

eCards

Research Topic Climate Change

Climate Change

Many now believe that climate change is the most significant issue of our time, maybe even the greatest challenge of this century. Climate change has brought climate science and energy technology onto the nightly news. It has motivated books and films, blogs and debates, protests and demonstrations. It has prompted world leaders to establish international panels and committees, to participate in international negotiations, and to reduce their nations' carbon dioxide (CO₂) emissions. Climate change has mobilized people of all ages from around the world to act.

Over the past few years Greta Thunberg has become the most well-known youth climate activist. Greta's Friday for Futures (<https://fridaysforfuture.org/>) has mobilized 100,000's of people to protest for climate action across the world. This video, <https://www.youtube.com/watch?v=IjRzyjTELUK>, from COP 26 features many young climate activists helping to spread awareness and education about climate change.

The reports from the International Panel on Climate Change (IPCC) are a good source to understand climate change and its effects. The IPCC is the United Nations body that assess the science on climate change. It provides policymakers with regular assessments of the scientific basis of climate change, its impacts and risks, and options for cutting emissions and adapting to impacts we can no longer avoid. According to the 2022 IPCC report summary video here:

<https://www.youtube.com/watch?v=SDRxfuEvqGg&t=328s> there are between 3.3 to 3.6 billion people who are in climate hotspots, that are from the poorest communities and the hardest hit, while the least likely to cope. The recent report also shows that every ecosystem from mountains to oceans are being affected by climate change.

The following graphic shows the effects of climate change on ecosystems and human health.

Impacts of climate change are observed in many ecosystems and human systems worldwide

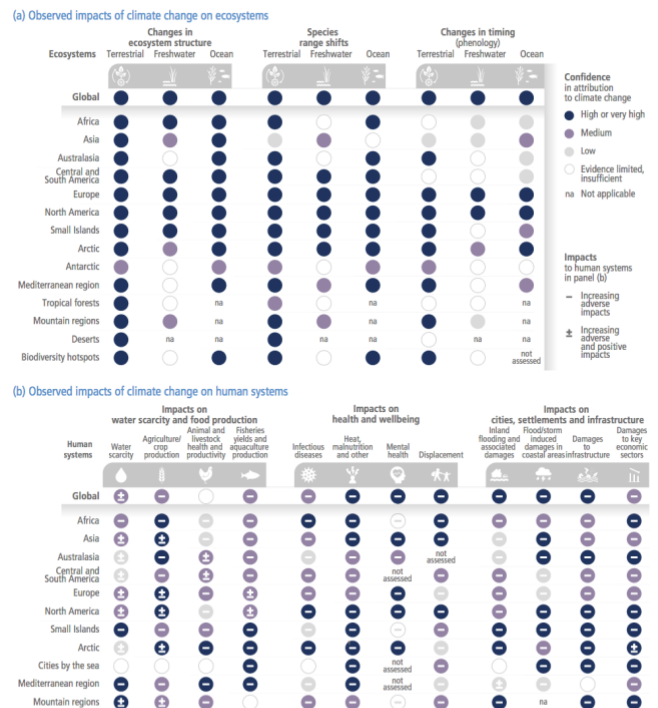


Figure SPM.2 | Observed global and regional impacts on ecosystems and human systems attributed to climate change. Confidence levels reflect uncertainty in attribution of the observed impact to climate change. Global assessments focus on large studies, multi-species, meta-analyses and large reviews. For that reason they can be assessed with higher confidence than regional studies, which may often rely on smaller studies that have more limited data. Regional assessments consider evidence on impacts across an entire region and do not focus on any country in particular.

(a) Climate change has already altered terrestrial, freshwater and ocean ecosystems at global scale, with multiple impacts evident at regional and local scales where there is sufficient literature to make an assessment. Impacts are evident on ecosystem structure, species geographic ranges and timing of seasonal life cycles (phenology). (For methodology and detailed references to chapters and cross-chapter papers see SMTS.1 and SMTS.1.1).

Image Source – (IPCC, 2022).

