

LEARNING ABOUT CLIMATE CHANGE

What is climate change? Scientists have been recording rapid changes in the climate over the past 100 years. These changes are attributed to human emissions of fossil fuels. But what does climate change mean? This is a basic explanation of the important concepts of climate change.

WHAT IS CLIMATE?

Climate is the average weather of a place over time. For example in Atlanta on June 19th, the weather could be hot or rainy. But the climate of Atlanta would be all of usual weather in Atlanta. So, the climate in the summer is hot and humid because Atlanta is in a subtropical region.

Earth has its own climate, or the "global climate." The global climate is the average of all the climates on Earth.



THE CLIMATE IS CHANGING

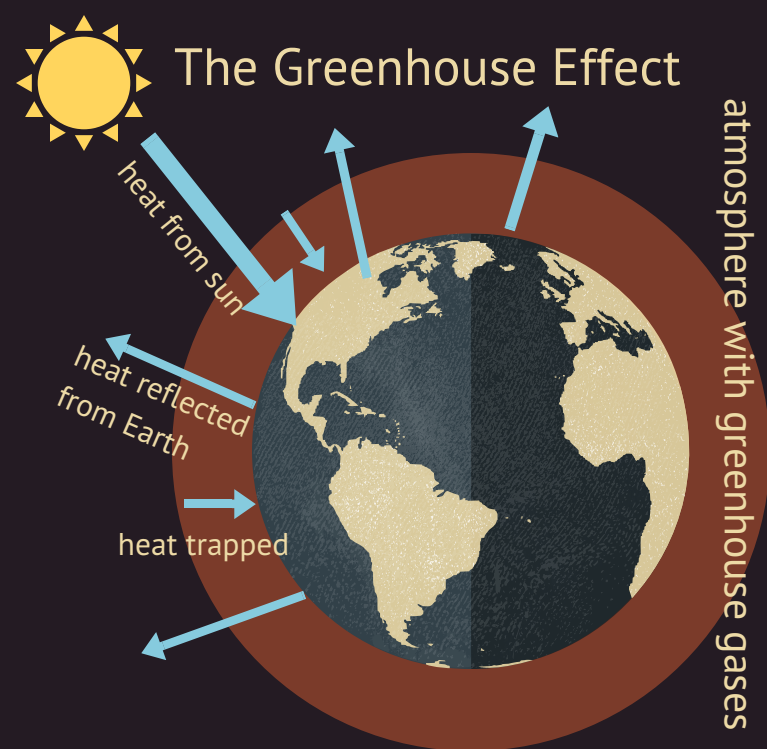
Weather changes daily but climate changes over hundreds or even thousands of years. However, in the past 100 years, scientists have observed the climate changing as the Earth gets warmer. This change is also happening faster than ever before recorded. Melting ice-caps and rising sea levels are evidence of a warmer global climate. Most scientists say that humans are causing the change in temperatures we see today.

HOW DOES CLIMATE CHANGE WORK?

1 The Earth is surrounded by gases, called the **atmosphere**. The atmosphere is mostly made of 78% nitrogen, 21 % oxygen, and 1% of argon. It helps keep our Earth the perfect temperature for humans, plants, and animals to live in. The atmosphere also has some **greenhouse gases**, including trace amounts of methane, water, carbon dioxide, and nitrous oxide.

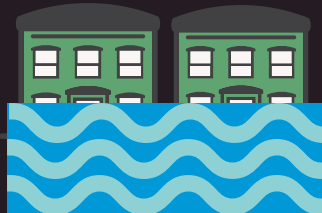
2 During the day, sunlight heats the surface of the Earth. At night, the Earth's surface cools and the energy is released back. However, the greenhouse gases in the atmosphere trap some of the heat. This process is called the **greenhouse effect**.

3 The climate is changing because the **greenhouse effect is getting stronger**. Humans are emitting even more greenhouse gases into the atmosphere, which means more heat from the sun is trapped. Humans emit greenhouse gases by using **fossil fuels** or gas, coal, and oil for energy for things like flying planes, driving cars, and running factories. These emit gases like carbon dioxide and methane into the atmosphere.



WHY DO WE CARE?

Increased global temperatures changes can change climates. Deserts can grow and become dryer. Ice can melt and Arctic ecosystems can be made vulnerable. Droughts can occur more often too, increasing chances of wildfires. Sea levels could also rise, and cities like Miami and New Orleans could be underwater if the global temperatures continue to rise.



