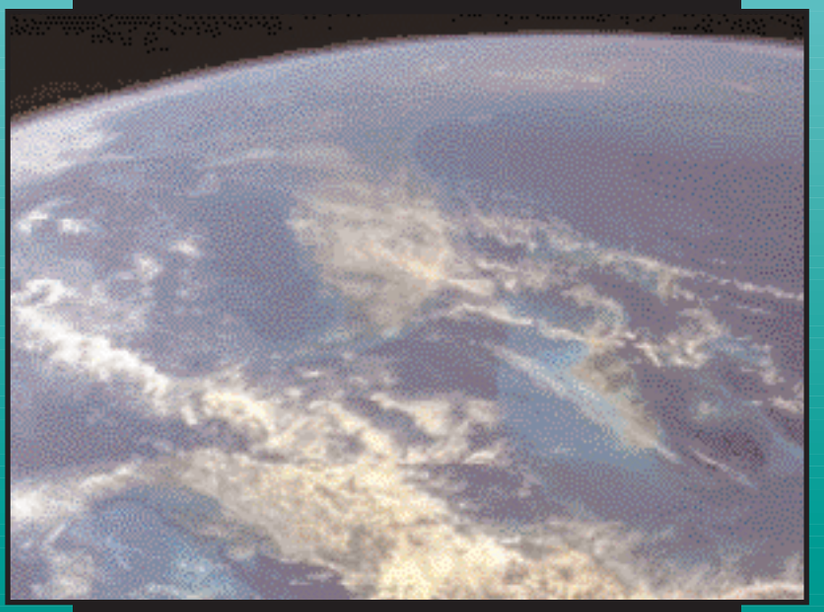

THE CANADA COUNTRY STUDY:

Climate Impacts and Adaptation

ATLANTIC CANADA SUMMARY

Canada

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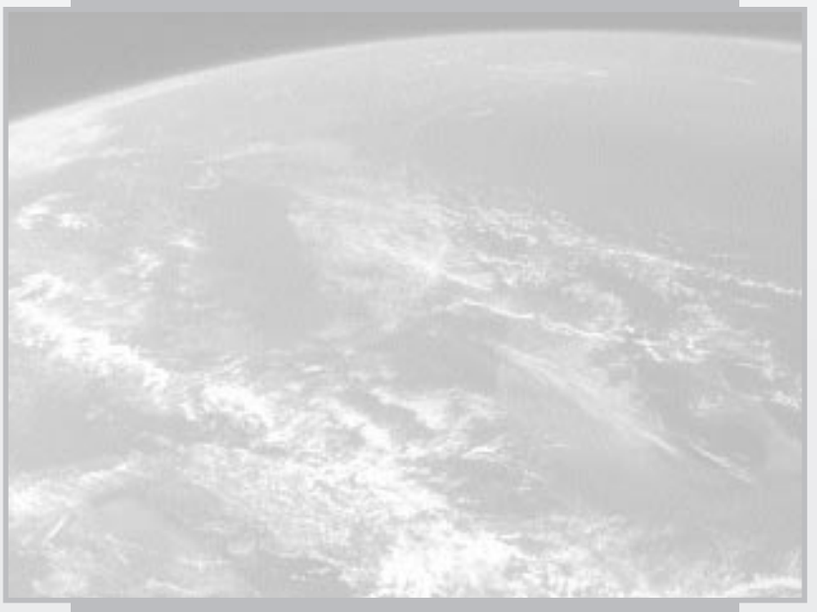

THE CANADA COUNTRY STUDY:

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Environment Canada

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THE CANADA COUNTRY STUDY

Climate Change in Atlantic Canada

Introduction

Atlantic Canada's ecosystems exist in a delicate balance under the influence of the air and the sea. In the same way, the social and economic conditions of the people who live in this part of Canada depend greatly on sustaining the region's natural resources and environmental conditions.

