

# 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	Fishing for Success Inc.
Location	Petty Harbour
Services	Boat Tours, Fishing Tours, History Tours, Hiking, Heritage Experiences
Operating Season	June 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 and potential revenue loss.
- ▶ Increased health and safety concerns for operators and patrons.

### Climate Adaptation Focus – Elevation of New Infrastructure



- ▶ A new Twine Loft is being constructed on the site that will host heritage tours and other operations. The Twine Loft will be constructed using traditional building methods and materials in order to preserve the heritage values of the business.
- ▶ In the past, storm surge has impacted the existing Twine Lofts on site which sit at approximately 2.3 m elevation, resulting in flooding and other damage.
- ▶ Climate projections for increasing extreme water levels should be incorporated into the construction of the new Twine Loft to mitigate the risk of impacts.

#### Business as Usual Scenario

- ▶ New Twine Loft is constructed in a similar manner to previous structures on site, without consideration for extreme water level projections.
- ▶ Infrastructure will continue to be impacted by waves, requiring frequent repair.



#### Adaptation Plan

- ▶ Consider projections for extreme water level in construction of the new Twine Loft.
- ▶ Build structure on an elevated platform foundation using concrete block footings.
- ▶ Mitigate risk of damage from storm surge and flooding.

# Coastal Climate Change Projections in Petty Harbour



## Wave Action

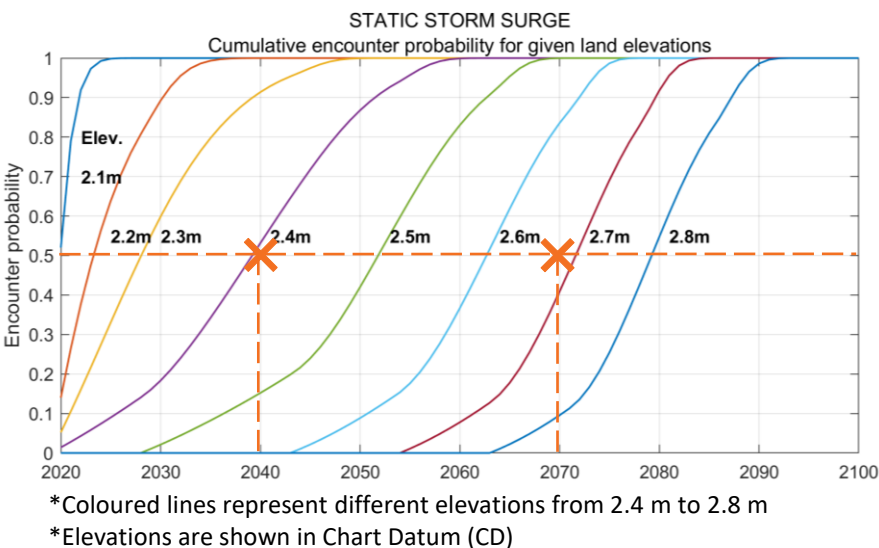
Petty Harbour is currently subjected to significant wave action. Projected sea level rise will result in more wave energy reaching the shore, which will cause increasingly severe impacts to infrastructure.

## Sea Level Rise

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

## Extreme Water Level

- ▶ Extreme Water Level is the sum of Sea Level Rise + Storm Surge + High Tide.
- ▶ Climate resilient infrastructure is typically designed to accommodate a 50% encounter probability (see orange dashed lines on below figure).



## Recommended Minimum Infrastructure Elevations for Climate Resilience

### 2040

- ▶ 50% encounter probability falls between 2.4 and 2.5 m CD.
- ▶ Recommended minimum infrastructure elevation by 2040 is **2.5 m CD.**

### 2070

- ▶ 50% encounter probability falls between 2.6 and 2.7 m CD.
- ▶ Recommended minimum infrastructure elevation by 2070 is **2.7 m CD.**

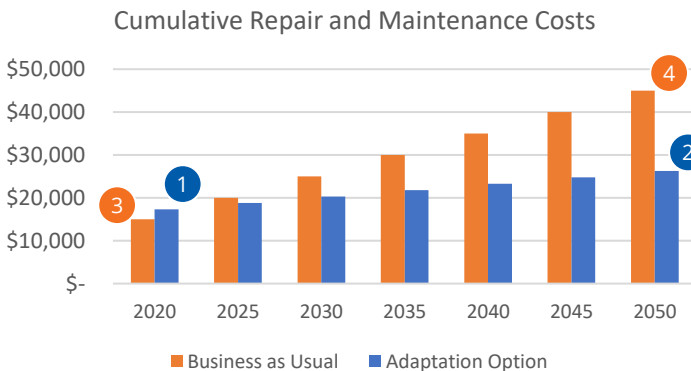
## Cost Benefit Analysis - Increased Elevation of Twine Loft

### Adaptation Option

- The new Twine Loft is constructed on an elevated wooden platform using approximately 0.4 m tall concrete blocks to support the platform. This brings the building floor to an elevation of approximately 2.7 m, which accommodates future projections for extreme water levels to 2070. Cost to source and install concrete blocks for foundation is minimal (<5% of total cost).
- Minor annual repair costs to maintain structure and concrete block footings are incurred between 2020-2050. It is assumed that no substantial repairs will be required because of adaptation to increasing extreme water levels.\*

### Business as Usual

- The Twine Loft is placed directly on the current site with no raised elevation to account for extreme water level projections.
- At the lower elevation, the structure will incur flooding and impact damage from storm surge. It is assumed that the Twine Loft will require significant repairs at least once every 5 years to maintain operation.



## Summary

- ▶ A small initial investment to elevate the Twine Loft will minimize maintenance and repair costs due to flooding and storm surge.
- ▶ With the additional elevation, annual repair costs are relatively low, leading to a lower cumulative operating cost over the lifecycle of the structure.

Cost to Benefit Ratio

1.7  
1

\*The assessment considers coastal climate change parameters only. Climate projections associated with adjacent Petty Harbour River were not assessed