

## CLIMATE CHANGE: THE BASICS

### What is climate change?

Climate change is a change or variability in the 'average weather' of a region. This means a change in the temperature, precipitation, winds and/or storms that a given region experiences over a specific period of time. Global climate change refers to these changes over the Earth as a whole.

### The nature of climate change...

Climate change can occur naturally. Our climate is controlled by a balance between energy received from the sun and radiation the Earth loses to space. Any changes in our environment, either natural or human-induced, that alters this balance can affect our climate.

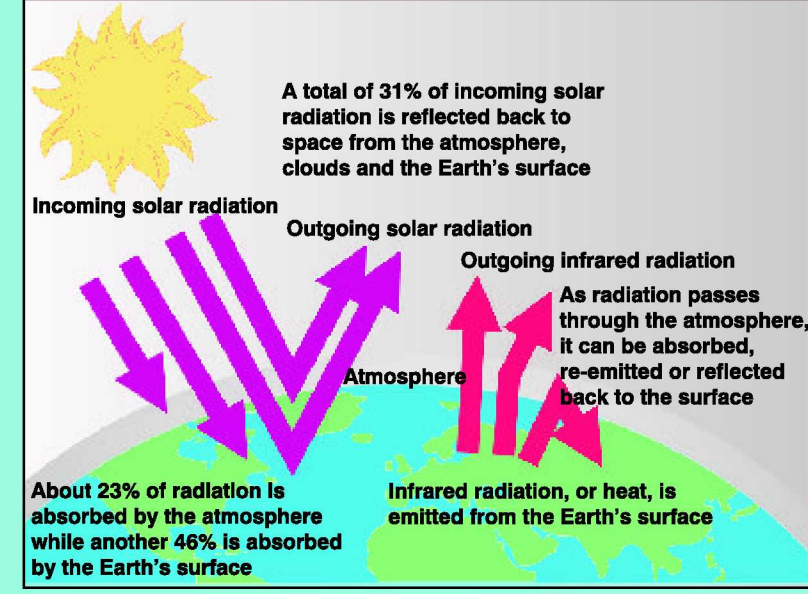
### The Earth's natural thermostat...

The Earth's temperature is regulated by a natural system known as the 'greenhouse effect'. Naturally occurring greenhouse gases, such as water vapour, CO<sub>2</sub>, methane, nitrous oxide, and ozone, trap radiation in the atmosphere which helps to keep the Earth warm enough to support life. Problems can arise when the concentrations of these naturally occurring gases are increased and new greenhouse gases like chlorofluorocarbons (CFCs) are added to the system.

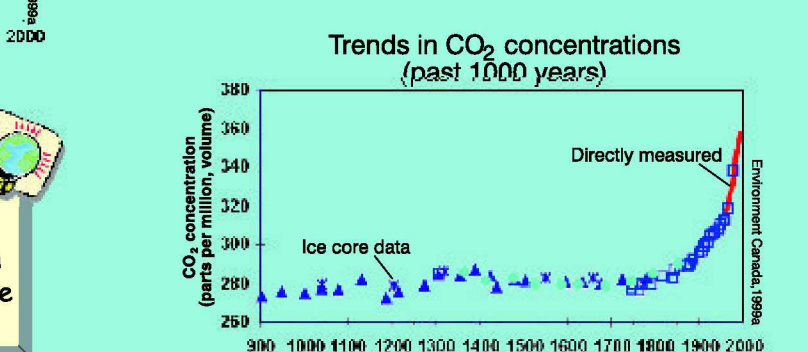
### Natural carbon in our Earth...

Carbon is a part of the Earth's natural system. Within the Earth, it is present as fossil fuels and in sedimentary rocks. It is also stored in the Earth's surface in vegetation and soil, and in the oceans as inorganic carbon dissolved in the sea water. In the atmosphere, carbon occurs mainly as carbon dioxide (CO<sub>2</sub>). Before the Industrial Revolution, CO<sub>2</sub> and other greenhouse gases such as methane (CH<sub>4</sub>) that were put into the atmosphere were balanced by processes of natural removal, so atmospheric concentrations of these gases did not vary much.

**Did you know?**  
Greenhouse gases accumulate in the atmosphere because their molecules have life spans of decades or even centuries.