Increases in the Earth's average air and ocean temperatures, widespread melting of snow and ice, and rising sea levels around the world tell us that the warming of the Earth's climate system is now a fact. We are now experiencing global climate change in the form of melting glaciers, higher sea levels, and more severe storms and other weather events.

Now is the time for all Canadians to understand this issue and take action

So, What is Climate Change?

Climate change is defined as long terms shifts in the average weather. It includes changes in temperature, wind patterns and precipitation which can mean an increase in droughts, floods, storms, hurricanes, tornadoes and other weather events. Global climate change refers to changes in the climate of the Earth as a whole. Global warming has led to the global climate change we are witnessing now. NASA's ongoing temperature analysis, which you can see here, <https://data.giss.nasa.gov/gistemp/>, has shown that "the average global temperature on Earth has increased by at least 1.1° Celsius (1.9° Fahrenheit) since 1880. The majority of the warming has occurred since 1975, at a rate of roughly 0.15 to 0.20°C per decade.

What is Causing Climate Change?

We are. The Earth is warming in response to the amount of greenhouse gases (GHGs) that people have emitted into the atmosphere, primarily by burning fossil fuels and coal for energy supply, industry and transportation, and through deforestation. As populations have grown in size and become more industrialized, more dependent on the conveniences of urban life, we have sent more GHGs into the atmosphere.

In the right quantities, GHGs are essential to life on earth. Made up of water vapour, carbon dioxide (CO₂), methane and other gases, they produce what is referred to as a greenhouse effect. They blanket the planet, acting as a layer of insulation, and reduce the amount of heat that is lost into space. Although GHGs

make up only a very small part of the atmosphere's gases (about 1%), they play a vital role in controlling the planet's temperature and making the Earth inhabitable.

Human activities over the last two hundred years have created a thicker blanket of greenhouse gases. Scientists now distinguish between the natural greenhouse effect and the anthropogenic—or human-caused—greenhouse effect. In 1750, before the industrial revolution, the concentration of CO₂ in the atmosphere was about 280 parts per million (ppm). Today, after many decades of burning coal, oil and natural gas, the concentration of CO₂ had risen dramatically to 420 ppm, see figure 2 below.

ATMOSPHERIC CARBON DIOXIDE (1960-2021)

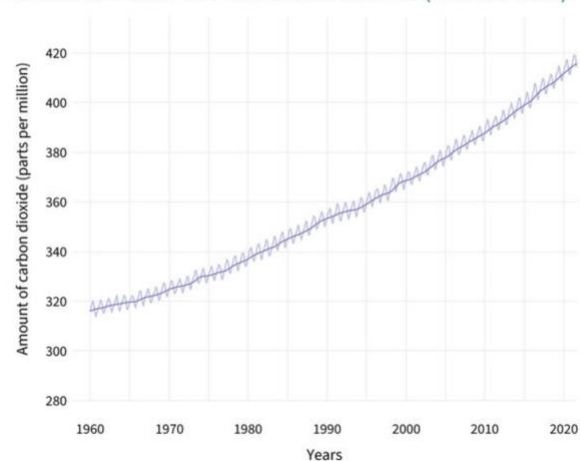


Image Source- (Climate.Gov, 2022).

In recent decades, energy supply, industry, transportation and deforestation have radically increased global GHG emissions. Global carbon emissions from fossil fuels have significantly increased since 1900. Since 1970, CO₂ emissions have increased by about 90%.

Tools such as the one from Our World in Data <https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions> is a great way to compare and see CO₂ and GHGs emissions and where countries are making progress.

