

Activity 1: Climate Change Background Knowledge

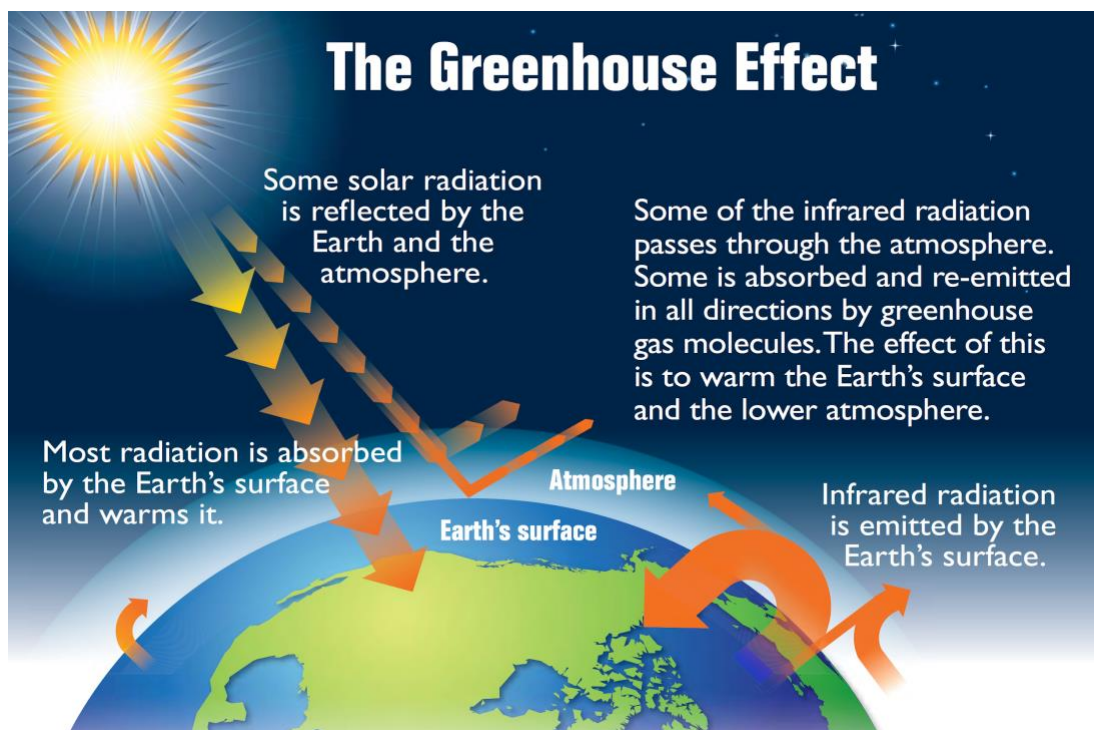
Before you decide on where you are going to buy land in order to weather climate change, you'll need to make sure you understand what climate change is, why it is occurring, and how it may ultimately impact the world. Several impacts of climate change are already apparent:

- Increased frequency and intensity of severe weather events such as hurricanes, typhoons, tornadoes, etc.
- Coastal flooding
- Watershed flooding in rivers, streams, and other waterways
- Increased frequency and intensity of abnormal or extreme weather patterns, such as heat waves or the Polar Vortex
- Impact on growing seasons and growing capacity due to over saturation or drought

Start by bringing yourself up to speed with the following readings and activities:

1. Read the Climate Change Impacts background information on pages 2-3.
2. Watch this TED-Ed video: [Climate Change: Earth's Giant Game Of Tetris](#)
 - a. Explore further with TED-Ed's [Our Changing Climate series](#)
3. Follow the directions on pages 4-5 below to use experiment with this greenhouse gas [simulation](#) to see how temperature changes as you add carbon dioxide to the atmosphere. Follow the instructions below and respond to the reflection questions.

