

Climate Change and the Newfoundland & Labrador Marine Tourism Industry

Cost Benefit Analysis of Infrastructure Adaptation



Natural Resources
Canada

Ressources naturelles
Canada

Canada

Newfoundland
& Labrador

Funded by the Department of
Environment and Climate Change

Petty Harbour

Business Profile

Name	Ocean Quest Adventures
Location	Petty Harbour
Services	Iceberg Tours, Boat Tours, Marine Snorkeling, Wildlife Encounters
Operating Season	May to October



Coastal Climate Change Risks

- ▶ Climate change is projected to cause rising sea levels, increased storm surge, and increased wind and wave action throughout Newfoundland and Labrador.
- ▶ Without implementing climate resilience measures, coastal infrastructure is anticipated to be at higher risk of damage due to climate change impacts.



Potential Climate Change Impacts

- ▶ Damage to coastal infrastructure such as buildings and wharves from wave action, overtopping, and flooding.
- ▶ Increased maintenance costs.
- ▶ Operational disruptions, prolonged closures for maintenance or repair, and potential revenue loss.
- ▶ Increased health and safety concerns.

Climate Adaptation Focus – Enhanced Coastal Erosion Protection



- ▶ Wave action had caused extensive erosion to the fill material supporting the building, and the surrounding armour stone.
- ▶ With projected climate change, factors causing coastal erosion such as sea level rise and storm surge are projected to intensify, placing the infrastructure at greater risk of significant damage.
- ▶ Operators recognized the need to upgrade the existing coastal protection features to prevent further coastal erosion and minimize potential damage to the building.

Business as Usual Scenario

- ▶ Coastal protection features are not upgraded.
- ▶ Building continues to experience significant wave action and coastal erosion.
- ▶ Possible extensive damage or loss of building as a result.



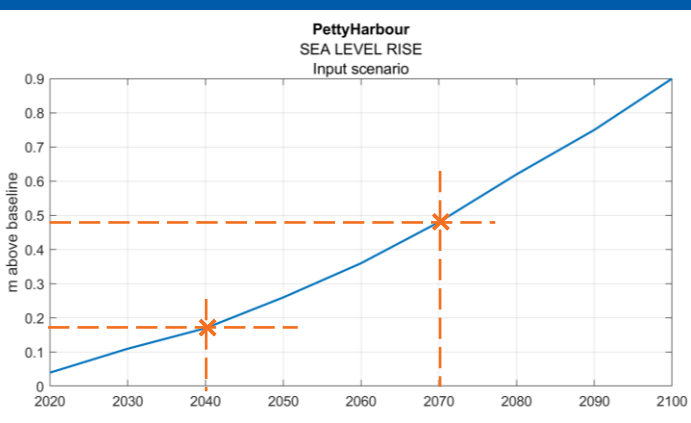
Adaptation Plan

- ▶ Capital investment to upgrade building foundation, armour stone, and crib work around wharf.
- ▶ Risk of coastal erosion is decreased, minimizing potential losses associated with damage and repair of building.

Coastal Climate Change Projections in Petty Harbour

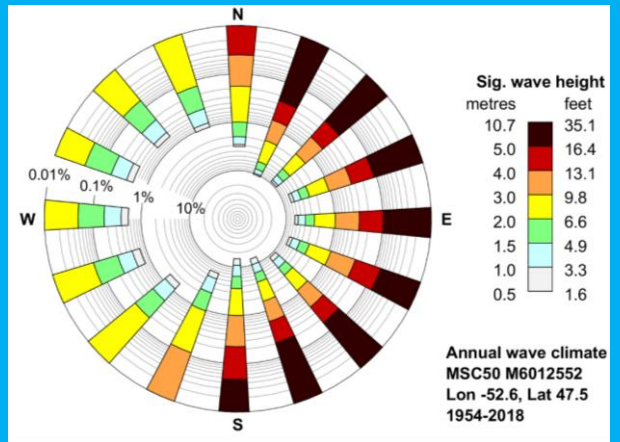
Sea Level Rise

- ▶ By 2040 sea levels are projected to increase by approximately 0.17m above 2010 levels.
- ▶ By 2070 sea level are projected to increase by approximately 0.48 m beyond 2010 levels.



Wave Action

- ▶ Petty Harbour is subjected to significant offshore wave action which from the east.
- ▶ Climate change projections indicate that this wave action will persist throughout the century.



The site is currently classified as having moderate exposure to wave action. Projected sea level rise will result in more wave energy reaching the harbour, which will result in increasingly severe impacts to infrastructure.

Cost Benefit Analysis of Enhancing Coastal Erosion Protection

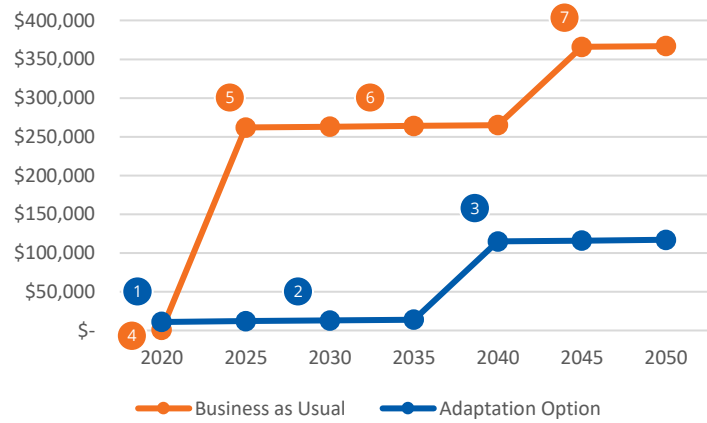
Adaptation Option

- Investment to upgrade coastal protection to prevent further coastal erosion and damage to building. Upgrades include replacing areas of deteriorated fill foundation with concrete, placement of armour stone adjacent to building, and additional crib work on existing wharf.
- Annual maintenance costs to address wear and tear to building, wharf, and armour stone.
- Significant replacement of wharf at end of useful life (approximately 2040), which accounts for climate change projections over the next infrastructure lifecycle.

Business as Usual

- No investment into coastal protection to minimize erosion impacts. Continued wear and tear to infrastructure resulting in higher annual maintenance costs.
- Assumed that building is damaged beyond repair in the next five years due to foundation erosion. Complete rebuild required, including necessary coastal protection features.
- Annual maintenance costs to address wear and tear to building, wharf, and armour stone.
- Significant replacement of wharf at end of useful life (approximately 2045), which accounts for climate change projections over the next infrastructure lifecycle.

Cumulative Maintenance and Repair Costs



Summary

- ▶ Analysis shows that a minimal investment into coastal protection features before significant damage occurs can result in significant savings over the lifecycle of the infrastructure.
- ▶ With additional coastal protection, annual maintenance costs are relatively minor, and the risk of extensive building damage is reduced.

Cost to Benefit Ratio

3.1 / 1