CLIMATE CHANGE PROJECTIONS
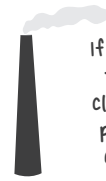## What could future climate look like in northern Ontario?

Climate models are complex computer programs that mimic how the Earth behaves.

CH₄ methane
CO₂ carbon dioxide
N₂O nitrous oxide

Scientists can use these models to predict what future climate might be like if we emit lots of greenhouse gases (GHGs) or if we emit fewer.
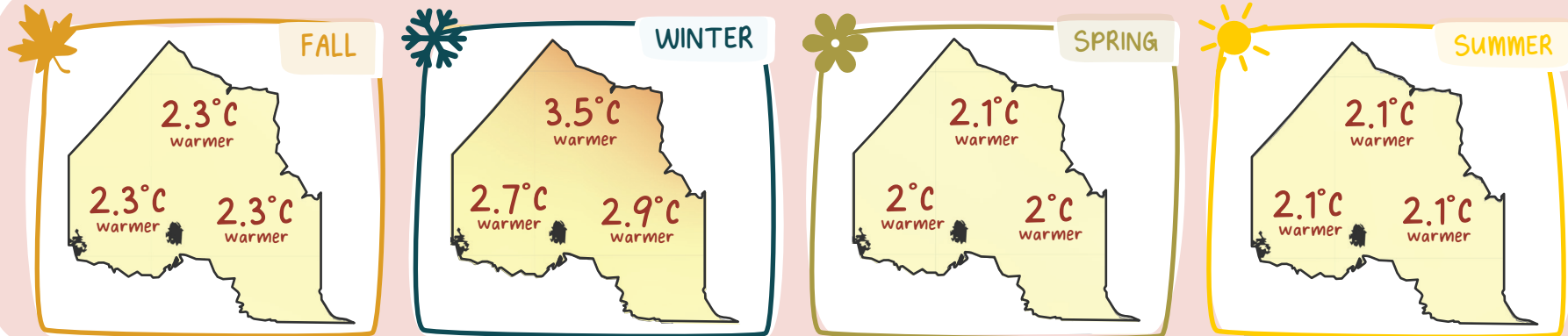
If we keep emitting GHGs at the rate we are now, our climate will likely follow the path predicted in the "high emissions" climate model.
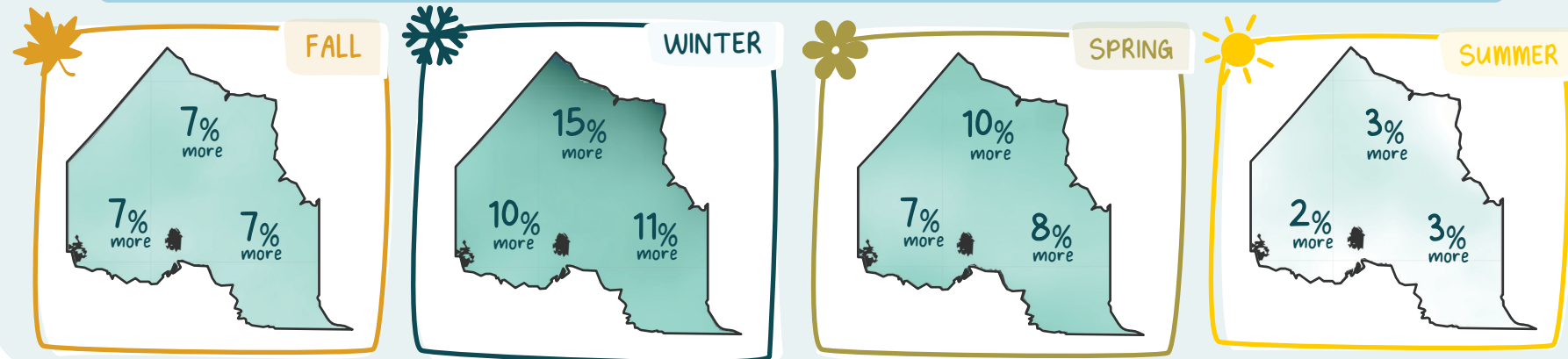
Maps below show temperature & precipitation (rain & snow) for a high emissions future.

How much warmer could the future (2021-2050) be compared to the past (1976-2005) ?

FALL
2.3°C warmer
2.3°C warmer
2.3°C warmer

WINTER
3.5°C warmer
2.7°C warmer
2.9°C warmer

SPRING
2.1°C warmer
2°C warmer
2°C warmer

SUMMER
2.1°C warmer
2.1°C warmer
2.1°C warmer

How much more rain & snow could the future (2021-2050) have compared to the past (1976-2005) ?

FALL
7% more
7% more
7% more

WINTER
15% more
10% more
11% more

SPRING
10% more
7% more
8% more

SUMMER
3% more
2% more
3% more

What could these changes mean?

