

# Projected Impacts of Climate Change for Newfoundland & Labrador: Frequently Asked Questions

Prepared by: The Office of Climate Change, Energy Efficiency and Emissions Trading  
Government of Newfoundland and Labrador

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## **Q1. Who developed the projections for the Government of Newfoundland and Labrador?**

Dr. Joel Finnis. Dr. Finnis is a Professor of Geography at Memorial University. He holds a PhD in Atmospheric and Oceanic Sciences from the University of Colorado. His research involves the analysis and intercomparison of large climate data sets, climate analysis and forecasting, and studying climate dynamics in Arctic and Sub-Arctic regions. Dr. Finnis is a leading expert in Canada for the downscaling of global projection models for application to smaller regions, such as Newfoundland and Labrador.

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## **Q2. Can you provide some detail on the process by which global climate projections models are “downscaled”? What exactly is “downscaling”?**

Dr. Finnis used four global climate models in his work – one Canadian, one British and two American models. These models generally provide long-term climate projections on grids as large as 1,000 kilometres. Within North America, a regional research project has developed four regional “downscaled models” that provide projections for grids as small as 50 kilometres. This regional research project is maintained by academics and technical climate researchers throughout North America and provides localized projections for Canada, the US and northern Mexico. These downscaled models have also formed the basis for work in other provinces. Dr. Finnis completed seven provincial-level simulations using these four global models and merged them into a single set of projections. This process reduces the level of uncertainty in the projections.

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## **Q3. The climate projections forecast change from the end of the last century to the middle of this century. Can you be more specific on the data underpinning the projections?**

Climate model predictions are based on 30-year averages, such as 1961 to 1990, or 1971 to 2000. The climate models used by Dr. Finnis examine changes in climate variables from the 1968 to 2000 period, to the 2038 to 2070 period. Dr. Finnis assessed data at all climate stations in the province for which data was available from 1968 to 2000. These weather stations are maintained by Environment Canada and all historical data at these stations are made publicly available by the federal government.

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## **Q4. The study includes projections at 50 x 50 km grids. However, there are some regions of the province that do not have a weather station, such as the Bonavista area. How are these included?**

The regional climate models project climate at 50 x 50 km grids, but are also able to make projections at distances up to 200 km away from a weather station. The network of weather stations in this study allows us to project with reasonable accuracy for the entire province.

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**Q5. The projections include 19 climate variables. Can you be more specific about what these variables are?**

The projections examine changes in average maximum and minimum daily temperatures for each season. It also measures change in certain ratios used by various stakeholders, such as heating and cooling degree days, which are important to energy providers, and growing degree days, which are important to the forestry and agriculture industries. Measures such as the duration of heat waves and the number of frost days are also analyzed. For precipitation, the projections look at changes in the amount of precipitation levels per precipitation event, the frequency of more intense precipitation events, and the average and maximum dry spells. A full list of the variables projected by Dr. Finnis is outlined in the technical report available on the website.

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**Q6. The study is limited to temperature change and precipitation. Why are there no projections for wind, sea surge or fog?**

The outputs from the study are a function of the model inputs and model structure. Regional climate change models have the ability to forecast variables such as wind and fog, but these are more complex to assess. Dr. Finnis is examining shifts in storm systems as part of his ongoing research program, and this could provide a basis for future wind analysis. The models do not forecast sea surge.

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**Q7. The climate is constantly changing. When can these projections be updated?**

The projections can be updated in 2019. That update would be based on new scientific information expected to be released by the Intergovernmental Panel on Climate Change in 2014. It takes several years for regional models to be populated with updated global temperature projections. A decision will need to be taken at that time with respect to updating the models.

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**Q8. Will temperatures rise in a straight line between now and the middle of the century, or will there be peaks and valleys along the way?**

There are a lot of factors that influence temperatures in any given year, such as the presence of El Nino events, volcanic eruptions that release dust, and so on. These factors could result in more or less warming in any given year relative to the previous year. Over a period of several decades, however, there is a distinct upward trend in temperatures.

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**Q9. Will we see more tropical storms and hurricanes?**

This province has been experiencing an average of 11.5 tropical storms and hurricanes per 10 year period since 1990, compared with 6 per 10 year period prior to 1990. The projections show that there will be more storms and more intense storms going forward, so there is the potential for a higher incidence of hurricane activity in future decades.

We are already seeing more hurricanes than in the past. For example, this province has been hit by four hurricanes since 1995, most recently by Igor in 2010. Prior to 1995, the last hurricanes to make landfall in the province were in 1977, 1970 and 1966.

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**Q10. You have shown that there are more hurricanes and tropical storms now than in past decades. Can you remind me about which storms made landfall in the province in recent years?**

The four hurricanes that made landfall in the province since 1995, according to Environment Canada officials, include Luis (1995), Michael (2000), Gustav (2002) and Igor (2010). Igor was the most devastating of these, resulting in over \$150 million in damage. In more recent years, tropical storms that hit the province include Leslie (2012), Maria and Ophelia (2011), Earl (2009), Bill (2008), Chantal and Noel (2007), and Florence (2006).

