

CLIMATE CHANGE

FOR

PRIMARY STUDENTS

VOL. 3



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Climate Change

Climate change describes a change in the average conditions such as temperature and rainfall in a region over a long period of time. The National Aeronautics and Space Administration (NASA) scientists have observed Earth's surface is warming, and many of the warmest years on record have happened in the past 20 years.



Causes Climate Change

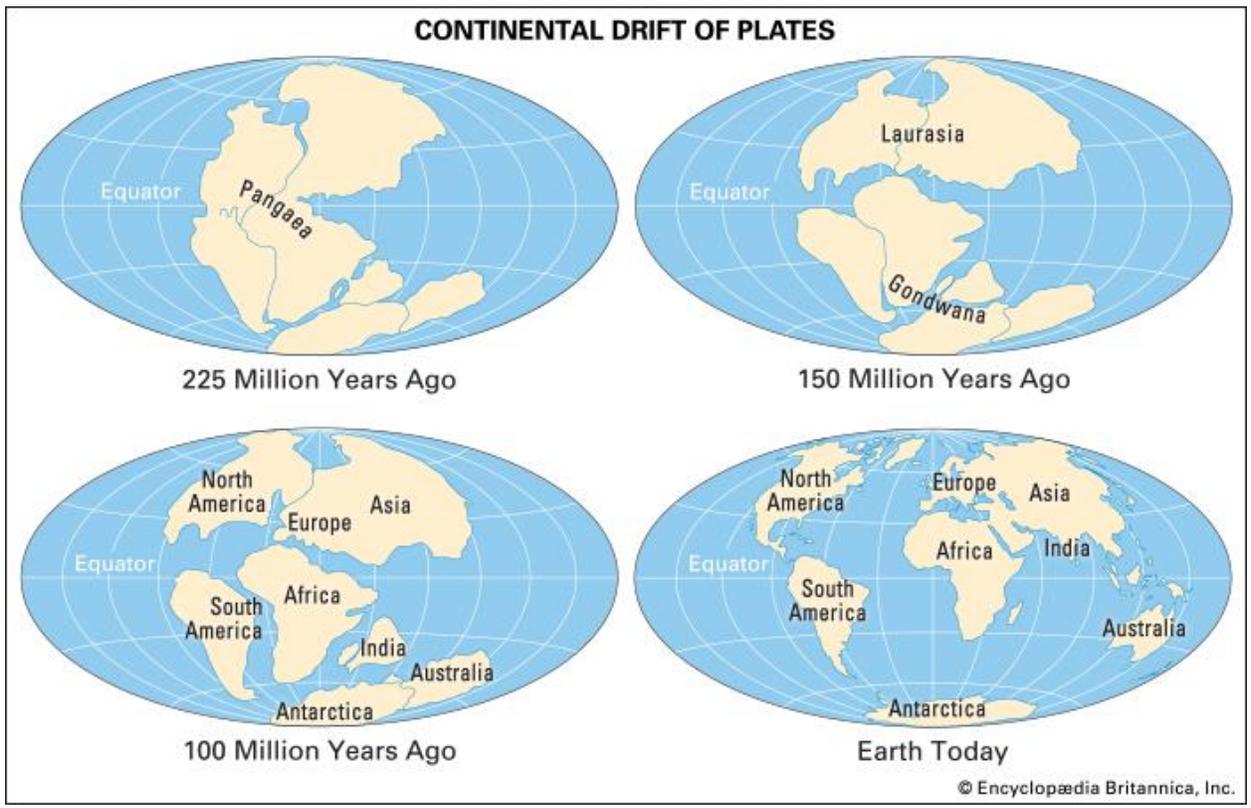
As we all know, the earth has gone through warm and cool phases in the past, and long before humans were around. However, apart from natural climate change, over the years human activities have also contributed to Climate Change.