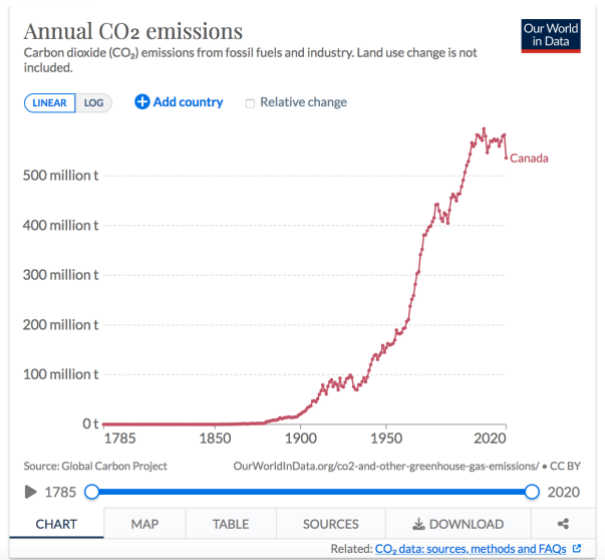


Image Source- (Our World in Data, 2020)

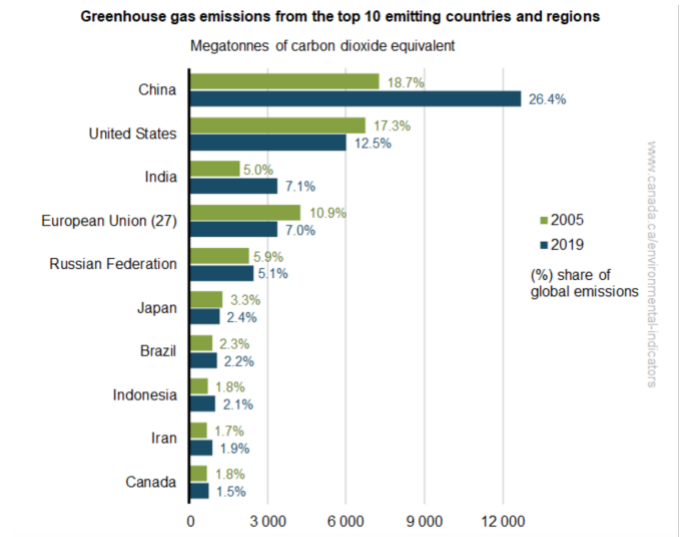


Image Source- (Government of Canada, 2022).

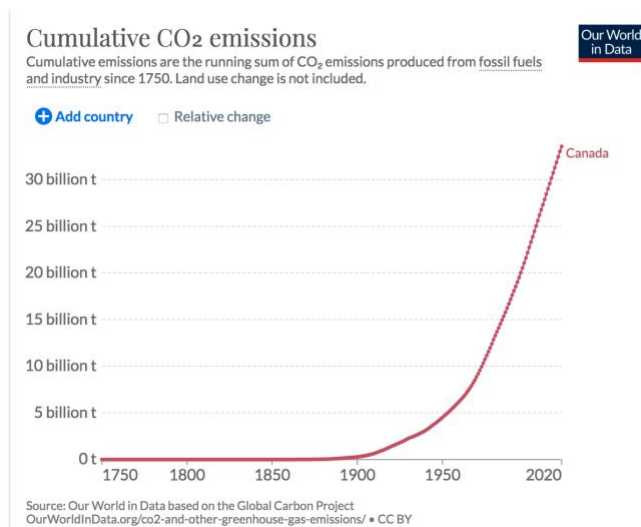


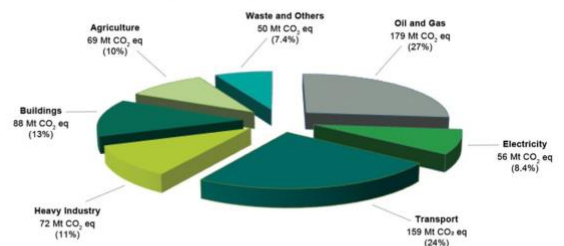
Image Source: (Our World in Data, 2020)

For Canada's full country profile visit:
<https://ourworldindata.org/co2/country/canada?country=~CAN>

The next graph shows that Canada ranks 10th in the world's top greenhouse gas emissions:

About half of Canada's greenhouse gas emissions come from large the oil and gas and transportation industry, see Figure 5 below.

Figure ES-7: Breakdown of Canada's greenhouse gas emissions by economic sector (2020)



Total: 672 Mt CO₂ eq
Note: Totals may not add up due to rounding.

Image Source- (Government of Canada, 2022).

