

Impact of Global Climate Change



Essential Standard 2.6

Analyze patterns of global climate change over time.

Learning Objective 2.6.3

Attribute changes in Earth systems to global climate change.

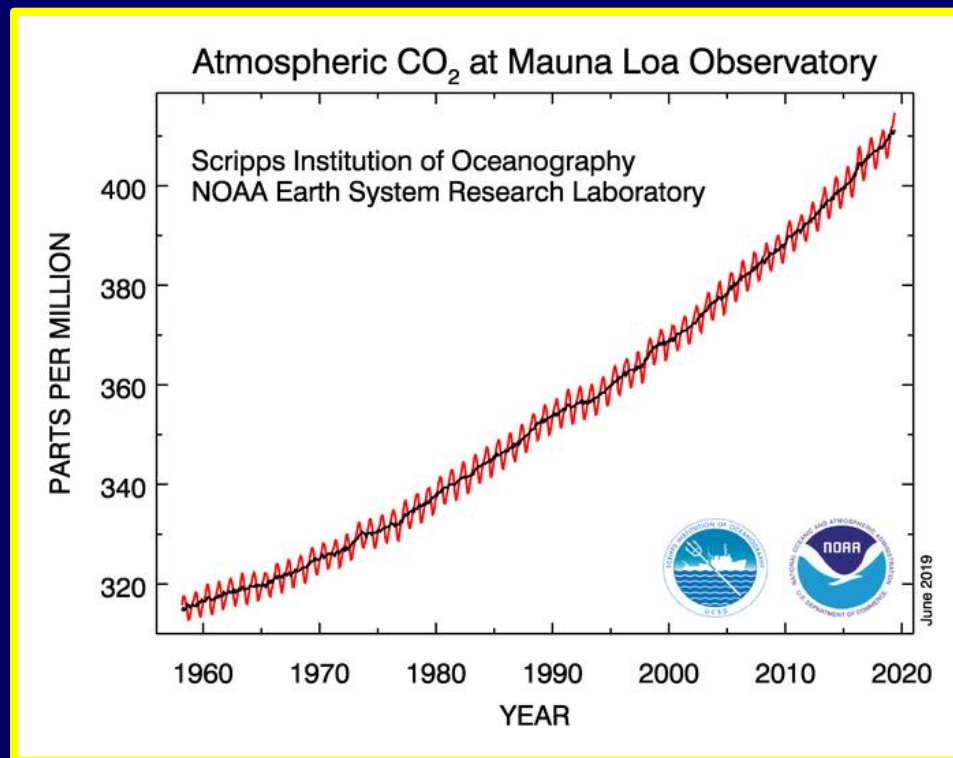
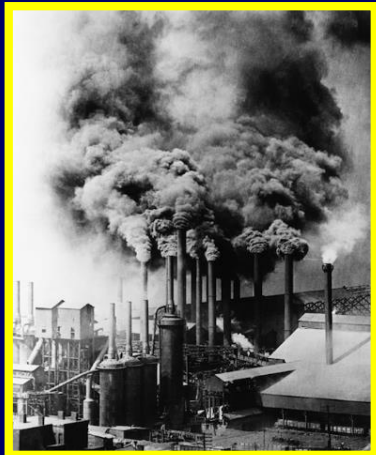
I Can Statements

At the end of this lesson, you should be able to say, with confidence:

- I can describe the impact climate change will have on glaciers and sea ice and how that will impact sea level rise, biodiversity, and human populations.
- I can describe the impact increased levels of CO₂ will have on coral reefs.
- I can explain the impact climate change will have on weather events, seasons, animal migration, and human health.
- I can describe various ways of reducing carbon emissions federally, locally, and individually.