Natural

Forces that contribute to climate change include the sun's intensity, ocean currents, the position of continents, the location of mountain ranges, plant life growing on the land, volcanic eruptions, and changes in naturally occurring greenhouse gas concentrations. But records indicate that today's climatic warming particularly the warming since the mid-20th century is occurring much faster than ever before and cannot be explained by natural causes alone. According to NASA, "These natural causes are still in play today, but their influence is too small, or they occur too slowly to explain the rapid warming seen in recent decades."

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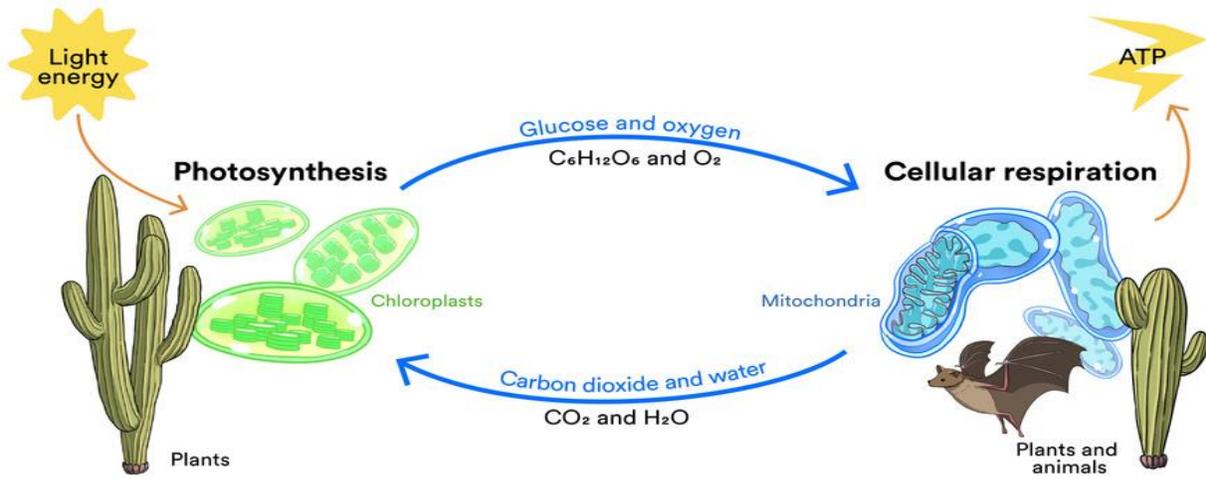
An example of a **slow change** is the movement of the continents, which takes millions of years. The movement of the continents has had strong effects on the circulation of the atmosphere and the oceans.



An example of a **fast change** is the eruption of a volcano. In 1815 Mount Tambora, a volcano in Indonesia, erupted. It released so much ash into the atmosphere that it blocked sunlight from reaching Earth's surface. Temperatures dropped around the world for months afterward. These kinds of events—slow or fast—cause climate change.



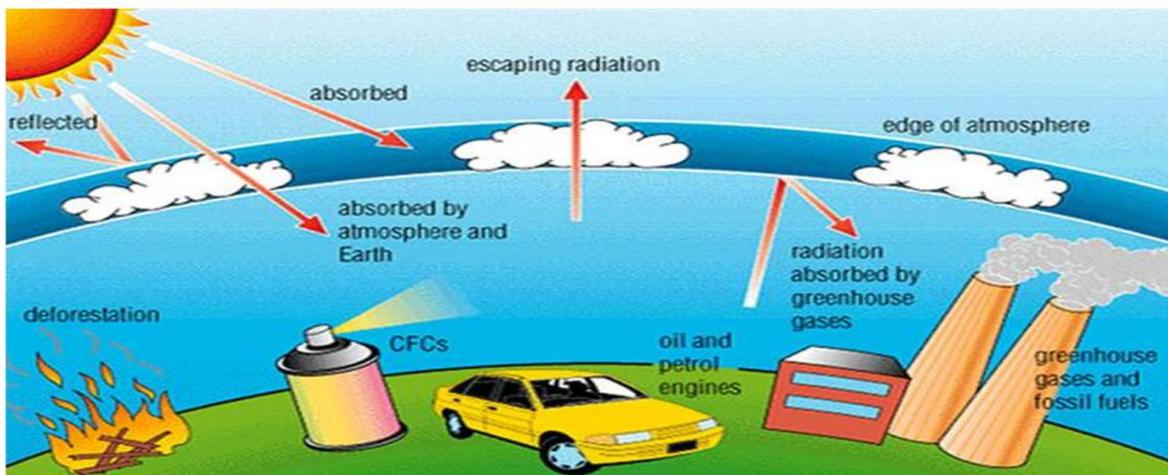
Living things also contribute to climate change as well. Natural processes, such as photosynthesis and respiration, have helped cause periods of warming and cooling in Earth's past.