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**Q11. It appears as though temperatures are rising in the province faster than they are at a global level. Are temperatures warming faster locally than globally?**

Global temperature change cannot be compared to temperature change at any specific location. Average global temperatures are measured at several hundred stations across the world, including land-based and ocean-based locations, and locations in the northern and southern hemispheres. These factors make a difference. For example, there is less land, fewer people and more ocean area in the southern hemisphere. Newfoundland and Labrador represents a small land-based, northern-hemispheric location in estimating global temperatures.

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**Q12. Carbon dioxide concentrations in the atmosphere are at their highest level in human history. Do these projections include anticipated further growth in carbon dioxide concentration?**

Carbon dioxide concentrations are now at 400 parts per million. By comparison, they ranged between 200 and 300 parts per million prior to the Industrial Age, and have not been this high in over 3 million years. Global climate models that formed the basis for this work already build in increasing carbon dioxide concentration.

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**Q13. Data show that temperatures are rising in Newfoundland and Labrador. However, many of us remember the cold summer of 2011 and the spring months seem to be as chilly as ever. How can you say that the climate in the province is warming given these examples?**

It is difficult to associate any particular weather event or short-term weather pattern with long-term climate change. Factors such as El Niño events, volcanic eruptions, and so on, impact short-term trends. It is more appropriate to look at longer-term changes. In looking at provincial data, average temperatures in the past few years, including 2011, are about 2 degrees Celsius higher than the mid-1990s. Over the longer term, temperatures in the province are now about 1.5 degrees higher than the 1961 to 1990 average. With respect to spring months, the projections show relatively fewer changes during these months than for other seasons. In part, this is related to Arctic sea movements during the spring.

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**Q14. Will some areas of the province be relatively more impacted than others?**

Different regions of the province will potentially be impacted in different ways. Some areas will warm more than others, some areas will see more rapid growth in precipitation intensity than others. Labrador will be impacted differently than Newfoundland. However, all regions of the province will experience warming, more precipitation and more intense weather events.

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**Q15. Can we expect to see more invasive species, like coyotes, as the result of climate change?**

Climate change impacts are seen in periods over decades, not years. While the natural range of any species is often heavily influenced by environmental conditions, including precipitation, temperature and geographic location, in the case of eastern coyotes, changing land use patterns by humans was more likely the cause of their range expansion. Going forward, we can expect more changes to wildlife as well as sea life, vegetation and incidence of diseases harmful to human health. However, we cannot predict with any certainty when these will occur.

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**Q16. Will we see an infestation of the mountain pine beetle?**

As we know, the mountain pine beetle is devastating large areas of British Columbia and has now moved into Alberta. A recent CBC television documentary argues that the pine beetle will continue to move in an easterly direction in Canada. It is fair to say that warming temperatures will create the conditions necessary for the pine beetle, and other invasive species, to survive in this region of the country, but it difficult to predict exactly when this will occur. However, in the case of the pine beetle, the preferred host is pine, whereas Atlantic Canada's primary hosts are spruce and fir. It is also fair to say existing natural populations will react to milder winters over time, possibly expanding their range and population.

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**Q17. Can you give us some examples of how different organizations and individuals can use this information?**

The study is being released with a summary presentation on the findings. The summary presentation contains 9 examples of how the information can be used. It covers areas such as municipal infrastructure and municipal zoning, coastal erosion, forestry and agriculture, aquaculture, human health, energy consumption and tourism. Taking forestry and agriculture, for example, warmer temperatures will lengthen growing seasons, but may also bring in new invasive species and pests. Climate change is also impacting us in ways we generally do not think about. Those living in Labrador West, for example, may recall that the rail line that provides supplies and fuel to the region washed out in December 2010, resulting in shortages for several days.

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**Q18. How will you ensure that this information is made available to stakeholders throughout the province?**

We are working with other federal departments, industry associations, non-governmental organizations and municipalities on climate change adaptation matters, and will ensure that this information is made available to them. A presentation deck of the key findings, all local weather station projections and the technical report will be posted on [www.turnbackthetide.ca](http://www.turnbackthetide.ca). All projection maps will be posted on the Department of Environment and Conservation's Water Resources Web Portal.

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**Q19. What data will be made available on the website? Who can access it?**

A presentation deck of the key findings, all local weather station projections and the technical report are freely available on [www.turnbackthetide.ca](http://www.turnbackthetide.ca). All projection maps will be posted on the Department of Environment and Conservation's Water Resources Web Portal.

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**Q20. Hasn't the government already published some projections? Aren't these already shown in documents to assist municipalities in adapting to climate change?**

A previous set of projections were developed to assist municipalities in planning for climate change adaptation. That study did not include Labrador and included only five weather stations in Newfoundland, and the extreme precipitation analysis was limited to five locations for a 24 hour period only. Additionally, temperature and precipitation data was not published for each weather station in the study, which is necessary to maximize its usefulness at the local level. The findings of the previous work, which was also completed by Dr. Finnis, led to the decision to take a broader and more comprehensive analysis, which we are releasing today.

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