ADDRESSING COMMON MISCONCEPTIONS ABOUT CLIMATE CHANGE



CLIMATE CHANGE IS A SCIENTIFIC CONTROVERSY

Climate change is not a scientific controversy. A study of [1,372 of the top climate change researchers](#) found that 97% are convinced by the evidence for climate change. Thus, while climate change may be a social controversy, it is not a scientific one.

THE CLIMATE HAS CHANGED BEFORE

The climate has changed before. In the past, climate change was due to an influx or outflux of CO₂ of which either cooled or heated the Earth (such as the heating that ended the Ice Age). This time, humans are responsible for the high levels of CO₂ entering the atmosphere. See this [NASA graph and article](#) of CO₂ levels today and in history for reference.



Woolly mammoth

PLANTS AND ANIMALS CAN ADAPT

Climate change has been the main cause of great extinctions (such as the woolly mammoth at the end of the Ice Age) in the past. Today, climate change is happening so rapidly that animals cannot adapt to changing temperatures through strategies such as migration. Already, climate change has caused a series of extinctions and caused [numerous species to become endangered](#).



THE WARM ISN'T WARMING- IT'S COOLING

Unfortunately, scientists have continued to see warming trends. [The top 10 warmest years on record have happened since 1998](#). It is true that in some places there has been snowfall or cooling rainstorms, but those are weather. Climate- the average weather of a place over time- is showing warming trends.



IT DOESN'T MATTER IF THE EARTH GETS WARMER

The effects of climate change might not be as clearly visible around you but they're still there. Climate change is already having an effect on [sea levels, health, mass extinctions, extreme weather events, and water availability](#). Around the world, seasons are shifting- summers are hotter and [spring is coming earlier](#). Even if effects are not apparent now, they will be soon. .



IT'S TOO LATE

The amount of carbon dioxide in the atmosphere today is at 390 ppm (parts per million). Scientists do agree that is unlikely we will get these levels back down to what they were before the Industrial Revolution (275 ppm). However, they also agree that 350 ppm is plausible and acceptable. So, if we act now, there is still time (Source: [Scientific American](#)).



CLIMATE CHANGE PROJECTS IN ATLANTA

OBJECTIVES:

These activities should be:

Local, relevant, and educational

Visual and interactive accompaniments to the curriculum

Hopeful and positive

Encourage action and not hopelessness

Science-based

1) TERRARIUMS

Illustrate the greenhouse effect with homemade terrariums

Because terrariums are built in an enclosed space, they have a "mini-climate" similar to a greenhouse. As in the Earth's atmosphere, in a terrarium, sunlight enters through the container and warms the air, soil, and plants. This is similar to how sunlight enters the atmosphere and warms the Earth's surface. Just as the atmosphere holds some warmth, so does the glass of the terrarium (NASA Climate Kids). Terrariums are a great way for students to see and feel how the greenhouse effect helps the Earth prosper. Make the terrariums even more relevant to students by adding Atlanta-specific features to the terrarium like a model of a street sign, a picture of their house, or a photo of the Atlanta skyline. That way, students can better understand their place in this scientific model.

2) TRANSPORTATION BRAINSTORM

Solve one of Atlanta's biggest environmental challenges

In 2014, [27% of Atlanta's greenhouse gas \(GHG\) emissions were from transportation](#). Brainstorm with students how transportation adds carbon dioxide into the atmosphere. How does this affect climate change? Next, talk to them about how they would solve the problem. Come up with some solutions together as a class and have students write down their ideas in letters to send to the [City of Atlanta's Power to Change initiative](#).

3) WHAT'S YOUR CARBON FOOTPRINT?

Identify solutions for carbon emissions

Have students trace both their feet. On one foot, have them write/draw all the things they do that increase their carbon footprint. Do you they drive to school? Leave the lights on when they leave the house? Answer any questions about how these actions impact CO2 emissions. Then, on the other foot, have students write what they can do to reduce their carbon footprint. Can they carpool or ride a bike to school? Or start recycling? After completing both feet, use this calculator to see how much students can reduce their carbon footprint if they take action. At the end, hang up both feet in the classroom so students can see each other's footprints and solutions.

4) MAKE A LIGHT SWITCH PLATE

Help Atlanta become more energy efficient

Electricity used in buildings is the [largest source of greenhouse gas emissions in Atlanta](#). One way to help solve this problem is remembering to turn the lights off. Talk to students about energy efficiency and how wasting energy can increase their carbon footprint. Then create labeled light switch plates that remind students to turn their lights on and off.