**CO<sub>2</sub> buildup...**  
Since the start of the Industrial Revolution in the 1700s, atmospheric concentrations of CO<sub>2</sub> have increased by 30%. Climate scientists predict that over the next 40 to 60 years these concentrations will double from their preindustrial levels. The primary cause of the expected buildup of CO<sub>2</sub> is from human activities.

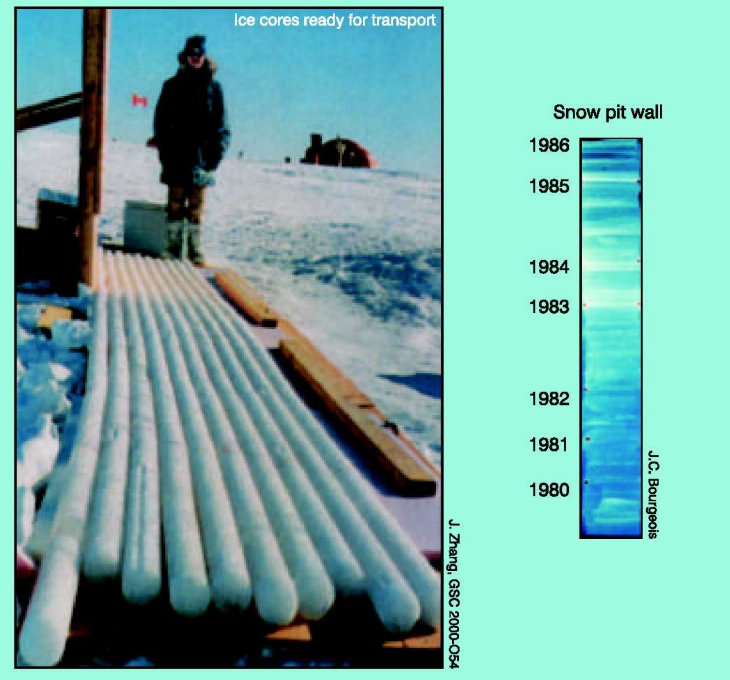


**Climate change factors...**  
Natural factors:  
• changes in solar activity  
• changes in Earth's orbit  
• natural atmospheric aerosols  
• volcanic emissions  
Human-induced factors:  
• enhanced greenhouse effect  
• land use change  
• enhanced atmospheric aerosols

**Did you know?**  
Human activity is currently responsible for emitting 20 million tons of CO<sub>2</sub> each year. 12 million tons of which accumulate in the atmosphere.

### The past preserved...

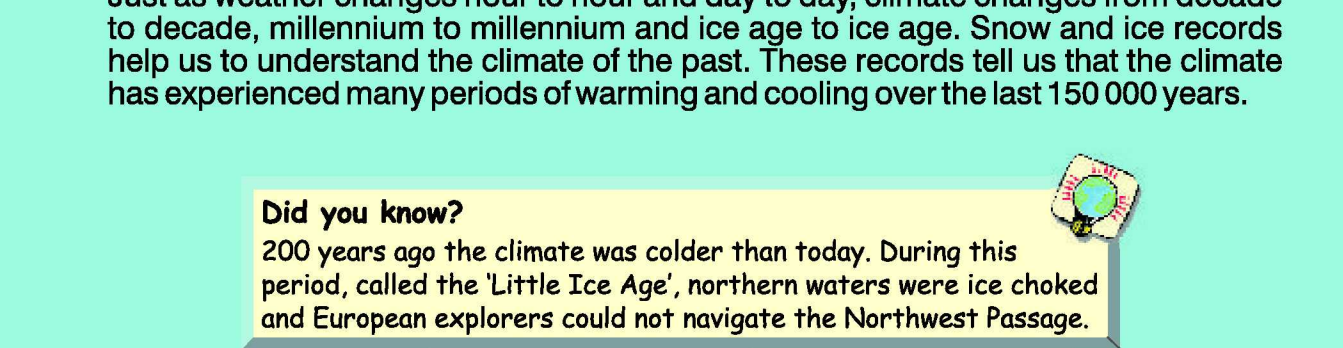
Ice cores drilled from the tops of Canadian Arctic ice caps provide detailed records of past environments, including temperature changes, precipitation, changes in atmospheric pollutants and gases. On the walls of snow pits dug at the top of the ice cap, the seasonal layers can be seen and sampled. Reconstructed temperature records extend the very short weather station records back to before the last ice age.