FALL
• later snowfall
• longer fire season

WINTER
• more winter rain
• thinner ice

SPRING
• faster melt
• more flooding

SUMMER
• more drought
• more wildfire

Climate projections can help us plan adaptations. Adaptations that plan for high emissions can help protect people and communities from climate change impacts even if we follow another path.

* Maps & data from: climateatlas.ca

How do climate models work?
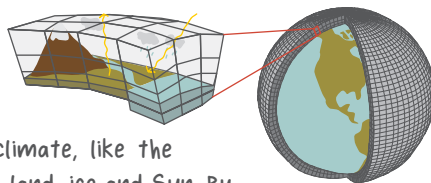
Climate models are computer programs that simulate the processes that drive Earth's climate, like the interactions between the atmosphere, oceans, land, ice and Sun. By first dividing the Earth into a grid of thousands of cubes that reach up into the atmosphere and down into the oceans, climate models use mathematical equations and the laws of physics to model processes like wind or the temperature of the air or water in each cube. They also take into account how what's happening in one cube affects neighbouring cubes. Climate models that look decades into the future are so complex they are run on large "super computers".

To model how climate might change because of pollution, scientists can run the models with more or less greenhouse gas (GHG) in the atmosphere to predict measures of future climate like temperature and rainfall. These predictions (called climate projections) are calculated for a range of possible GHG futures.

What are the future climate pathways?

Climate models simulate different climate futures (called "pathways") based on how much greenhouse gas (GHG) continues to be added to the atmosphere by human activity. Two systems have been developed:
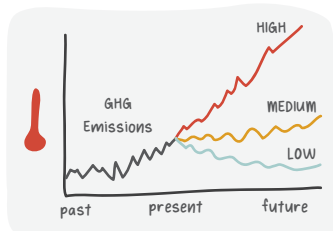
1. RCP (Representative Concentration Pathway) scenarios look at how GHGs affect radiative forcing, or heat energy trapped in the atmosphere by GHGs. The higher the number, the more energy is trapped and the more the Earth heats up.

2. SSP (Shared Socioeconomic Pathway) scenarios look beyond radiative forcing and try to include how factors like population size, economic growth, and new technologies might influence GHG emissions, and therefore climate warming, into the future. SSP scenarios are numbered 1 to 5.

High Emissions Pathways (like RCP8.5 and SSP5) assume that we keep using more fossil fuels. They predict the biggest changes in climate.

**Medium Emissions Pathways** (like RCP4.5 and SSP2) assume we start to replace fossil fuels with green energy and, in the near future, emit less GHGs than we are now.

Low Emissions Pathways (like RCP2.6 and SSP1) assume we dramatically cut fossil fuel use now.

Why are northern Ontario projections higher than the global average?

less ice reflecting sunlight

warm air pushing north
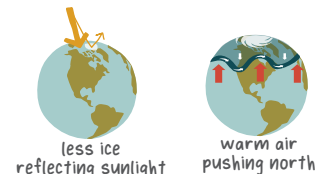
Many countries, including Canada, joined the 2015 Paris Agreement to keep average global temperature rise below 2°C by 2100. But high emission projections show warming for northern Ontario of 3.5°C in winter as early as 2050 and as high as 9°C in winter in 2100.

Global warming does not mean the same amount of warming everywhere. Some places are warming more, and more quickly, than others. The Arctic and northern regions are warming more quickly because more warm air is being carried north by large weather systems. The loss of ice reflecting sunlight and more open ocean also means that more of the Sun's heat is being absorbed by the dark water. This faster warming means that when planning adaptations in northern Ontario, we have to look beyond the global averages and use predictions for northern communities.

Why do scientists trust climate models?

35 Climate Models (CMIP5)

present   2050   2100

To see how well climate models work, scientists test them against climate data from the past. If the model can correctly predict past climate trends, then we expect it to be good at predicting future climate. To get the best results, projections are based on many models developed by scientists all over the world using slightly different calculations for Earth's processes. Canada's climate projection maps come from a group of 35 climate models called CMIP5.
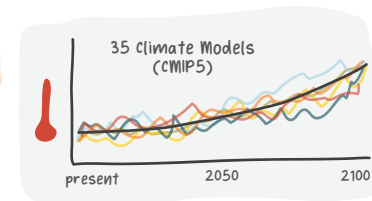
Where can I find climate projections for my community?

The Climate Atlas of Canada (www.climateatlas.ca) is a user-friendly website that provides climate projections for all of Canada. Use the Indigenous button on the interactive map to highlight First Nation, Inuit, and Métis communities and view or download future projections. The numbers on this graphic are from Climate Atlas.

GRAND COUNCIL TREATY #3

KEEWAYTINOOK OKIMAKANAK

Matawa First Nations Management

Mushkegowuk Council

Nokiiwin TRIBAL COUNCIL

Shibogama First Nations Council

Laurentian University Université Laurentienne

UP NORTH ON CLIMATE
Climate Change Impact and Adaptation Study for the North of Ontario

www.upnorthonclimate.ca