

**Overview of Climate Change**  
High School Backgrounder 1



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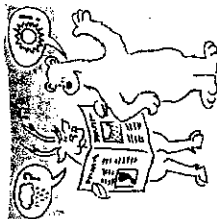
# Climate Change: What's the Big Deal?

Weather has always been a hot topic of conversation. We talk about whether it is hot or cold, windy or calm, snowy or dry. We listen to the radio to figure out if the weather will be different tomorrow. We look out the window in the morning to see if the weather has changed since yesterday.



Changes in weather are different than changes in the climate. Weather is the day-to-day stuff we experience and climate is the long-term pattern of weather in a region. Another way to put it is that weather is what you get, climate is what you expect to get! Weather can change daily but the climate in an area is usually pretty much the same year to year.

Although people have always talked about changes in the weather, it is changes in the climate that are making headlines around the world. Climate change is the topic of international conferences and intergovernmental negotiations. We hear about how climate change is affecting our environment, wildlife, and our way of life. Many are saying we need to change our behaviour to help stop the changes in the climate.



This backgrounder is the first in a series of 17 backgrounders on climate change. This one gives you an overview. It

explains how climate change is impacting our world and outlines some of the things we can do about it. The rest of the backgrounders go into details on specific topic areas. Read on!

## Things are heating up!

Since the world was formed, it has shown patterns of warming up and cooling down. For example, Canada has been covered with large glaciers several times in the last 1,000,000 years. The ice has melted each time as temperatures have warmed up.

Up until the last hundred years or so, the Earth's climate had been in a stable stage for 10,000 years. Little changed, but in the past 100 years, something different has been happening. The rate of global temperature change has been far more rapid than at any other time in the last 10,000 years!

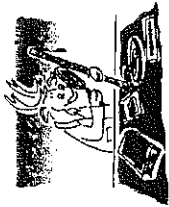


## How do we know what happened 10,000 years ago?

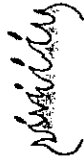
There are a number of things that people do to figure out what our climate was like way back when. Researchers take ice cores out of glaciers and examine the layers of volcanic ash, dust, carbon dioxide, and other chemical elements within the ice to get clues about past climates. They take mud out of the bottom of lakes and get a sense of the local climate from pollen, insect remains, and other clues. They also dig out what was once warmer than others. They research written and oral records from ancient cultures.

A lot of the information on climate change is reviewed by the Intergovernmental Panel on Climate Change (IPCC). This panel has reports on the current state of the world's climate. Many of the climate change facts and future predictions we read about come from information reviewed by the IPCC.

To get the full story on "How do we know", check out Backgrounders 5.



The world's climate is getting warmer. The average temperature of the globe increased by about 0.6° C between 1900 and 2000. Many regions of the Arctic have warmed up by as much as 5° C in the same 100-year period!



## Hot Facts

- ★ Worldwide, people have kept temperature records since 1860. Since that time, we know that eight of the ten hottest years on record have occurred since 1990. 1998 was the hottest of all.
- ★ Based on ice cores and other data, 1998 is believed to have been the warmest year in the last 1,000 years!
- ★ The effects of climate change are greater in the north. Temperatures in the Canadian Arctic were, on average, 5° C above normal in 1998.
- ★ Most areas of the Arctic have seen an average 1.6° C rise in temperature in the last century. However, the mountainous region of the eastern Arctic has actually cooled slightly since 1970. This is part of what happens with

**Climate change and Global Warming: Same or different?**  
People sometimes call the warming up of the world "global warming". However, "climate change" describes the full range of changes that are happening. We are getting more than just warmer weather:

- Some places will get more rain than usual while others will become drier.
- Some regions can even become cooler.
- Climate change also affects things like wind patterns, cloud cover, and waves.

currents.

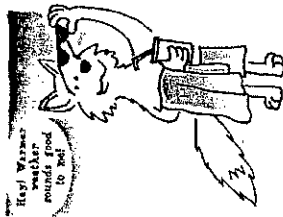
So climate change includes global warming. Climate change is the bigger picture.