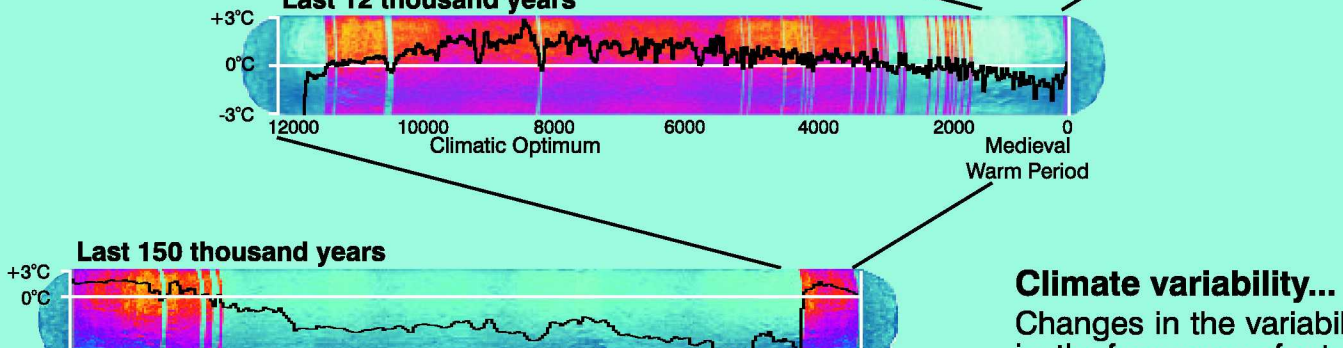
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1000 years ago the North Atlantic climate was like today. During this period, called the Medieval Warm Period, Vikings sailed in Canada's northern waters.

## CLIMATE HAS ALWAYS CHANGED

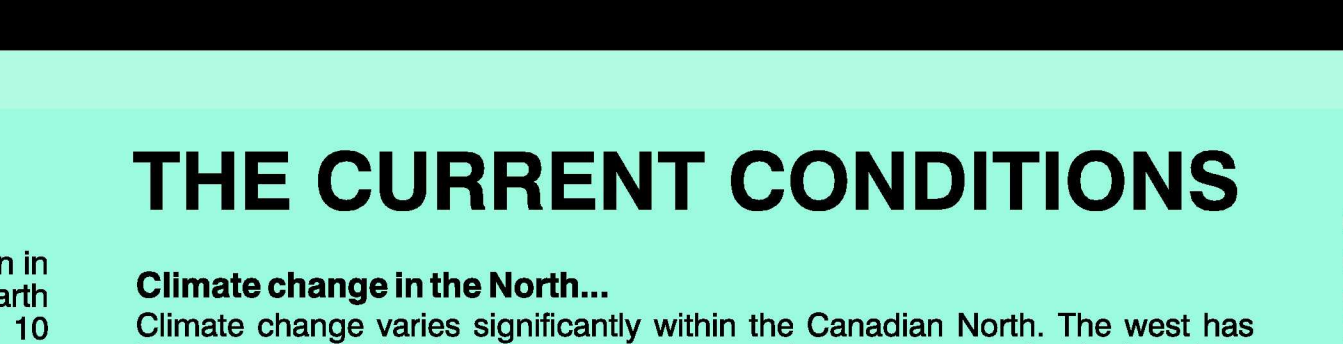
**What the past is telling us...**  
Just as weather changes hour to hour and day to day, climate changes from decade to decade, millennium to millennium and ice age to ice age. Snow and ice records help us to understand the climate of the past. These records tell us that the climate has experienced many periods of warming and cooling over the last 150,000 years.