According to the IPCC "The 2021 report provides new estimates of the chances of crossing the global warming level of 1.5°C in the next decades, and finds that unless there are immediate, rapid and large-scale reductions in greenhouse gas emissions, limiting warming to close to 1.5°C or even 2°C will be beyond reach."

What Are the Effects of Climate Change?

Earth's average surface air temperature has increased by about 1°C (1.8°F) since 1900, with over half of the increase occurring since the mid-1970s, which doesn't sound like much, but it is. The Earth, like the human body, is in a delicate balance and very sensitive to any change in temperature. A few degrees in either direction goes a long way. The difference in the average surface temperature of the Earth between the last ice age and today, for example, is only about 7°C. The 1°C rise in the Earth's average surface temperature that has taken place over the past century has already had far-reaching effects. For the last thirty years, the area of the Arctic covered by sea ice in the summer has been shrinking by about 12.6% each decade. (National Aeronautics and Space Administration, 2021). Melting sea ice has meant a loss of traditional lifestyles for Inuit people. It has also meant a loss of habitat for polar bears and other Arctic mammals. Cold days and nights are now less frequent in most areas. Hot days and nights are more frequent. The world has also seen more extreme weather events like heat waves, droughts, wildfires, cyclones, storms, blizzards, floods, and more of the human tragedy they often create. While it is not possible to tie any one weather event to global warming, climate scientists have long predicted more frequent severe weather events.

Even if we could somehow stop all emissions today, the planet is already locked into about 1.5°C of warming since 1850. Because of the way greenhouse gases linger in the atmosphere, yesterday's emissions will keep adding to the warming of the Earth for decades, even centuries, to come.

Just 2°C of warming from the pre-industrial level would be enough to harm many people and ecosystems and to create a large increase in the number of extreme weather events. Many dangerous outcomes can be expected during this century, some during our lifetimes,

The following graphic shows some of the different effects between a 1.5 and 2 degree increase in global temperature:



Infographic: How do the impacts of 1.5C of warming compare to 2C of warming? By Rosamund Pearce for Carbon Brief.

Source- (Carbon Brief, n.d.).

Climate change has become a matter of social justice. Developed countries have created most of the greenhouse gas emissions that have led to climate change, yet it is the people in developing countries who will be hurt the most.

What Kind of Energy Future Do We Need to Create?

To prevent the most dangerous consequences of climate change, we need to immediately and drastically reduce our GHG emissions and keep the rise in the average surface of the Earth as low as possible. If the world acts now, it is not too late to avoid the worst impacts of climate change. Through the Paris Agreement, <https://sustainabledevelopment.un.org/frameworks/parisagreement>

Preventing “dangerous” human interference with the climate system is the ultimate aim of the UNFCCC.

Carbon Brief has put together an interactive table to help show what each country’s position is on the various topics of COP 27:

<https://www.carbonbrief.org/interactive-who-wants-what-at-the-cop27-climate-change-summit/>

No matter what each’s country’s position is on certain topics, the UNFCCC agrees that a ‘more ambitious climate plan is needed as they prepared for COP 27:

<https://unfccc.int/news/more-ambitious-climate-plans-needed-ahead-of-cop27>

To reduce global greenhouse gas emissions so that global warming does not exceed 2°C, all countries must make significant efforts. Developed countries will need to cut their emissions deeply and quickly in order to enough leave "atmospheric space" for poorer countries to develop enough. Developed countries have created most of the increased GHG emission concentrations to date, and we continue to emit far more per person than developing countries.

Besides being more responsible for the problem, the people in developed countries such as Canada are also much more able to deal with the costs and other challenges associated with reducing emissions.

The world's poorest people have contributed little to global greenhouse gas pollution, but for reasons of geography and of poverty, they are most vulnerable to the effects of climate change. Under the UNFCCC, Canadians have an obligation to help developing countries adapt to climate change. Helping with adaptation means supporting people in developing countries in a number of ways. For example:

- reduce emissions through advances in energy efficiency and renewable energy
- train farmers in techniques to deal with drought improve public health care
- invest in malaria prevention as the disease spreads
- build infrastructure strong enough to withstand more violent storms

<https://climateactiontracker.org/countries/canada/> and you’ll see that Canada has an overall rating of highly insufficient.



