

A regional perspective on global climate change

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Global climate change has garnered some media attention, but has failed to gather the attention of most governmental decision makers and the public. In an effort to advance concerns about the issue, the New England Governors and Eastern Canadian Premiers sponsored a three-day symposium on climate change last May 19-21 in Portland. At the symposium, scientists and public officials from both the U.S. and Canada explored the science of climate change, the potential implications and impact of climate change on this region, and the possible policy responses. In the following analyses by James Bruce, Dean Marriott, and Mark Victor, reflecting the breadth of topics explored at the symposium, each author argues that the level of public and public policy decision makers' awareness about climate change issues must be heightened, and decision makers must begin to deal collaboratively with the many serious challenges climate change is presenting to the region.

Canadian provincial perspective on climate change

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This is an overview of the issues that relate to climate change in eastern Canada, which includes Quebec, New Brunswick, Nova Scotia, Newfoundland and Prince Edward Island. I will begin by describing the three distinct climate regions of eastern Canada. I will then speculate on some of the economic and social impacts that could result from climate change. Finally, I will briefly outline some of the actions being taken by the provinces in response to the threat of severe climate change.

The provinces of Quebec, New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland represent approximately twenty percent of the land mass of Canada and are inhabited by more than nine million people. Over such a vast area, there are significant regional climate differences to which the local inhabitants have adapted to over time. These climate regions are defined as northern Quebec and Labrador, southern Quebec, and Atlantic Canada.

In northern Quebec and Labrador, summers are generally cool, and winters are long, cold and snowy. As you move to the south and east of this region, annual average temperature figures increase. The annual average temperatures can range from minus seven degrees Celsius (20 degrees Fahrenheit) in the northwestern part of the region to plus one degree Celsius (34 degrees Fahrenheit) in the southeastern part. Over the past century, this region has experienced a moderate warming of 0.5 degrees Celsius (one degree Fahrenheit).

The second climate region is the extreme southern portion of Quebec, which includes Quebec City. This region is influenced by air masses from the Pacific, the Arctic, the Gulf of Mexico and occasionally the Atlantic. The result is a variable climate with marked temperature extremes and no extended wet or dry spells. Average annual temperatures are in the range of five degrees Celsius (41 degrees Fahrenheit) with daily temperatures averaging above freezing from March to November. Over the past century, this region has recorded a warming of approximately 0.7

degrees Celsius (1.5 degrees Fahrenheit), which is slightly higher than that of the northern Quebec and Labrador region.

The Atlantic Region, which includes New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland, has a significantly different climate from northern Quebec and Labrador and a slightly different climate from the southern Quebec region. Because of prevailing westerly air flow, the climate in the Atlantic region is essentially continental. As a result, wide daily and seasonal temperature fluctuations are experienced, which are not normally found in a true maritime climate. However, the ocean also impacts on local weather conditions. For example, winter pack ice along the coasts often delays the arrival of spring, coastal locations in Newfoundland and Nova Scotia are cooled in summer by the cold waters of the Labrador current and in autumn, the relatively warm waters of the Gulf of St. Lawrence can retard the onset of winter by up to a few weeks. Annual average temperatures range from a low of about five degrees Celsius (41 degrees Fahrenheit) in Newfoundland up to approximately seven degrees (44 degrees Fahrenheit) in the southern part of Nova Scotia. Over the past century, this region has warmed only 0.4 degrees Celsius (less than 1 degree Fahrenheit), which is less than the other two regions.

Potential climate change implications

In this discussion of potential climate change implications for each of the five eastern provinces, I will assume that the build-up of greenhouse gases in the atmosphere will continue unchecked at current or increasing rates for many years to come.

Quebec

Quebec is a province rich in natural resources. The sectors of the Quebec economy that have been previously identified as being most susceptible to the adverse or beneficial effects of climate change are energy, forestry, agriculture and tourism.

For the energy sector, there would be changes to the hydro-electric power generation capacity under a warming scenario. In the northern part of Quebec, which would include the James Bay area, power generation capacity would likely increase due to surplus runoff and positive economic impacts would result. In the southern region, however, it is expected that power generation capacity would decrease due to a warmer, dryer climate. Climate change can also impact upon energy consumption rates. In a warmer climate, winter heating requirements would decrease while summer cooling requirements would increase. The net change in consumption of energy due to climate change has yet to be quantified with any degree of certainty.

Forestry is also a major component of the Quebec economy. It has been predicted that a doubling of atmospheric carbon dioxide would have negative impacts, as major forest ecosystems would be pushed northward by several hundred kilometers. This could have significant impacts on the survival rates of certain types of tree species. It could also mean drastic changes in habitat for creatures living in these forests, some of which may not be able to adapt. On the positive side, hardwood forest areas would develop across the southern part of the province and would expand

by about 200 percent. Furthermore, forest growth rates would increase as a result of a warmer climate but damage to forests due to disease, fire and insects would also likely increase.

