

Climate Change in Atlantic Canada:

Effects in Newfoundland, Nova Scotia, and Prince Edward Island

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Overview

The Canadian Atlantic Provinces of Nova Scotia, Newfoundland, and Prince Edward Island are experiencing significant effects of climate change, including rising sea temperatures, decreasing sea ice, and changes in precipitation. The populations of each are affected differently based on each province's unique geology, topography, and economy, resulting in unique adaptation and mitigation strategies.

This part of the world, given its legendary tidal changes, history of sea ice, and maritime culture, is acutely affected by global changes in climate. The three provinces studied, however, each have different attitudes and effects. Prince Edward Island, with its highly erodible sandstone bedrock and agricultural and aquacultural economy, is the “canary in the coal mine¹”, while Newfoundland, comprised of solid granite, dramatic elevations, and with an extraction-based industry, is less affected.

This paper is based on extensive interviews and travels in the Maritimes and will explore the considerations, challenges, and attitudes of the provinces toward climate change.

Climate Change

As greenhouse gases, such as Carbon Dioxide, Nitrous Oxide, and Methane increase in the upper atmosphere, solar radiation is trapped, resulting in changes to the earth's climate. These changes include temperature rise, in general, which results in droughts, flooding, hurricanes, and changes to the weather systems including air-flow and ocean currents.

¹ Taylor, Erin (2012, July 31). Personal Interview

Sea Temperature: Systematically, sea surface temperatures affect climate and weather significantly worldwide. Warmer waters result in droughts, hurricanes, and shifts in climate patterns.

Locally, sea temperature also has profound effects on the ecology of a region, both on land and in the oceans. These changes are found in vegetation, insects, and sea life, often resulting in invasive species taking hold. These variations effect the human population in a number of ways. Increased deer ticks (and deer), which result from mild winters allowing the population to survive and increase, lead to increased Lyme disease, which is a concern of the health department².

Additionally, ecological changes result in profound changes to aquaculture and agriculture. Warmer sea temperatures generally lead to increases in shellfish, but can also be detrimental to certain finned fish.

These changes have proven beneficial to some: as the growing season has expanded in duration, so too have the opportunities to diversify crops. Traditional potato farming in Prince Edward Island has expanded to include corn, soy, and strawberries. In Nova Scotia, vineyards are taking root for the first time, producing some outstanding red wines.

Temperature Rise: Current climate models project a 2 to 4 degree Celsius increase in summer temperature, on average, by 2050, with a 1.5 to 6 degree Celsius increase in winter temperatures. Precipitation has been shown to increase since 1948 and this trend is expected to continue.³