Atlantic Canadians are keenly aware of the devastation that the collapse of a resource can bring. The economic hardships brought about by the loss of the Northern cod stock have been magnified by the social disruptions this has caused. Social networks and communities are bonded with fishing nets and boats, all of which disintegrate with the collapse of the resource they are built upon.

The continuing increase in greenhouse gas emissions is expected to result in a changing and more varied climate. Some experts say climate change is already happening. While there has been a world-wide warming trend and a warming across Canada overall, the Atlantic region has experienced cooling over the past half century. Some potential changes that would put additional stresses on the built and natural environment are: more rain and snow, more severe storms, more weather extremes and a rising sea level. By identifying how climate change is affecting or might affect different parts of the region in different ways, we can take the steps necessary to anticipate and adapt in the best ways possible.

The impacts and implications of climate change on the Atlantic provinces of Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick, are documented in detail in Environment Canada's 1997 report, *Climate Change and Climate Variability in Atlantic Canada, Volume VI,* Canada Country Study. This document is a summary of those findings.

The Canada Country Study (CCS) is the first-ever national assessment of how climate change will affect Canadians and their social, biological and economic environment over the next century. It brings together the knowledge and views of climate experts in government, industry and academic institutions, identifies gaps in research and recommends plans of action.

The volume for Atlantic Canada is one of two national and six regional reports summarizing the Canada Country Study findings.

Climate Change

Climate is naturally variable. From our own experiences we know that one summer is often warmer than another, or one winter is colder or snowier than another. Such variability is normal, and is related to changes in ocean currents or sea-surface temperatures, volcanic eruptions, alterations in the sun's energy output, or other features of the climate system.

Over the past century, however, climates of nations around the globe, in general, have been getting warmer. In the last half a century, most parts of Canada have also experienced warmer temperatures and increased precipitation. These trends may reflect the growing influence of human activities on our planet.

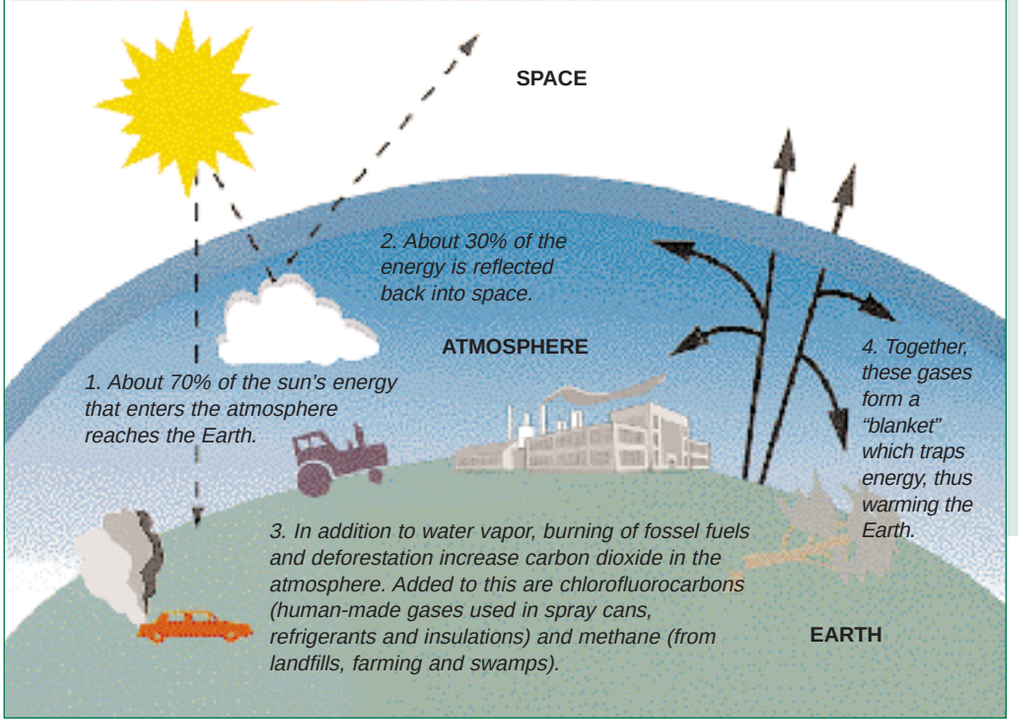
The concentrations of greenhouse gases, mainly carbon dioxide, methane and water vapour, which occur naturally in the atmosphere, are being altered through the burning of fossil fuels (coal, oil, natural gas), deforestation, and industrial and agricultural processes. These gases warm the atmosphere, and the climate and environment respond. Each climatic response triggers others, and we are still learning about some of these responses. So, it is difficult for scientists to accurately predict how much climate will change, or how those changes will affect us, especially at a regional or local level.