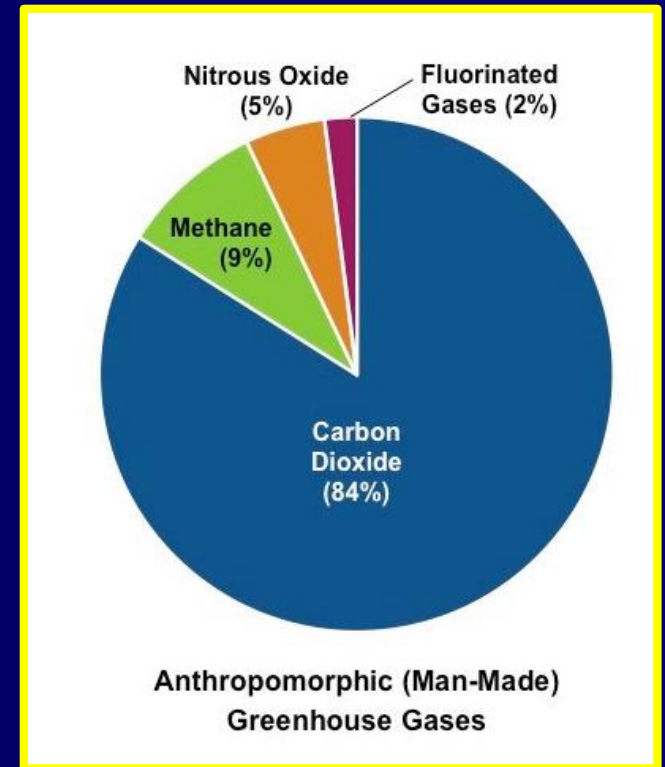
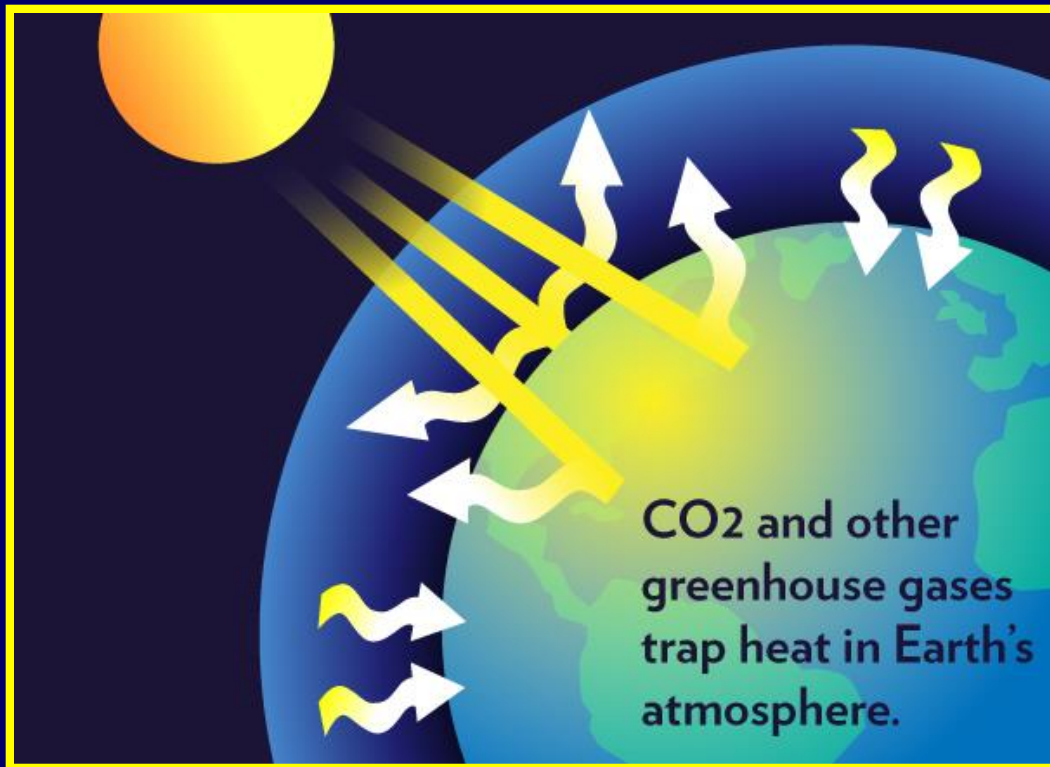
Increase in Carbon Dioxide

Recall that since the Industrial Revolution, there has been a steady increase in carbon dioxide in the atmosphere due to both combustion of fossil fuels and deforestation.