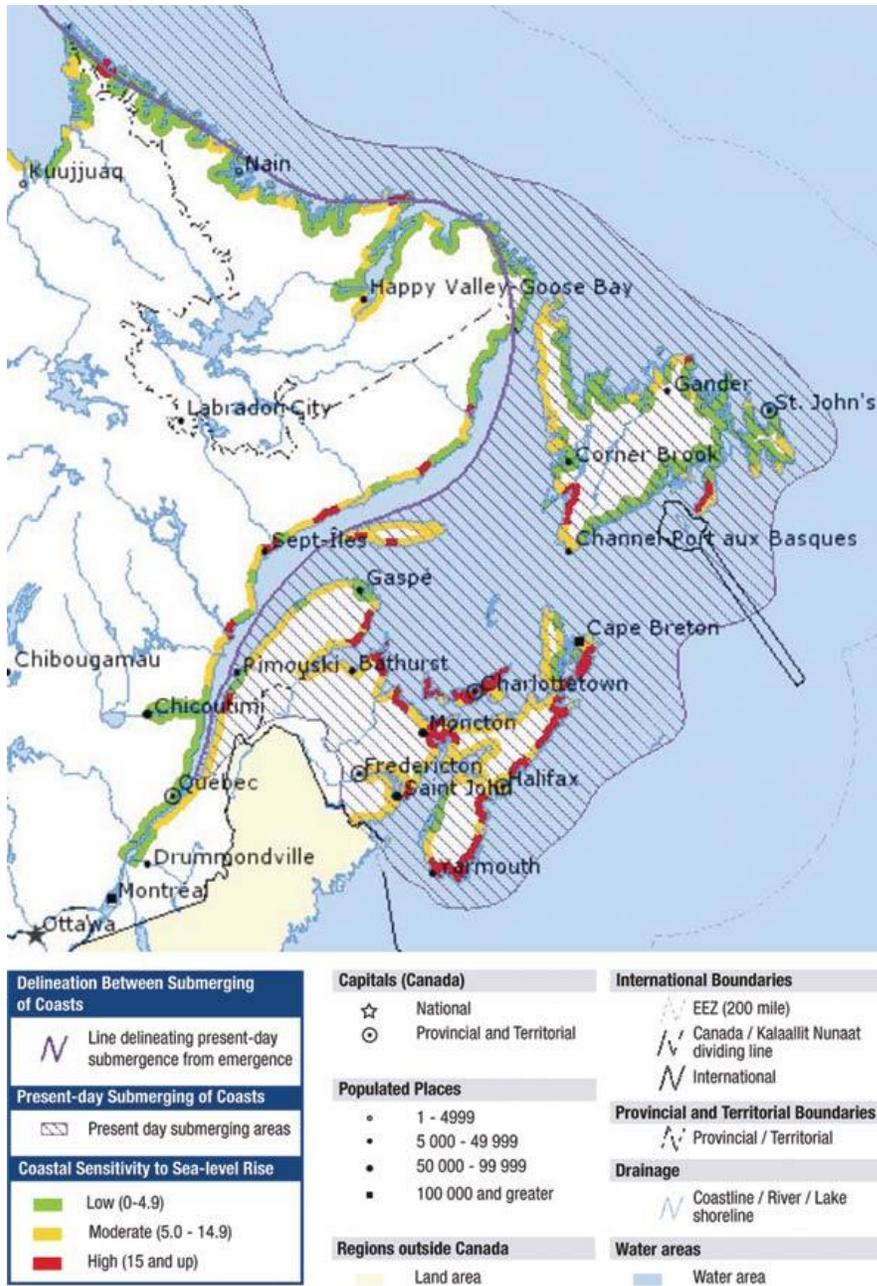
² Milne, Kyla (2012, July 18). Personal Interview

³ Vasseur, L. and Catto, N. (2008): Atlantic Canada; in From Impacts to Adaptation: Canada in a Changing Climate 2007, Government of Canada, p131

Sea Ice: Sea ice has changed significantly in the Maritime Provinces. Reduced sea ice simplifies logistics allowing ferries to travel unencumbered in early spring, while also resulting in increased exposure for shorelines to winter erosion. Ice is forming later, with mid-winter break ups now increasing and spring flooding occurring earlier each year.⁴

Sea Level Rise: Atlantic Canada is acutely threatened by sea level rise, as shown in the figure below. Sea level rise is caused by the changing volume of the ocean, which results from glacial melting as well as thermal expansion, and can be exacerbated locally by hemispheric, global and tidal factors.