Greenhouse gas emissions will continue to increase over the next century. If the world continues along its present course, the concentration of greenhouse gases in the atmosphere will double before the end of the 21st century. In response, the average global temperature is expected to rise by one to four degrees Celsius. To get an idea of how significant this change could be, consider that the global temperature during the last Ice Age was only four to six degrees cooler than today.

While climate changes and impacts in Canada will mirror global ones, significant regional variations are anticipated, owing to the large size of the country. Here are some of the changes we're already experiencing:

- warming across most of Canada this century, with largest changes occurring in the northern prairies and Mackenzie Basin;
- increased precipitation in almost all regions of the country over the last half a century;
- sea level rises along portions of the coast;
- increases in insured losses caused by extreme weather events.

How the Greenhouse Effect Works



Source: World Resources Institute, *Changing Climate: A Guide to the Greenhouse Effect* (World Resources Institute, Washington, D.C., 1989).

How Climate Change Will Affect Atlantic Canada

Variations in temperature, rainfall, snowfall, storm activity and other weather conditions can affect coastal areas, water resources, vegetation and wildlife, agricultural production, forestry and fisheries, energy supply and demand, buildings and roads, infrastructure, transportation, recreation and tourism, the insurance and financial sectors, as well as human health and safety. In Atlantic Canada, the effects of greater climate variation will be felt across all sectors and by all households.

Climate variations affect many of the economic sectors that Atlantic Canadians depend upon for prosperity. Additional climatic changes will result in direct benefits for some industries but create losses for others. For instance, more ice free days would benefit the marine transportation and offshore oil and gas industries but may be detrimental to some aquatic species.

Certain climatic changes may benefit agriculture and forestry. These gains, however, may be offset by other factors such as unusually late springs or early frosts, as well as disease outbreaks or insect infestations.

Oil rig

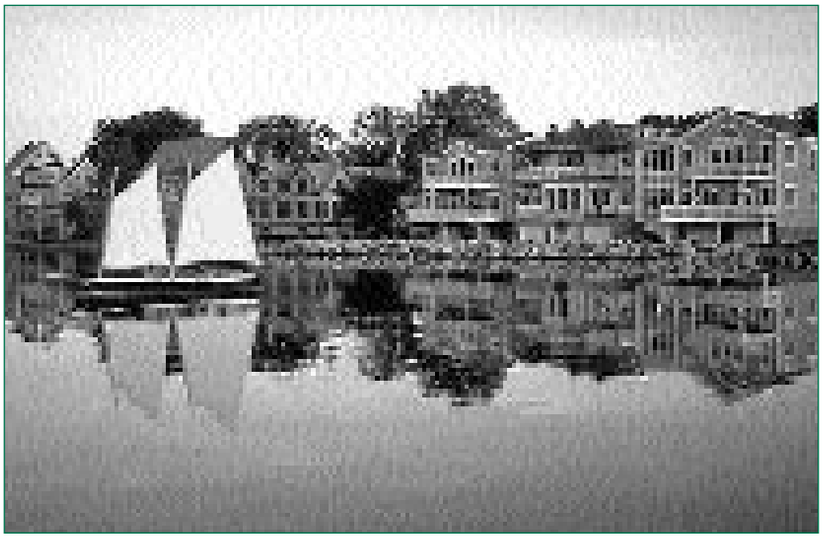
property in the region is on the rise. With more and more people living along the coast, the loss of life and financial risk associated with changes in hurricane activity is greatly increased.