There are lots of other factors that contribute to Earth's climate. However, scientists agree that Earth has been getting warmer in the past 50 to 100 years due to human activities.

Human Activities

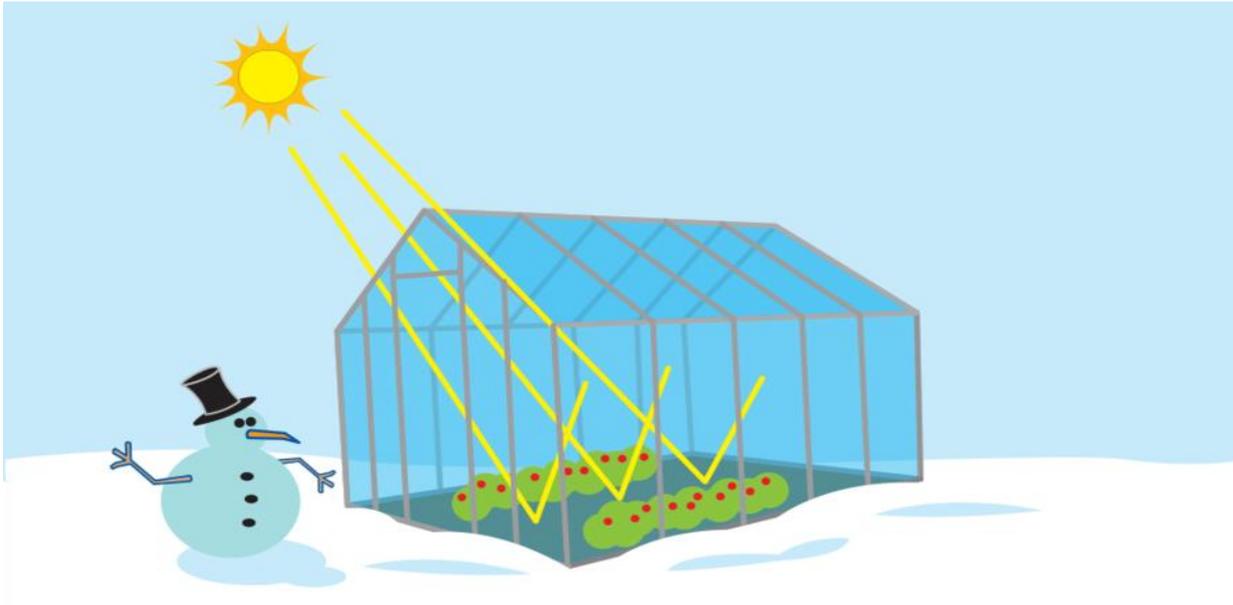
The main cause of the current climate change is human expansion of the “greenhouse effect” and the increased warming of the earth by human activities. These activities are releasing large amounts of gases in the air that trap energy from the Sun. These heat-trapping gases are called greenhouse gases. They cause the average surface temperature on Earth to slowly increase because they block heat from escaping. They keep the Earth warm like the glass in a greenhouse keeps plants warm. This trend is known as global warming. However, to understand global warming, it is important to understand the greenhouse effect.