- ★ climate change – some areas get cooler as global weather patterns change.
- ★ Most of Canada has seen an increase in precipitation (rain and snow) in the last 50 years.
- ★ Sea ice in the Arctic Ocean is estimated to be 40% thinner and cover 6% less area than it did in 1980.
- ★ By 2100, global temperatures are predicted to rise by 1.4° to 5.8° C. Average temperatures in most northern parts of the world are expected to increase even more!

### Hey! Warmer weather sounds pretty good to me!

Warmer temperatures may sound kind of nice, especially in the winter. However, climate change is about a lot more than just warmer temperatures! Here are a few things that are already happening because of climate change.

- **Melting permafrost:** Some northern buildings and roads are shifting and sliding as the permafrost they are built on melts. The melting is also causing landslides and slumping riverbanks.
- **Earlier break-up of sea ice:** Wildlife, like polar bears or walrus that live on the ice, are already being affected by disappearing ice. So are human hunters. But earlier break-up also means that ships can travel into Northern coastal towns for more weeks in the year.
- **Rising sea levels:** Communities along the coast are losing land to the ocean.
- **More forest fires:** Hotter temperatures are drying things out and larger areas of forest are burning, and burning more often.
- **New plants, fish, animals, and insects:** All sorts of new species are being found in northern areas. Warmer temperatures are making it easier for southern species to survive farther and farther north. But some northern species are finding it harder to survive as their environment changes.



Worldwide, there are more "extreme" weather events like hurricanes, floods and extended dry periods (called droughts). These extreme events can damage buildings, injure or kill people and wildlife, and destroy food crops. As average temperatures continue to rise, some of these impacts will happen more and more often. (For more details on the impacts of climate change, see *Backgrounders 6 to 12*.)

### What's a few degrees?

If the world continues along its present course, scientists predict the average global temperature is expected to rise by 1.4° to 5.8°C between 1990-2100. So what's the big deal with a few degrees?

Well, in the last ice age, the world was only about 4° to 6°C cooler than it is today. This difference in temperature caused huge areas of the world to be covered by ice. Some animal species disappeared completely. So a few degrees can make a big difference!

And in the North, it is predicted our temperatures will change even more than temperatures in southern Canada. By 2080, winter temperatures over the land areas in the Arctic could rise 2.5° to 14°C above current normal temperatures. Summer temperatures are expected to increase by 4° to 7.5°C above what we now usually get. Remember, a few degrees can make a big difference!



### Doesn't the Climate Always Change?

It is true that the world's climate has always changed. There have been ice ages and there have been warm periods. Isn't this latest increase in temperature just part of the natural change in the climate? It doesn't look like it.

Climate change in the past has been caused by natural forces. Sometimes the sun put out more energy. Other times, large volcanoes erupted and the ash they spewed into the air shaded the world from the sun's warmth. However, since the last ice age – about 10,000 years ago – our temperatures have been pretty stable. That is, they have been stable until the last 100 years or so.

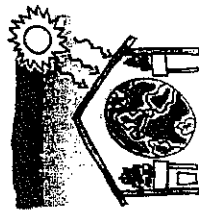
The big difference between warming after the last ice age and current global warming is that this latest change doesn't appear to be caused by the sun or by volcanoes. It seems to be caused mainly by human activity. And the change is happening very quickly.

### So just how are we heating up the world?

The earth is surrounded by a layer of gases we call the atmosphere. When the sun shines down on our world, some of the sun's energy is reflected back into space by the atmosphere but most of the sun's energy travels down to us. The ground and water all reflect a bit of this energy back into the atmosphere. However, most of the sun's energy – its heat – is absorbed by the land and water. This absorbed heat is slowly released back up to the atmosphere during day and night.

The atmosphere helps trap some of the heat in. If the atmosphere was not there, the world would get really cold every night. The atmosphere acts like a blanket for a greenhouse. It holds the sun's heat in and slows down its release into space.