A higher risk of flooding and dike overtopping, associated with a rising sea level, would occur in the Bay of Fundy. Salt water could enter drinking water supplies, mix with soil, damage crops, vegetation and wildlife. Roughly half of Atlantic Canadians rely entirely on groundwater for their domestic needs. Flooding would drive people away from many areas.

Changes in winter sea ice, particularly in the Gulf of St. Lawrence and northeast Newfoundland, may contribute to coastal erosion. Atlantic Canada is one of the regions most seriously affected by ice-jamming. Ice jamming has a multitude of socioeconomic

The People — Living Near the Sea

Of particular concern to Atlantic Canadians is the potential damage to ports and coastal cities that an increase in storm intensity would have. More intense and frequent storms would increase the risk of flooding, coastal erosion, property and crop damage. Demand for coastal



South shore seascape

impacts such as flooding, damage to private property, roads and sewer lines. It can also interfere with navigation and inhibit hydropower generation. Ice jamming costs the Canadian economy about $60 million a year.

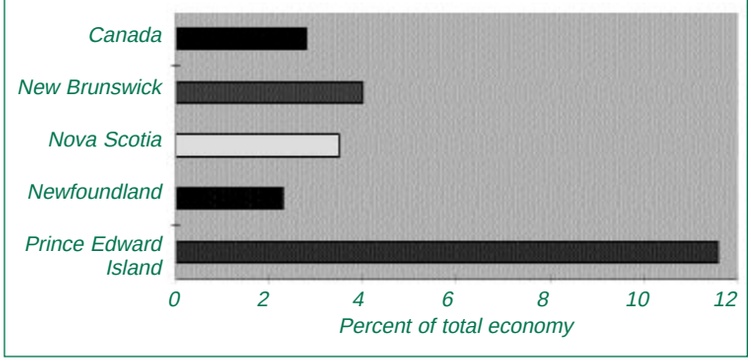
The Economy — Dependent on Natural Resources

Primary resource-based economies, such as agriculture, fishing, forestry and related industries are most susceptible to climate change and variability. These industries play a greater role in Atlantic Canada's economy than in the national economy as a whole.

Preliminary efforts to understand the effects of climate change on the region's economy indicate that, while some sectors will benefit, others will be negatively affected:

Agriculture

Percentage of total economy accounted for by the primary industries *(agriculture, fishing and forestry)*



The agricultural sector is particularly sensitive to climate change and variability because of its direct dependence on the weather and climate. Soils and climate, to a large extent, determine the types of crops that can be grown in the Atlantic region, where these are best produced, the yield and quality that is achievable with present-day technology and the types of management practices used.

The region's relatively short, cool growing season and general lack of good quality soils makes many areas unsuitable for farming. The most important agricultural areas are the Annapolis Valley of Nova Scotia (fruit orchards), Prince Edward Island (grain and potato productions) and northwestern New Brunswick (potatoes). Newfoundland and Labrador have limited agricultural production.

Forestry

Forestry is also sensitive to changes in climate. Climatic factors influence tree growth rates, the ability of forests to absorb atmospheric carbon dioxide, the length of the growing season and the amount of productive forest land available.

Although an improvement in forest productivity is possible if the climate warms, some of the potential gains may be offset by other negative factors such as air pollution, especially smog, acid rain and acid fog transported from highly industrial areas to the south and west. Other disturbances such as insect outbreaks and increased risk of fire can affect forest health and productivity.

Fisheries

Many factors influence changes in fish populations, making it particularly difficult to estimate socioeconomic impacts of climate change. Fish stocks vary depending on both fishing practices and natural factors, including environmental change. It is difficult to define which of the two cause more damage. It is known that climate change factors, such as temperature changes, can have a pronounced effect on the growth of fish species, spawning and reproduction, distribution, abundance and migration, and catchability and availability.