STEP I: Background Information Reading — Climate Change Impacts



Earth's greenhouse effect (US EPA, 2012, [Wikimedia Commons](#), public domain)

Most of our harnessed energy has come from the burning of fossil fuels, which has caused an increase in the concentration of carbon dioxide in our atmosphere (CO₂). Methane (CH₄) concentration has also risen from our world's cattle population (because they fart methane), although methane does [come from other sources](#) as well, like wetlands, and the production of oil and gas. Natural gas is approximately 90% methane. Carbon dioxide and methane are two gases known as "greenhouse" gases. Our reliance on these methane- and carbon-dioxide-producing resources has created a scenario where these 'greenhouse' gases trap heat in our atmosphere, causing a rise in overall global temperatures. This affects many systems on our planet and changes the global climate.

The rise in global temperature has a domino effect. As the global temperature increases, the [surface temperature of the ocean will also warm](#), causing evaporation to occur much more easily. These evaporating waters drive the global [precipitation cycle](#). An increase in the amount of water that evaporates into the atmosphere will mean that the stabilized 'normal' [precipitation patterns will be disrupted](#) and there will be an increasing amount of strange precipitation events, which will cause more severe flooding events.

Melting Glaciers & Impact on Water Cycle

Rising global temperatures are causing the ice caps, glaciers, and alpine snow reserves to melt. This issue is actually occurring at an [exponential rate](#). As portions of these regions melt, more of the underlying surface area of ice and snow is exposed, which means a greater surface area is impacted by the sun at a time, causing, even more, to melt on the next round! These are vast volumes of water that are



entering the oceans, causing the sea level to rise around the globe. As the ocean level increases, [coastal regions are at risk of flooding](#). This risk is even higher for small island nations such as the [Marshall Islands](#), which boasts a high elevation of seven feet.

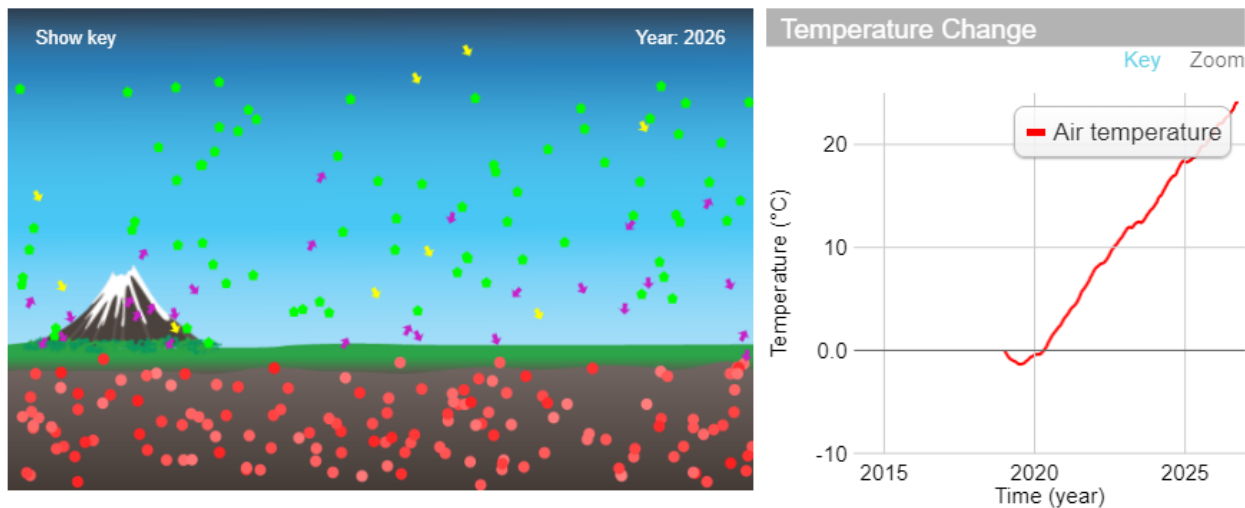
The freshwater in glaciers, ice caps, and alpine reserves were once part of the water cycle in the form of precipitation. The ocean is salt water and salinity is the measure of how salty the water is. The amount of salinity must exist in a specific and delicate range. Any changes in salinity could have major effects on global weather. Waters in certain regions have warm water, while others have a cold. This difference causes the ocean currents which bring warm water from the equatorial regions towards the poles. These '[conveyor belts](#)' as they are called, help to drive global weather. In an arctic region, water freezes, leaving higher amounts of salt in the surrounding water. This extra salt causes it to become more dense and the water sinks. Ocean water circulates via these belts due to the dense water sinking and less dense water replacing it.