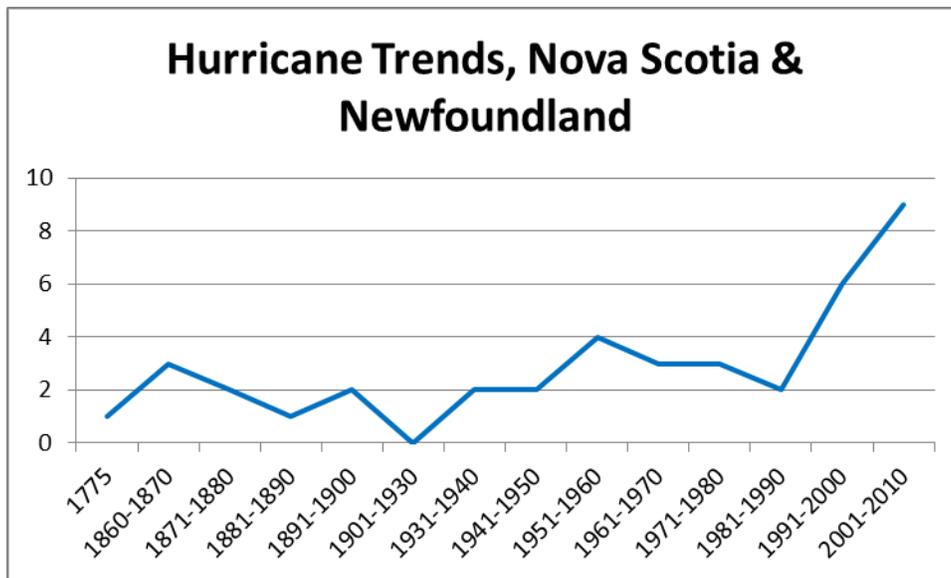
⁴ 2010. Department of Environment, New Brunswick. "Atlantic Region Adaptation Science Activities."



Source: Coastal sensitivity to sea-level rise, Atlantic Canada (Shaw et al.,1998).

Hurricanes: Tropical storms and hurricanes have been shown to increase in intensity and frequency with climate change. These storms sometimes skirt the eastern seaboard and make landfall in Nova Scotia and/or Newfoundland. While significant hurricanes are documented as far back as 1775, these storms have increased significantly in frequency and magnitude since 1948. These storms create unique challenges for residents of the Atlantic Provinces.

As the figure below illustrates, Atlantic Canada typically experienced between zero and four hurricanes per decade since 1775. However, the period since 1991 has seen a steady increase in the frequency of storms, up to 9 in the last decade from 6 in the 1990s.



Data Source: Environment Canada www.ec.gc.ca

Recorded Hurricanes, by Year, in Atlantic Canada

Year	Month	Name	Category	Nova Scotia	Newfoundland
1775	September	NFLD Hurricane of 1775			X
1863	August	Cat 1 / Nova Scotia	1	X	
1866	September	NFLD Hurricane of 1866	2		X
1869	October	1869 Saxby Gale		X	
1871	October	Nova Scotia Hurricane		X	
1873	August	Nova Scotia Hurricane of 1873	3	X	X
1886	August	Hurricane of 1886	1		X
1891	September	Hurricane of 1891	1	X	X
1893	August	Hurricane of 1893			X
1939	October	Hurricane of 1939	1		X
1940	September	Hurricane of 1940		X	
1950	August	Hurricane Able		X	
1950	October	Hurricane George		X	
1953	September	Hurricane Carol		X	
1958	September	Hurricane Helene			X
1959	June	Escuminac Hurricane		X	
1959	July	Tropical Storm Cindy		X	
1962	October	Hurricane Daisy		X	
1963	October	Hurricane Ginny	2	X	
1964	October	Hurricane Gladys			X
1971	August	Hurricane Beth		X	
1973	July	Hurricane Alice			X
1975	July	Hurricane Blanche		X	
1989	August	Hurricane Dean			X
1990	August	Hurricane Bertha			
1995	July	TS Barry		X	
1995	September	Hurricane Luis			X
1996	July	Hurricane Bertha			X
1996	September	Hurricane Hortense	1	X	
1999	September	Hurricane Floyd		X	
2000	October	Hurricane Michael	1	X	
2001	October	Hurricane Karen		X	
2002	September	Hurricane Gustav	1		
2003	September	Hurricane Juan	2	X	
2005	September	Hurricane Ophelia	1	X	X
2007	November	Hurricane Noel	1	X	
2008	September	Hurricane Kyle	1	X	
2009	August	Hurricane Bill		X	X
2010	September	Hurricane Earl		X	
2010	September	Hurricane Igor	1		X
2011	September	Hurricane Maria			X
2011	October	Hurricane Ophelia			X