The collapse, since the early 1990s, of the northern cod industry in the region has been the subject of intense debate and the possible effects of climate change on the industry are yet unclear. The crisis, however, has demonstrated the region's social and economic reliance on the health and resilience of a natural resource.

It is estimated that 35,000 direct (fishing and

fish processing) jobs and another 15,000 indirect jobs have been lost in Atlantic Canada since the industry collapsed. Hundreds of communities are facing the loss of both their livelihoods and their way of life. Billions of dollars have been spent by the provincial and federal governments to deal with the crisis.

Even with the moratorium on groundfish in Newfoundland, fish processing continues to play a major role in the economy. In Nova Scotia, the two largest manufacturing industries in 1992 were fish processing and other food products, both of which are sensitive to climate change.

Energy

Energy demands are equally sensitive to climate change. It is estimated that for every one degree Celsius change in the mean annual temperature, energy demand for space heating drops or increases by $46 million a year. If Atlantic Canada's cooling trend continues, this will result in increased energy use unless more energy efficiency and conservation measures are taken. Those parts of the region that might experience higher summertime temperatures would see increased energy use for air conditioning as well. Since changes in mean temperatures do not reveal subtle variations in seasonal or diurnal trends, it is not possible at this time to conclude precisely the energy costs or savings anticipated from a changing climate.

The Environment—A Delicate Balance

Atlantic Canada contains a large number of land, freshwater and marine environments, providing homes for a broad variety of wildlife. These environments also support the activities of 2.3 million people. The nature of the region, its flora and fauna, climate and patterns of human settlement are strongly influenced by its location on the eastern edge of North America. Ocean currents, sea ice and wind patterns greatly influence climate in this region.

Canada's Maritime provinces have more than 25,000 inland lakes and rivers. Labrador and Newfoundland's interior have an estimated 135,000 water bodies each. Marine mammals include polar bears, seals and a variety of whales, dolphins and porpoises. Land animals range in size from the moose to the shrew. The largest herd of caribou in the world ranges over part of Labrador.

The Region's extensive coastline, extending about 40,000 km, is also home to a wide variety of seabirds and coastal birds. The coastal waters of Newfoundland and Labrador, and the mudflats of the upper Bay of Fundy, are particularly important for migratory shorebirds. Marine fish include the Atlantic salmon and several species of commercially important finfish such as cod, haddock and pollock. Climate changes which disrupt habitat, food sources or breeding patterns for wildlife will directly result in economic losses for the region.

Climate Trends

Since the health of their economy directly depends on the health of the environment, Atlantic Canadians can hardly be complacent about climate change. Climatologists predict that climatic swings will dramatically affect growing seasons, forest cover, drainage patterns, ice caps, sea and lake levels, permafrost, lakes and fisheries, and the distribution of certain diseases.

An event far removed from Atlantic Canada may have significant local effects. For instance, the melting of the polar ice caps and the thermal expansion of the world's oceans, causing a rise in sea levels, will significantly affect Atlantic coastal areas and the many species of life that live there.

Global air circulation patterns, ocean currents and sea ice extent are major influences on the current climate of the Atlantic Region due to its location on the eastern edge of North America. Atlantic Canadians are used to dealing with geographic and seasonal variations in climate.

Each year, Environment Canada weather centres issue hundreds of inland weather warnings and thousands of marine warnings. The high degree of climate variation that the region naturally experiences makes it difficult to identify, with any degree of certainty, trends that are the direct result of climate change.