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Greenhouse

A greenhouse (also called a glasshouse, or, if with sufficient heating, a hothouse) is a structure with walls and roof made chiefly of transparent material, such as glass, in which plants requiring regulated climatic conditions are grown. It captures heat from the sun during the day. The walls trap the sun's heat which keeps plants inside the greenhouse warm. Some of the heat is then reflected into the atmosphere.

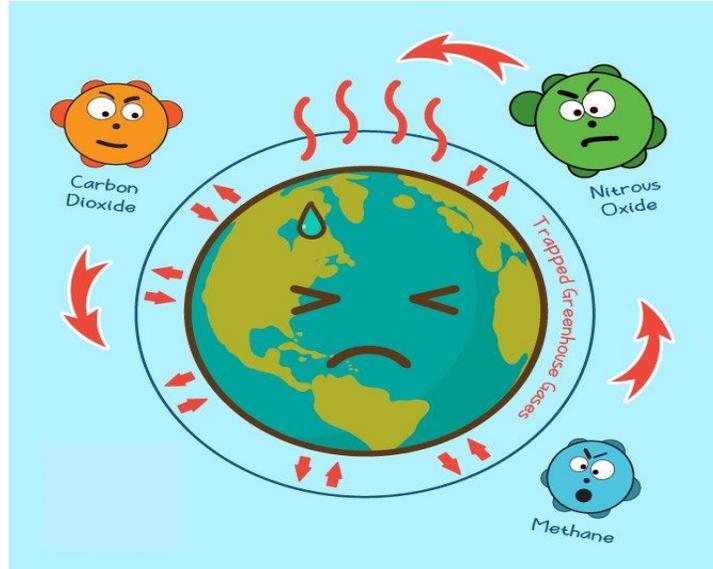


Greenhouse Effect

During the day, the sun shines through the atmosphere. The earth's surface warms up in the sunlight. At night, Earth's surface cools, releasing the heat back into the air. But some of the heat is trapped by the greenhouse gases in the atmosphere. That is what keeps our Earth warm and makes it inhabitable. However, as more greenhouse gases get into the air, they also trap more heat. This leads to global warming.

Scientists cannot tell how warm Earth may get over time. Some guess an increase between 3.2° F and 7.2° F (1.8° C and 4° C) by the year 2100. The warmer weather could harm living things. It also could cause polar ice caps to melt. This would cause sea levels to rise. Plants, animals, and buildings along coastlines would be in danger.

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Greenhouse Gases

Greenhouse gases are gases in Earth's atmosphere that trap heat. They let sunlight pass through the atmosphere, but they prevent the heat that the sunlight brings from leaving the atmosphere. Land, oceans, and plants absorb, or soak up, energy from sunlight. They release some of this energy as heat. Greenhouse gases absorb the heat and then send it back toward Earth. Without greenhouse gases, this heat would escape back into space.

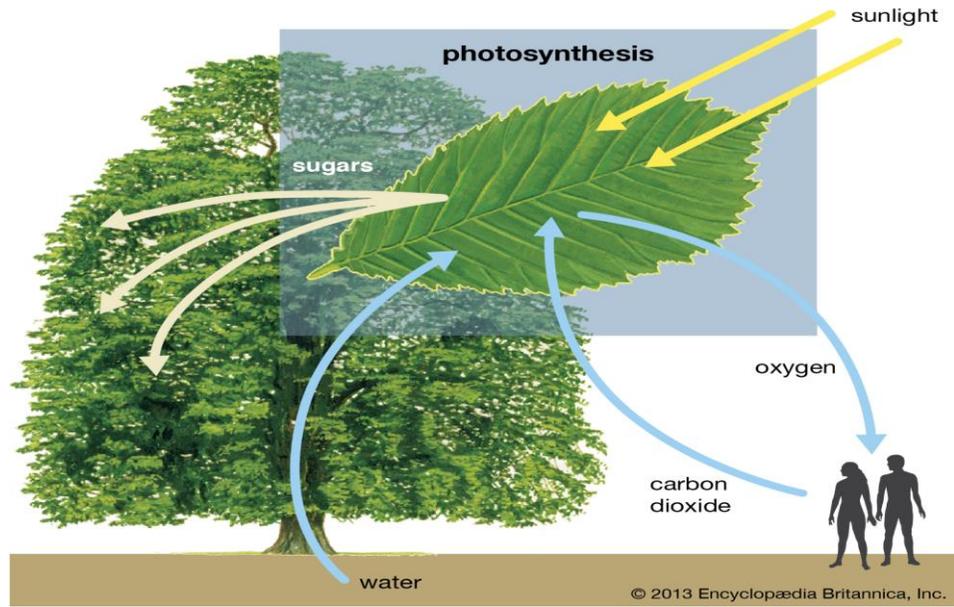
Scientists believe that human activities are increasing the greenhouse effect. When people drive a car or operate a factory they burn coal, oil, and other fossil fuels. This adds extra greenhouse gases to the air, and the extra gases trap more heat. Many scientists think that this has led to global warming, or a steady rise in the average temperature of Earth's surface.