Data Source: Environment Canada www.ec.gc.ca

Storm Surge is a result of storms, a combination of extreme tidal events and storm events can combine to create a flooding effect. Storm surge elevation is “the difference between the observed water level during the storm and the level that the tide would normally rise to in the absence of storm activity.”⁵

Newfoundland

Newfoundland has experienced reduced sea ice and increased storms in recent history. Newfoundland also has very sparse population density – of 1.4 persons per square kilometer, with over half of the population residing in the Avalon Peninsula – or St. John’s and its suburbs.⁶

Newfoundland is comprised of rolling uplands, plateau regions, and steep cliffs, rising in excess of 100 meters on the east coast and 800 meters on the west coast, with a narrow coastal plain bordering the western margin of the island.⁷

The economy of Newfoundland is highly dependent on resource extraction. Many of the island’s residents are migrant workers, who earn wages in the tar sands in Alberta. Additionally, large offshore oil reserves are being exploited off the coast of Newfoundland.

The natural features of Newfoundland are not susceptible to erosion. Additionally, as mineral resources are not significantly affected by climate change, the economy of Newfoundland is also minimally affected by climate change.

⁵ Forbes, D.L. et al. Storms and shoreline retreat in the southern Gulf of Saint Lawrence ; Marine Geology, v210, p172

⁶ Statistics Canada. 2012. *Focus on Geography Series, 2011 Census*.
<http://www12.statcan.gc.ca/census-recensement/2011/as-sa/fogs-spg/Facts-pr-eng.cfm?Lang=Eng&TAB=1&GK=PR&GC=10>

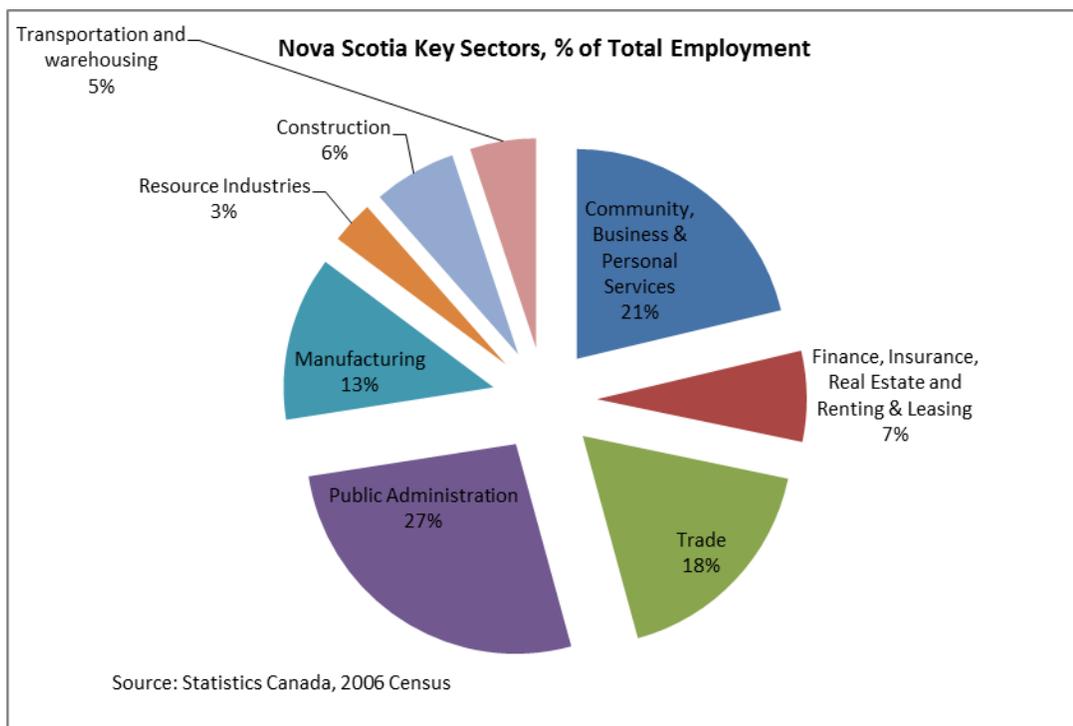
⁷ Vasseur, L and Catto, N. (2008), p 125

Nova Scotia

Nova Scotia is experiencing moderate affects from Climate Change. Of particular concern is the fact that most of Nova Scotia’s population and infrastructure is located in vulnerable coastline areas.⁸

The majority of the land in Nova Scotia is bedrock, while erosion has created beaches and marshes.