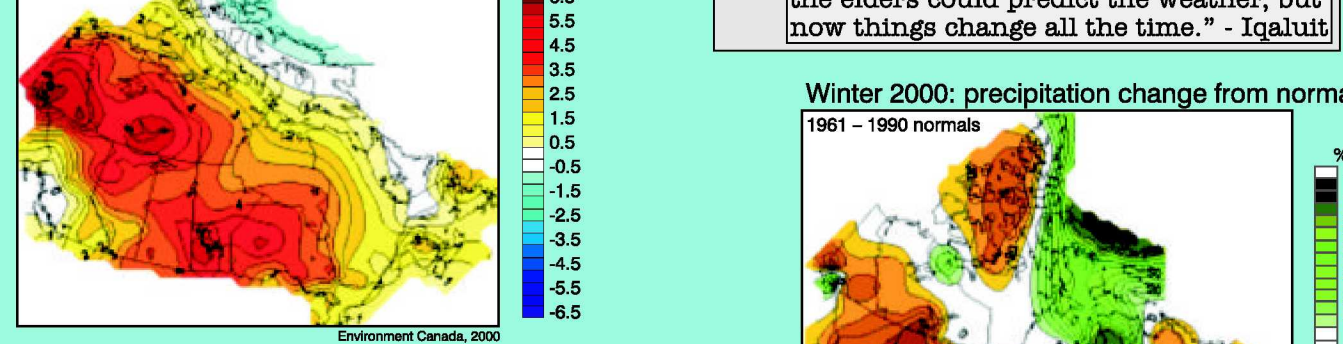
**Did you know?**  
200 years ago the climate was colder than today. During this period, called the Little Ice Age, northern waters were chilled and European explorers could not navigate the Northwest Passage.



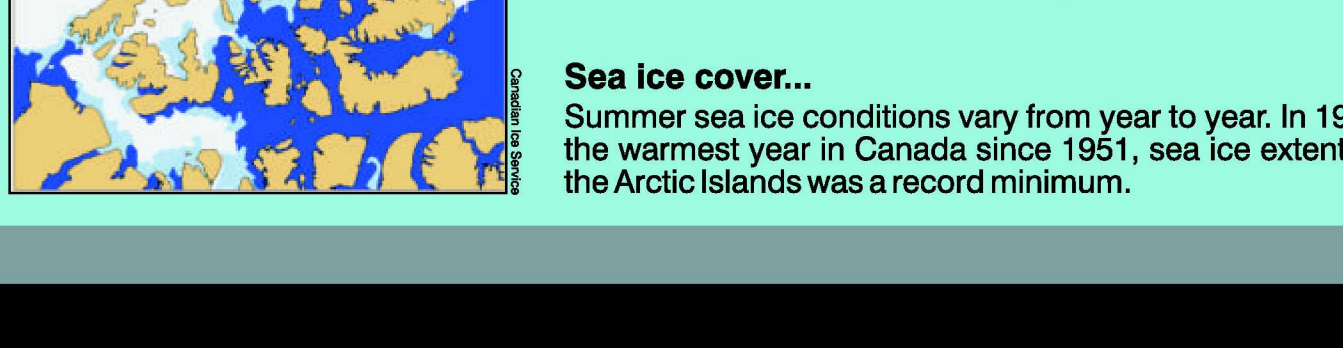
**Current observations...**  
Current temperature trends show that over the past 50 years Nunavut has experienced both strong warming and cooling. The warming trend occurs primarily in the west, where as the east has undergone a cooling trend.



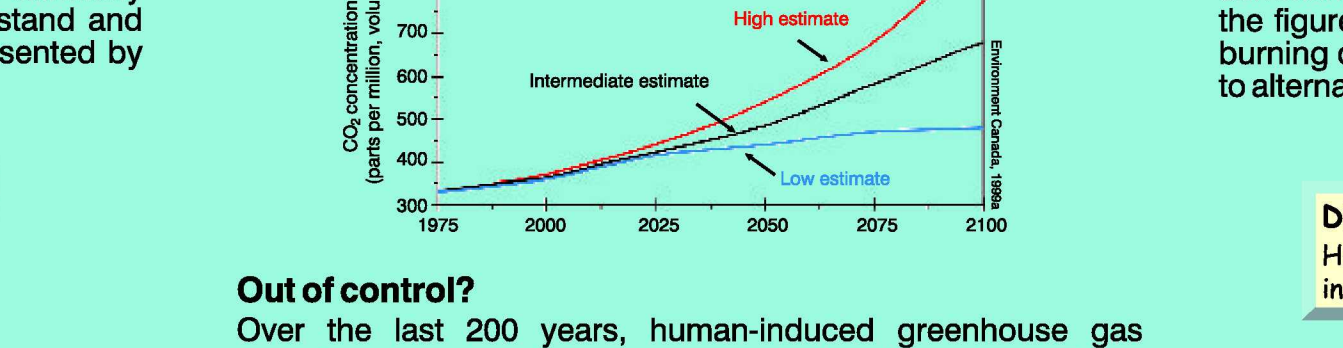
**Climate variability...**  
Changes in the variability or in the frequency of extremes may be as important to life in Nunavut, as the longer term warming or cooling trends.



