesses like dehydration and hypertension• Stroke• COPD• Diarrhea• Abdominal pain• Preeclampsia and gestational hypertension • Range of acute and chronic illnesses



Health risk	Linkage to SLR	Potential health outcomes
Increased exposure to vector-borne diseases	Coastal inundation and flooding can cause expansion of water-based habitat for disease vectors such as mosquitoes	<ul style="list-style-type: none"> • West Nile virus leading to encephalitis
Increased exposure to mould	Coastal inundation and flooding caused by rising water tables impacts coastal homes which need to be remediated.	<ul style="list-style-type: none"> • Allergies • Bleeding disorders • Cancer
Mental health effects	<p>Reduced food and water security due to SLR contaminating drinking water, soil and food sources</p> <p>Displacement and physical loss of homes or traditional lands</p>	<ul style="list-style-type: none"> • PTSD • Anxiety • Depression • Suicide ideation • Psychoterratic syndromes (e.g., ecoanxiety, solastalgia)
Compromised social determinants of health	<p>Access to health care disrupted</p> <p>Food security challenges, particularly with the loss of traditional subsistence food sources</p> <p>Changes in quality of physical environment, reduced land security, loss of home, loss of traditional livelihood, disruption of attachment to place, reduced social capital</p>	<ul style="list-style-type: none"> • Potential increase in mortality and morbidity rates from both chronic and acute illnesses • Malnutrition and micronutrient deficiencies • Mental illness (see above) • Chronic stress leading to higher rates of high blood pressure and heart disease • Injuries from domestic violence



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PART 3:

Scan of community-based planning approaches to SLR and health



Reviewed 25 studies, reports, or climate change guidance documents at the provincial and/or territorial level for New Brunswick Nova Scotia, Newfoundland-Labrador, Prince Edward Island, Northwest Territories and British Columbia.

- Sea level rise was generally noted as a concern.
- Health was regularly referenced in relation to heat and air quality.
- No direct connections made between sea level rise and health.





- A Acadian Peninsula and Chaleur region
- B Northumberland Strait
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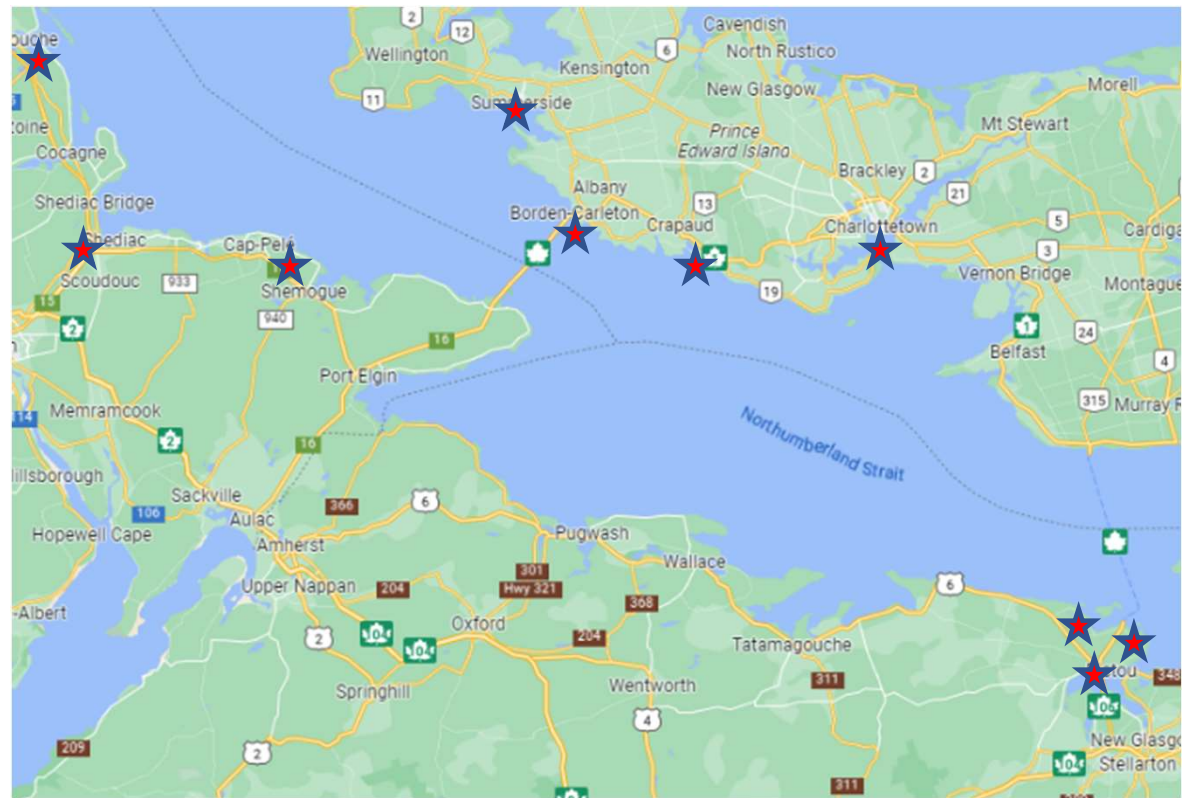
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0 km 1,000   First Nations