Some of the gases in the atmosphere are key to keeping this heat in. They have been called "greenhouse gases" or GHGs for short. Carbon dioxide, methane and nitrous oxide are the three most common GHGs.



However, you can have too much of a good thing. We need the right amount of GHGs in the atmosphere to keep the right amount of heat in. Too much heat – or too little – can hurt humans and our environment.

The problem is that human activities are adding too many heat-trapping GHGs to the atmosphere. We are tipping the natural balance and that is why our climate is changing.

We put these extra GHGs into the environment in many ways. For example, we put carbon dioxide (CO<sub>2</sub>) into the atmosphere when we burn gas, diesel, propane and other "fossil fuels". We burn these fuels to get around in planes and cars, to create electricity, to heat our homes, or to run

"There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activity."

The Intergovernmental Panel of Climate Change (IPCC), a United Nations organization involving over 2,000 of the world's scientists.

our industries. When we use these fossil fuels, they release a lot of carbon dioxide into the air.

Trees and plants help take carbon dioxide out of the atmosphere when they make food through a process called "photosynthesis". But we are cutting down more and more of the world's forests so we are reducing the number of plants and trees that can help absorb some of the carbon dioxide. (This is a snapshot of the greenhouse effect and greenhouse gases. For more details see backgrounders 2 and 3).

### How can we turn down the heat?

The good news is that if humans are the main cause of this latest change in the climate, then we can help slow down these changes! There are many things that we can do at home or at school. Businesses and governments from around the world are also taking action to reduce the GHGs going into the atmosphere.

For example, people are developing better ways to use renewable energy like the wind and sun so that we don't have to use as much fossil fuel. Also, new types of fuels are being created from things like sugar cane or cow manure that release fewer GHGs! New cars that can travel much farther on one tank of gas are already on the road. All of these efforts help to reduce the GHGs going into the atmosphere.

Much of the electricity in the world is produced by burning fossil fuels like diesel or coal. So reducing how much electricity you use at home can help reduce the GHGs going into the atmosphere. This can be as simple as turning off lights or computers when you're not using them. It may mean washing clothes in cold water because it takes electricity or fuel to heat the water. People are also putting more insulation into the walls and attics of their houses so that they will use less oil or gas for heat.

The less electricity and heat you use, the less carbon dioxide you put into the atmosphere. And the less money you spend on electricity and heat! Bonus!

These are just a few ideas about how people can reduce their use of fossil fuels. (For more ideas on solutions to climate change, see backgrounders 13 to 17). Can you think of other things people are doing to reduce how much energy they use?

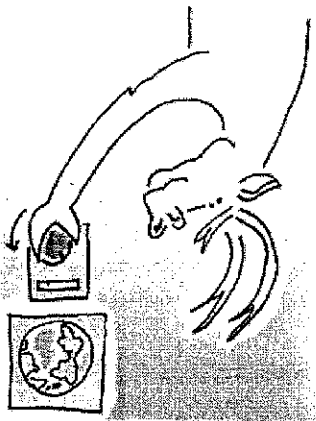
### Wrap-up

So climate change is going to have a big impact on our lives and it is something we can't ignore. This backgrounder provided an overview of what climate change is, how it might impact us, and what we can do to help slow down the changes. For more details on all of these topics, check out the rest of the backgrounders!



### Key Points

- ★ The planet's climate is changing. The world can expect a 1.4° to 5.8°C temperature increase on average in the next 100 years. (A drop of only 4° to 6°C triggered the last ice age!)
- ★ The North will warm up even more than the rest of the world.
- ★ The warming climate is already having an impact on our communities, forests, wildlife, sea ice, permafrost and more.
- ★ The climate has always changed but recent changes are caused by human activity.
- ★ We are putting too many greenhouse gases (GHGs) into the atmosphere.
- ★ There are many things people can do – and are doing – to help reduce climate change.



**Fossil fuels**

Fossil fuels come from the remains of plants and other organisms that were buried in the mud and other sediments millions of years ago. These organic remains were heated and compressed by the earth's crust. This changed them into carbon-rich substances like oil, gas and coal.