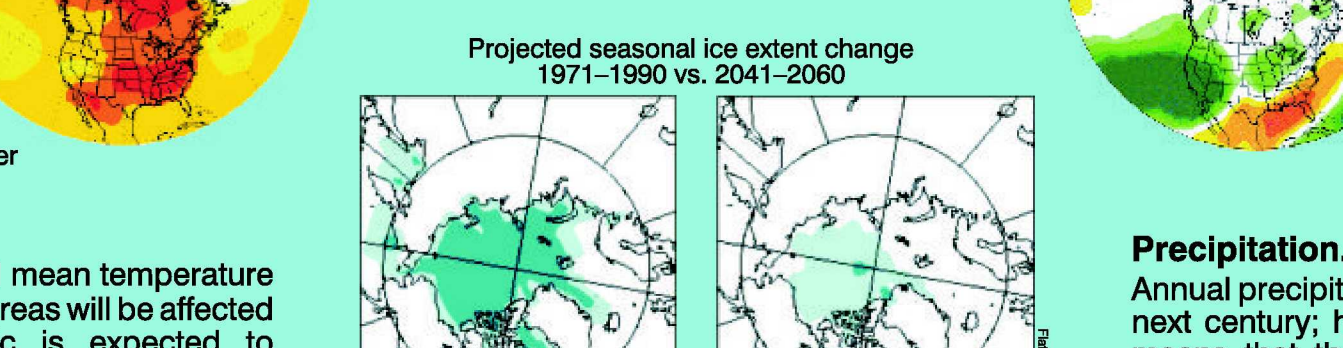
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**Climate change alert...**  
The rate of climate change today is more rapid than in the recent past. Temperature records indicate the Earth has warmed over the past 100 years, with the 10 warmest years on record occurring since 1980.



**Climate change in the North...**  
Climate change varies significantly within the Canadian North. The west has been warming, with the greatest temperature increases occurring in the winter and spring. The east however, has experienced a general cooling trend, with greatest temperature decreases occurring during the winter and spring.



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**Climate change in Canada...**  
Over the last 100 years Canada's climate has been changing, with the most significant changes occurring in the past few decades. These changes however vary across the country by region, as well as by season.



**Did you know?**  
Canada contains the largest area of glaciers and ice caps outside Greenland and Antarctica.



**Monitors of climate change...**  
Glaciers and ice caps respond to the effects of summer temperature and annual precipitation. As a result, they advance and retreat in association with changes in the climate. These changes give us information about climate differences from year to year, as well as help us determine longer term climate trends.



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**What the glaciers are telling us...**  
Records from ice caps in Nunavut show significant annual variations, but no obvious trend over the past three years. However, South Melville Ice Cap in the western Arctic (N.W.T.) is beginning to show a trend toward more summer melt.



**Flooding potential...**  
As in the photo to the right, glaciers may act as a barrier to water drainage and create glacier-dammed lakes. With the predicted melting expected from climate change, these glacier dams may break and result in flooding of land downstream.



**Did you know?**  
If the Greenland Ice Sheet melts, it contains enough ice to raise the global sea level by 6-7m.



**Rising sea levels...**  
As the climate warms, water levels in the world's oceans are expected to rise. The expansion of sea ice will contribute to more erosion and flooding along vulnerable Arctic shorelines. Higher sea levels with less ice cover will expose more of the coast to both normal waves and more powerful storm waves.



**Did you know?**  
Increased coastal erosion may result in the loss of many Dorset and Thule archaeological sites.



**Impacts of sea level rise...**  
Sea level rise, as well as on regional geological adjustments. During the last ice age, the land was pushed down under the weight of the glaciers. As the glaciers retreated, the land started to rebound to its original level. Most areas in the Arctic are still slowly rebounding so increased global sea-level rise may not be much of a problem. On eastern Baffin Island and the northwest Arctic Islands, the land is no longer rebounding so these coasts are more at risk.



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Annual precipitation is predicted to increase by up to 25% over the next century; however, these changes will vary seasonally. This means that the amount and type of precipitation will vary by season. For example, in the northern regions winter snow cover may be reduced by up to 30 days and in western regions snow may be replaced by rain or freezing rain in early spring and autumn.



**Did you know?**  
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