With respect to agriculture in Quebec, growing seasons could be lengthened by up to sixty days in a warmer climate, which would be generally beneficial. However, possible moisture stress in the southern regions would likely reduce yields of certain crops unless irrigation systems are installed. This would be costly and would place increased demands on a diminishing water supply.

Finally, tourism would be affected both positively and negatively. As would be expected, warming would extend the spring/summer/fall tourist season. On the other hand, in a climate warming scenario the number of ski days in southern Quebec could decrease in the range of 40 to 70 percent. This would severely cripple the economies of some areas of the province.

Atlantic Provinces

In Atlantic Canada, the dimensions of climate change in the region is slightly more difficult to predict. Correspondingly, so are the impacts. Probably the most talked about and studied impact of global warming is sea level rise. Many coastal communities and their associated infrastructures are at risk and susceptible to flooding, erosion and saltwater intrusion of groundwater supplies. For example, a study of possible impacts of a one meter rise in sea level for Charlottetown, Prince Edward Island, resulted in predictions of significant social and economic damage to the city's waterfront developments which includes wharves, marinas, streets, sewer systems, parks and over 250 buildings.

Another concern in the Atlantic region is the impact of climate change on fisheries. There are those who suggest that problems presently being experienced with the demise of cod stocks off of the coast of Newfoundland are a result of recent cooling, which may have effected fish migration and breeding patterns. Along the same lines, every spring in Prince Edward Island, lobster fishermen wonder whether the season will start on time or will be delayed due to ice along the shorelines of the Island. This past winter has been one of the worst for ice in recent years and even as late as early May, some lobster fishermen could not leave the docks to set their traps due to ice. In contrast, a warmer climate would extend the inshore fishing season and would likely promote a substantial growth in the local aquaculture industry.

Besides the fishery, two of the other major resource based industries in Atlantic Canada are forestry and agriculture. These industries would be affected by a warmer climate in much the same ways that I have already described for the province of Quebec. To be more specific about agricultural impacts that could be expected, Nova Scotia's blueberry industry may benefit from more frost free days, while the potato industry in New Brunswick and Prince Edward Island may suffer.

There are also some marine impacts that could be the result of global warming. Less sea ice would reduce the need for ice breaking and hence would reduce shipping costs. It may also decrease the down-time for offshore oil and gas exploration rigs. Less sea ice, however, would

likely result in an increase in all forms of marine traffic, which would in turn increase costs related to search and rescue operations.

Because climate change along both the Atlantic and Pacific coasts of Canada is not expected to be as great as in the central region, the impacts may not be as significant as in other parts of the country. Furthermore, global warming would have both positive and negative impacts directly on eastern Canada, but global warming is not expected to cause the catastrophic events that are predicted to occur in other parts of the world. But the occurrence of catastrophic events in other parts of the world will impact indirectly on the region. We should expect to see significant disruptions in world trade patterns, especially in agriculture, and the creation of millions of environmental refugees seeking higher ground and more hospitable climates.

Canadian action on greenhouse gases

Finally, we need to consider what steps are being taken by the provinces to address the buildup of greenhouse gases in the atmosphere. At the federal level, the Government of Canada has already made international commitments to stabilize greenhouse gas emissions at 1990 levels by the year 2000. As a result of this commitment, most provinces have begun to compile greenhouse gas inventory information, which can be established as baseline data for measuring progress. While the provinces are in the process of compiling their inventories, there are many programs already in place in eastern Canada that will contribute to a reduction in emissions of greenhouse gases. Most of these programs are either related to the conservation of energy or to the development of sources of alternate energy. New regulatory initiatives to deal with air quality issues are also underway in many provinces. These regulations will help both in terms of gathering the required greenhouse gas inventory information and in controlling the sources that emit greenhouse gases into the atmosphere.

Conclusion

Regional climate change can be difficult to predict. While one part of the world is experiencing a warming trend, other parts may have lower than average temperatures over an extended period of time. For this reason, it is difficult to convince the public that we are almost certainly in the midst of an overall trend toward increasing global average temperatures. This is especially true in eastern Canada, where opinions are likely to be based on recent experiences with unusually colder temperatures in both the past summer and winter. The average person is not aware of the complexities of global weather patterns or of the effects on climate of natural phenomena such as the 1991 eruption of Mt. Pinatubo in the Philippines. In conclusion, it may be difficult to convince people to change behavior if they do not directly experience the problems that are to be solved. Unfortunately, our society characteristically ignores potential problems until confronted directly with a crisis. It is our challenge to do what we can to avoid such a crisis.

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