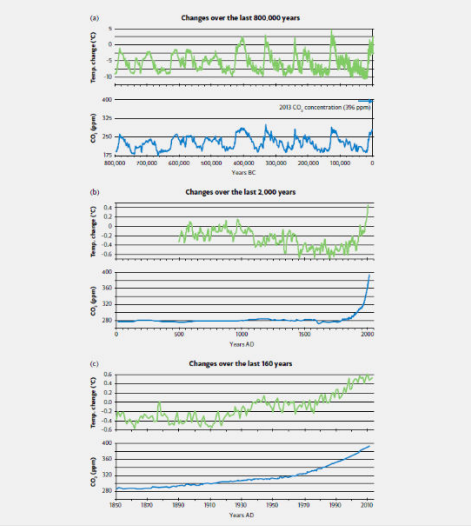
QUILLS
Queen's University Indigenous Land-Based Learning STEM
Queen's University Biological Station

Climate Change
Teacher Backgrounder

- The earth's climate has changed many times over millions of years. For instance, between 20-100 thousand years ago, a good portion of Turtle Island was covered in a thick sheet of glacial ice. Some of these changes are natural and inevitable.
- For instance, due to the *natural* greenhouse effect the ice receded around the globe.
- In recent years we have continued to observe massive changes to the earth's climate.
- For instance, in addition to local changes that can be observed (and felt emotionally, physically, and spiritually) there are several global indicators that help us to perceive changes in climates. These include global warming, changes in polar and glacial ice, rising sea levels and increasing ocean acidity, changing wind and precipitation patterns, and changing storm intensity and frequency.
- Some people still insist that climate change is simply caused by the *natural* greenhouse effect.
- The intergovernmental panel on climate change (IPCC), however, has presented overwhelming evidence showing that the most recent changes are caused by *anthropogenic* (human made) impacts.



Past changes in temperature align with changes in CO_2 at a variety of time scales. These graphs show the changes from long-term average temperature (oC) and average atmospheric CO_2 concentration (parts per million) over the last (a) 800,000 years, (b) 2,000 years and (c) 160 years. The temperature changes in (a) are for Antarctica, while for (b) and (c) they are global averages. Source: Compiled from various publicly available data sources as summarised in Box 2.1. Graphic from: https://rb.gy/fecdh

- If we are effectively address the manner in which human behavior is impacting the natural world it is important to understand the ways *anthropogenic* impacts are affecting the changing climate.
- For instance, since industrialization, a combination of the burning of fossil fuels and deforestation has resulted in a marked increase in *anthropogenic* emissions. These emissions include carbon dioxide, methane, and nitrous oxide. An excess of greenhouse gases cycling through the physical systems of our planet (atmosphere, hydrosphere, cryosphere, lithosphere, and biosphere) is causing the earth's temperature to increase. In Ontario the biggest sources of greenhouse gas emissions come from transportation, industry, buildings, electricity and heat generation, agriculture, and waste.

(Information adapted from: (https://www.peelregion.ca/planning/teaching-planning/pdfs/Grade9forWeb.pdf)