Image Source- (Climate Action Tracker, n.d.).

Canada could help lead the way in the world's response to climate change. It has the wealth, skills, technology and renewable resources to emerge as a leader in clean energy technologies.

Despite our potential, Canada recently ranked 60th in the Climate Change Performance of 64 countries for its performance in tackling climate change. Canada ranked ahead of only Iran, Saudi Arabia, and Kazakhstan. Preventing the worst impacts of climate change depends on governments implementing policies and measures to reduce greenhouse gas pollution. Canada needs a climate change plan that cuts greenhouse gas emissions from all major sources.

To find out more about Canada’s climate action plan visit:

<https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan.html>

And to explore what climate change means where you live explore

https://climateatlas.ca/map/canada/plus30_2030_85#

What is the UNFCCC?

The United Nations Framework Convention on Climate Change (UNFCCC), entered into force on 21 March 1994. Today, it has near-universal membership. The 197 countries that have ratified the Convention are called Parties to the Convention.

many countries, have formally adopted 2°C as an upper limit to the increase in the Earth's average temperature since pre-industrial times as a key part of their long-term climate policies. The Paris Agreement pursues efforts to keep it below 1.5°C.

According to the IPCC report "Limiting warming to 1.5°C depends on greenhouse gas emissions over the next decades, where lower GHG emissions in 2030 lead to a higher chance of keeping peak warming to 1.5°C".

How Do We Reduce Greenhouse Gas Pollution?

Because most GHG emissions come from burning fossil fuels for energy, to pollute less we need to change the ways we generate and use energy. Energy conservation, energy efficiency and renewable energy are our best strategies for reducing greenhouse gas emissions:

- **Energy conservation** means finding ways to use less energy. You conserve energy when you bike instead of drive, or you use less electricity.
- With better **energy efficiency**, advances in technology help us reduce energy use. You increase your energy efficiency when you replace old appliances with energy-efficient appliances.
- Low-impact **renewable energy** means meeting energy needs with sources that have little impact on the Earth. Wind, solar or geothermal power, for example, can replace high-impact, non-renewable sources such as coal and oil. You tap into renewable energy when solar panels heat your home or school.
- As individuals, there is a lot we can do to reduce our emissions. It is also essential that we see action by our federal government. In a recent Canadian poll only 30% of Canadians are aware of the government's plan to tackle climate change.

Although Canadians are ready to act, Canada still lags behind many developed countries in its response to climate change. Take a look at the Climate Action Tracker

The *polluter-pays principle* also obliges Canadians to provide this kind of support. This international principle, upheld since 1972 by the Organization for Economic Cooperation and Development (OECD), maintains that polluters should bear the expenses for polluting prevention measures or pay for damage caused by pollution.

Today's decisions about climate change will impact this planet and its inhabitants for a long time to come. There are many actions we can take as individuals, as communities, and as nations. How will you respond? How do you want the people in your community to respond? How do you want your country to respond? Now is the time to make your voice heard!

Bibliography

International Panel on Climate Change. (2022). *Summary for Policy Makers*:

https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_SummaryForPolicymakers.pdf

National Aeronautics and Space Administration. (2021). *World of Change: Global Temperatures*:

<https://earthobservatory.nasa.gov/world-of-change/global-temperatures>

Climate.gov (2022). *Climate Change: Atmospheric Carbon Dioxide*:

<https://www.climate.gov/newsfeatures/understanding-climate/climate-change-atmospheric-carbon-dioxide>

Hannah Ritchie, Max Roser and Pablo Rosado (2020) - "CO₂ and Greenhouse Gas Emissions". Published online at

OurWorldInData.org. Retrieved from: <https://ourworldindata.org/co2/country/canada?country=~CAN>

Government of Canada. (2022). *Global Greenhouse Gas emissions*:

<https://www.canada.ca/en/environment-climatechange/services/environmental-indicators/global-greenhouse-gas-emissions.html>