Cooler, More Rain, Snow

Predicted climate changes for Atlantic Canada


Atlantic wetland

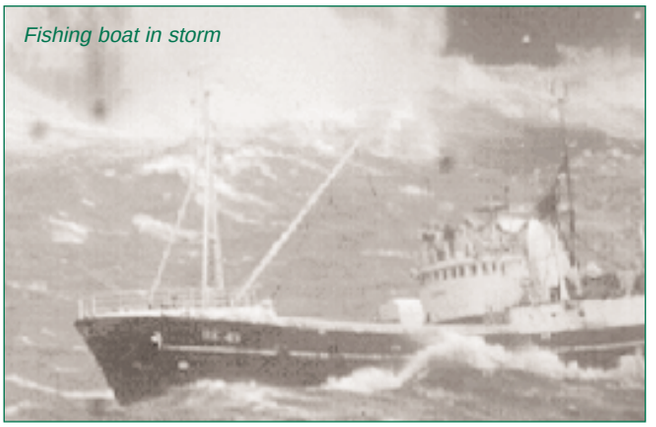
will not be uniform. Although there has been a worldwide warming trend and a warming in Canada overall, much of the Atlantic region has experienced slight cooling over the past half century. The region has also been experiencing increased precipitation since 1948, with no decrease in recent years, as in other parts of Canada.

More Cyclones, Hurricanes

Recent changes in Atlantic sea surface temperatures and upper air wind patterns are creating conditions that favour increased tropical cyclone activity, especially major hurricanes. Recent studies suggest the region may be entering a period of significant hurricane activity, similar to that experienced in the 1950's and 1960's.

Rising Sea Level

Sea levels are rising along most coasts of Atlantic Canada. Climate models suggest that global sea level is rising at a rate of one to two


Fishing boat in storm

millimeters a year and a further increase of about 0.5 meters is anticipated by the year 2100. In many parts of Atlantic Canada, this global rise will lead to increased flood risk in some areas and accelerated coastal erosion in others. People living along the coastline will be particularly vulnerable and tourism will suffer losses because of beach erosion. Wildlife habitat will also be threatened.

Can We Adapt and How?

Given the serious potential effects of climate change to Atlantic Canada's social, economic and environmental well-being, it is important to explore ways of adapting to the changes taking place. Improved climate models, particularly regional models, are needed to assess these changes and their probable impacts on natural resources, coastal areas and all forms of life.

Energy Efficiency

Given the region's heavy reliance on fossil fuels, the implementation of energy efficiency and conservation measures in the short term and the introduction of renewable energy sources in the longer term are essential.

Coastal Zone Management

Given the low population density and large,

mostly natural coastline, the best way to adapt to the rising sea level is by allowing the coastline to retreat, except in areas where protection is warranted. This would avoid costly engineering solutions. Coastal zone management policies should be developed and implemented to protect specific areas.

Fisheries Conservation

This important food supply must be protected. The preservation of existing fisheries habitat must be made a priority and aquaculture operations expanded to both safeguard this food source and provide increased employment opportunities.

Fisheries management policies should be modified and strengthened. The promotion of fisheries conservation and environmental education among fishermen on an international basis should be encouraged.

Agriculture

Coping with variability and extremes in climate will be difficult for the agriculture industry. Adoption of better soil management practices, improved irrigation and drainage practices, increased efficiencies in operations and the development of improved crop varieties will help producers to cope more effectively with predicted changes.

Forest Management

Most forests thrive in particular ranges of temperature and precipitation and may not re-adapt fast enough to keep up with the pace of climate change now being predicted. A sudden loss of large tracts of forested area in one region can put increased pressure on remaining stocks in other regions.

To minimize the harmful effects of climate change, we need to improve forest practices, speed up reforestation with tree species that are better adapted to climatic variability, and preserve wildlife habitat. While these efforts may be challenged by the threat of disease and insect infestations, extensive monitoring of forest health will provide early warning of any changes.

Taking Action

Although Atlantic Canada contributes little to

Peggy's Cove, the lighthouse route

the total amount of greenhouse gases that are disrupting climates globally, we still have an important role to play in the control of emissions. The first step Atlantic Canada can take is to remain engaged in the issue of climate change through continued research, enhanced monitoring and information exchange.

With ample supplies of wind, water and sunlight at its disposal, Atlantic Canada can also develop renewable energy technologies for which a massive global market already exists. We can foster the creation of technological innovations in agriculture, forestry and the fishery industry to help meet the challenge of climate change.

Atlantic Canadians have a tenacious and enterprising spirit. If our past can predict our future, our innovative spirit may prove to be our most valuable resource in meeting the challenges posed by climate change.