Nova Scotia’s economy has traditionally been resource based, and has a history of boom-and-bust with Cod fishing, which ceased in 1992 with the loss of 20,000 jobs. The current economy of Nova Scotia shows a diversification of industries by population.



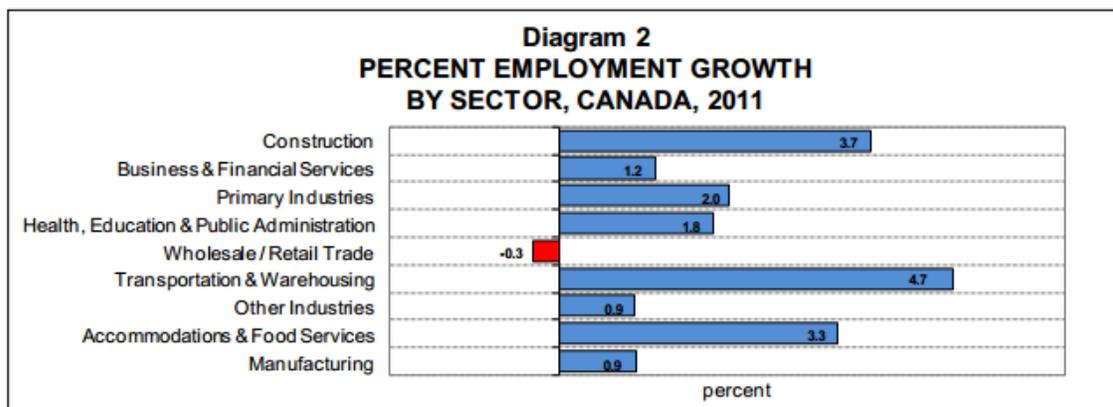
⁸ (2009). Toward a Greener Future: Nova Scotia's Climate Change Action Plan. N. S. D. o. Environment. Canada.

However, by region, Nova Scotia does have defining industries, such as farming in the Annapolis Valley, Scallops in Digby, and Tourism in Cape Breton.

Given the diversity of topography and the importance of niche industries, Nova Scotia will be moderately affected by climate change.

Prince Edward Island

Prince Edward Island has a thriving and diverse economy which is largely based on agriculture, aquaculture, and tourism. The island is famous for potatoes, mussels, and Malpeque oysters.



Source: Statistics Canada

The island is comprised of highly erodible red sandstone and has experienced significant subsidence in recent years, particularly on the northern coast.

Northeastern storms in late December are causing the greatest subsidence in Prince Edward Island. During the winter months, the area experiences its highest tides and most severe storms. In the past, sea ice has played a role to serve as a buffer and keep storm surge from reaching the shore. In recent years, however, this

surge has decimated areas of the coast, resulting in an average loss of 1 foot around the island, with local losses often exceeding 2 meters. This results in losses of public and private land and property, in addition effecting roads and infrastructure.⁹

Conclusion

As climate change continues to increase the frequency of storms, as well as the temperatures overland in in the ocean, the Atlantic Provinces will each be affected in different proportion based on their competing geology, economy, and topography. The three provinces of Newfoundland, Nova Scotia, and Prince Edward Island can serve as examples for similar entities worldwide. As low lying, sandstone-based, farming and fishing Prince Edward Island is acutely affected and its residents are overwhelmingly aware of the problem, the highlands of Newfoundland and its extraction-based economy result in vastly differing attitudes toward the global challenges presented by climate change.

⁹ Taylor, Erin (2012, July 31). Personal Interview