Currently, as polar region ice is melting at an [accelerating pace](#), more and more freshwater will be present in those regions, reducing the density, and therefore the amount of sinking water, which drives the conveyor belts. If the salinity of the ocean continues to change, these [conveyor belts are at risk](#). For example, if the conveyor belt that brings warm water to North America is slowed or stops, the United States could face a colder climate, even though the Earth is warming overall. If this occurs, there could be major climate impacts that are felt on a global scale for generations.

STEP 2: Greenhouse Effect Simulation

Follow the directions below to experiment with this greenhouse gas simulation to see how temperature changes as you add carbon dioxide to the atmosphere. Respond to the reflection questions as you move through the simulation.

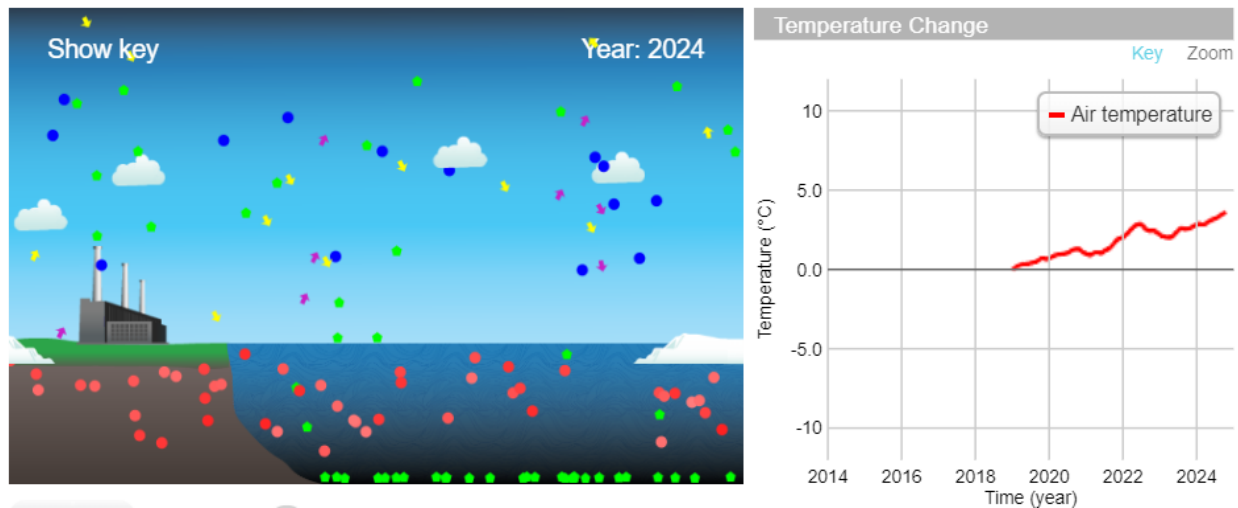
Start by visiting this [simulation](#) from the Concord Consortium to see what happens to air temperatures as you add carbon dioxide to the atmosphere.



1. What happens to the temperature when you add carbon dioxide to the atmosphere?

2. What happens to the temperature when you slowly remove carbon dioxide from the atmosphere?

Here is an advanced version of the same [simulation](#) that you can explore to see what happens to the ocean and ice levels:



1. What happens to the ice as the amount of atmospheric carbon dioxide increase?

OVERALL REFLECTION: Based on the background reading, TED-Ed videos, and your exploration of the simulations, what are three impacts of climate change that you feel are the most dangerous for humanity?