Below are some of the **main greenhouse gases**:

- **Carbon dioxide (CO₂)**

Carbon dioxide is a chemical compound that is usually in the form of a gas. It is made up of one atom of carbon and two atoms of oxygen. Its chemical formula is CO₂.

Carbon dioxide is necessary for life on Earth. When animals breathe out, they release carbon dioxide into the air. Plants use this carbon dioxide to make their own food in a process called photosynthesis. Plants then release oxygen into the air for animals to breathe in.



Source:

Carbon dioxide also is an essential part of Earth’s atmosphere. Even though it makes up only about 0.03 percent of the atmosphere, it plays an important role as a greenhouse gas. However, the amount of carbon dioxide in the atmosphere increases as people burn fossil fuels (oil, gas, etc.) for transportation and power generation, deforestation and degradation (mining) are also activities which contribute to greenhouse gas emissions. More carbon dioxide in the air traps more heat, which leads to global warming.



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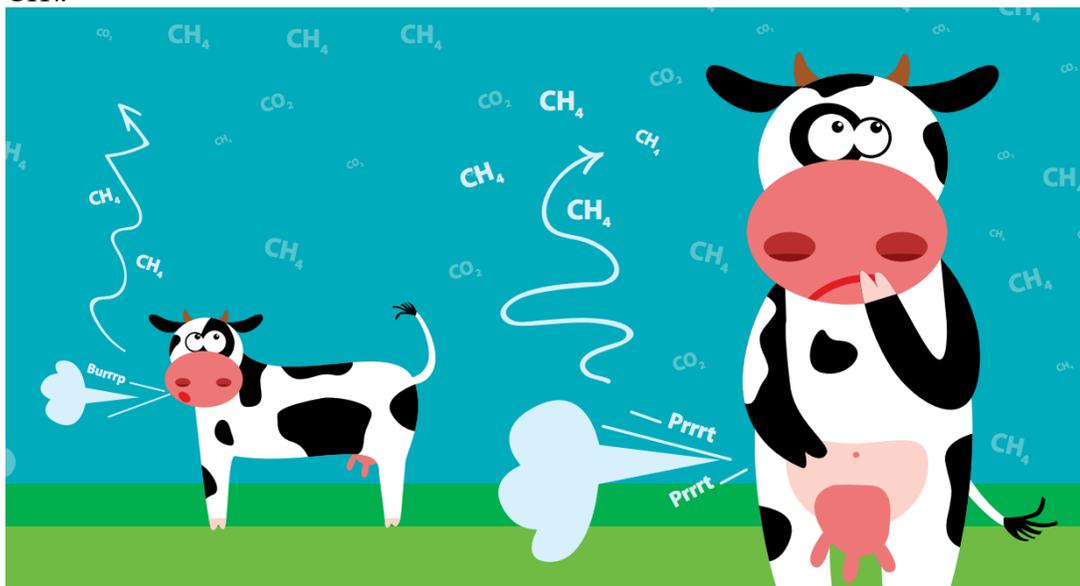
- **Methane (CH₄)**

Methane (CH₄) is a colorless, odorless, and highly flammable gas. It can be produced naturally and artificially, and when burned in the presence of oxygen, it produces carbon dioxide. It is used to produce heat and electricity around the world.