- Summerside PEI (3 docs)
- Borden-Carleton PEI (0 docs)
- Victoria PEI (2 docs)
- Charlottetown PEI (6 docs)
- Shediac NB (2 docs)
- Cap-Pelé NB (2 docs)
- L'nui Menikuk First Nation (1 doc)
- Pictou Landing First Nation (3 docs)
- Pictou, NS (0 docs)
- Caribou, NS (0 docs)





- 58 communities identified in the three regions (based on Part 1)
- 136+ community-based planning documents were reviewed including vulnerability and risk assessments, climate adaptation plans, and land use plans
- SLR is commonly addressed in these documents, particularly in relation to adaptation plans or vulnerability studies. More recent land use documents are incorporating SLR concepts.
- Health is sometimes covered in climate change sections of documents but mostly in relation to heat and air quality. Health in relation to the built environment is almost never covered in land use documents.
- SLR and health are directly connected in only 2 documents.



- SLR adaptation measures such as “protect, accommodate, retreat, and avoid” were identified in adaptation plans and some even identified potential long-term health implications (particularly in terms of mental health)
- Several documents connect the impacts of SLR to social determinants of health (e.g., food security, culture, sense of place, coastal livelihoods)



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PART 4:

Integrating health into adaptation planning for sea level rise

Photo Credit: Tuktoyaktuk NWT; GNWT



Health-related impacts from SLR already being seen:



- Drinking water quality and quantity (salt-water intrusion into wells)
- Mental health issues (PTSD, anxiety) for people who have lived experience with coastal storms
- Compromised social determinants of health – loss of income, loss of access to services, disrupted connection to place, loss of community supports



SLR Adaptation measures currently being implemented:

- Protection – coastal armouring, sediment enhancement
- Accommodation – nature-based solutions (e.g., living dykes, coastal salt marsh)
- Retreat – relocation is considered a “last resort”
- Avoidance – implementation of development control in hazard areas



Tuktoyaktuk, NWT (source: GNWT)



Perspectives on incorporating health and sea level rise into adaptation planning:

- Too much emphasis on risk to property and infrastructure at local level (little consideration of people)
- Health is provincial; infrastructure is local – silos create challenges
- Too challenging to separate health impacts from SLR at the community-level. Communities need to consider all climate change impacts on health.
- Social determinants should be embedded into climate risk assessments.

Challenges and opportunities to adapting to SLR:

- Funding
- Adequate data and surveillance
- Managed retreat
- Land use planning
- Legislative and policy resources
- Multi-disciplinary efforts
- Local capacity



Souris, PEI (source: T.Wade)



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Synthesis of findings



- The direct impacts of sea level rise on health are intertwined with other climate change hazards.
- Sea level rise may also have direct impacts on saltwater intrusion, water and soil contamination.
- Some communities may be at higher risk of experiencing health impacts due to geography, or due to heightened sensitivity to risks based on cultural, historic or systemic inequities.

“One thing coming up in my work is understanding trauma in relation to climate change. ...[R]ecognizing that people are increasingly experiencing trauma from climate change (e.g., through evacuations, displacement, loss of homes, etc.) – most often as a result of extreme events. It’s also a recognition that marginalized and racialized groups have intergenerational traumas they carry and these compound with climate change.” (Atlantic participant)



Most coastal communities:

- recognize sea level rise as a significant hazard
- focus on gradual long-term impacts of SLR, from a land use and infrastructure and built environment perspective.
- have undertaken vulnerability and risk assessments or climate change adaptation plans that include SLR

Adaptation plans for Indigenous communities are more likely to consider impacts on health and the social determinants of health.



Other findings:

- Communities do not appear to be considering how SLR may be exacerbating current extreme weather events, or how health is impacted.
- Health is generally considered within provincial jurisdiction; land use planning is local in scope.
- At the same time, the adaptation actions that revolve around infrastructure is effectively a public health response.



Protection measures (dykes, berms, etc.) are the most common adaptation measure taken.

Accommodation measures (nature-based solutions) are becoming more widely used.

Managed retreat was a recurring theme in many discussion documents, but raised as an option for consideration.

Avoidance measures through development regulation and land use planning were the desired strategy by many, but virtually no jurisdiction has been able to implement complete bans on development.

Most community-based adaptation plans recommended a combination of these approaches.



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Project Synthesis

Adaptation approaches themselves (rather than the physical effects of rising water) could have the most impact on community health.

“Relocation is currently being considered in Tuktoyaktuk, NWT. The big question is where to relocate the people who are being moved? If they are moved to a location that is “safe” [from any coastal hazard exposure], it is far removed from the rest of the community, which is at a lower risk of exposure. This will physically and emotionally separate community members, which will then affect individual and community health.” (NWT discussion participant)



Coastal communities need:

- access to meaningful data
- better understanding of the impacts from SLR from both a health AND infrastructure perspective
- assistance to **implement solutions** - identifying priorities, applying for funding, managing large infrastructure projects, assessing impacts, etc.



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Thank you!

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<https://ncceh.ca/environmental-health-in-canada/health-agency-projects/sea-level-rise-and-public-health-implications>