Source:

Methane is released during the production and transport of coal, natural gas, and oil. Methane release also results from livestock and other agricultural practices and by the decay of organic waste in municipal solid waste landfills.

Scientists consider it the second most important contributor to human-caused global warming of all the greenhouse gases. Of all the greenhouse gases, methane is one of the most potent because of its ability to efficiently absorb heat in Earth's atmosphere. Studies have shown that, over a 20-year period, a kilogram of methane warms the planet as much as 80 times more than a kilogram of carbon dioxide. The chemical formula of methane is CH₄.



- **Nitrous Oxide (N₂O)**

Nitrous oxide is a colourless non-flammable gas that is commonly used for a state of calm or sleep and pain relief, but is also used by people to feel intoxicated or high. Nitrous oxide occurs in small amounts in the atmosphere, but has been found to be a major scavenger

Source:

These emissions occur from the use of various nitrogen-based fertilizers in agricultural production eg. Rice cultivation. One ton of nitrous oxide is equivalent to 298 tons of carbon dioxide. Nitrous oxide has an atmospheric lifetime of 110 years. The process that removes nitrous oxide from the atmosphere also depletes ozone. So nitrous oxide is not

only a greenhouse gas, but also an ozone destroyer. The chemical formula of Nitrous Oxide is N_2O .



Global Warming

This is the increase in Earth's average temperature over a long period of time. Global warming occurs when Carbon Dioxide (CO_2) and other air pollutants and greenhouse gases trap heat that would otherwise escape Earth's atmosphere, thereby causing the planet's temperature to rise. That is called global warming, which causes climate change.



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Some parts of Earth are warming faster than others. But on average, global air temperatures near Earth's surface have gone up about 2 degrees Fahrenheit in the past 100 years. In fact, the past five years have been the warmest five years in centuries.

Many people, including scientists, are concerned about this warming. As Earth's climate continues to warm, the intensity and amount of rainfall during storms such as hurricanes is expected to increase. Droughts and heat waves are also expected to become more intense as the climate warms. When the whole Earth's temperature changes by one or two degrees, that change can have big impacts on the health of Earth's plants and animals, too.

Does What We Do Matter?

Yes. As we stated earlier, when human activities create greenhouse gases, Earth warms. This matters because oceans, land, air, plants, animals and energy from the Sun all have an effect on one another. The combined effects of all these things give us our **global climate**. In other words, Earth's climate functions like one big, connected system.

How does Climate Change affect you?

Global climate change has already had observable effects on the environment and Guyana will not be spared since:

- The melting glaciers will cause a rise in the sea level, thereby threatening coastal areas.
- Increase in temperature will result in heat waves and heat stress for both plants and animals.
- Intense rainfall will cause flooding which leads to diseases.
- Less rainfall will result in prolonged droughts.





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So, what can you do about Climate Change?

There are several ways you can take action to fight climate change. We can all take notice of our environment. We can learn how our planet works. We can learn how to live on it without making a mess of it. We can help to keep it magnificent for ourselves, our children and grandchildren, and other living things besides us.

Some of the ways you can help may have to wait until you are a little older—like choosing an energy-efficient car, installing solar panels on the roof of your house, or choosing a "green career."

Next Booklet: What can you do? (Adaptation and Mitigation)

References

What can we do to help?



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<https://climatekids.nasa.gov/how-to-help/>

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Global Warming 101

<https://www.nrdc.org/stories/global-warming-101>

Greenhouse Effect 101 | NRDC

Five Major Greenhouse Gases. The most significant gases that cause global warming via the greenhouse effect are the following: Carbon Dioxide Accounting for about 76 percent of global human-caused ...

<https://www.nrdc.org/stories/greenhouse-effect-101>