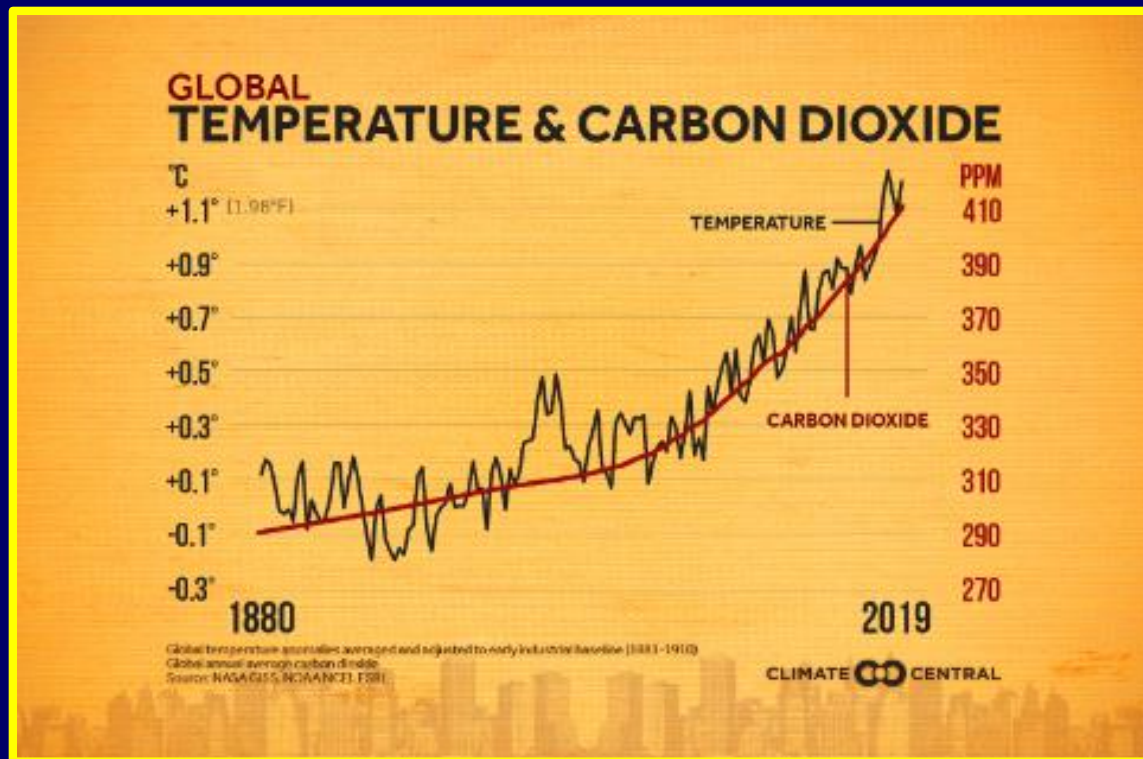
Greenhouse Gas

Recall that carbon dioxide is the most abundant greenhouse gas in Earth's atmosphere, in that it traps in heat from the Sun, thus warming the atmosphere.



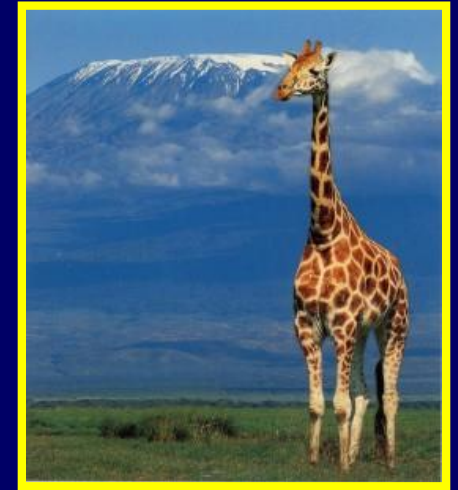
Carbon Dioxide and Temperature

Recall that the large increase in carbon dioxide in the atmosphere, since the industrial revolution, corresponds with an increase in the average global temperature.



Impact on Glaciers

The ice cap on Kilimanjaro, Africa's highest peak, is 82% smaller than it was in 1912.



1912 (Average area of snow: 12 km²)



1970 (Average area of snow: 5 km²)



2000 (Average area of snow: 2.5 km²)



2007 (Average area of snow: 1.5 km²)

It is estimated the ice caps will be gone within a decade or two.

Impact on Glaciers

Studies show that 95% of the world's glaciers are melting.



1973



2006



2020

White Chuck Glacier in Washington has severely retreated, leaving behind a glacial lake and moraine.

Impact on Glaciers

The Gurschen glacier at Switzerland's Andermatt ski resort has shrunk 66 feet or 20 meters within the past 15 years.



To try to slow down the melt, they began wrapping the ice with sheets of plastic.

[Saving Glaciers in the Swiss Alps](#)

Impact on Glaciers

Studies show that ice loss from five of the glaciers in Antarctica has doubled in the past 6 years and were melting five times faster than they were in the 1990's.



Impact on Glaciers

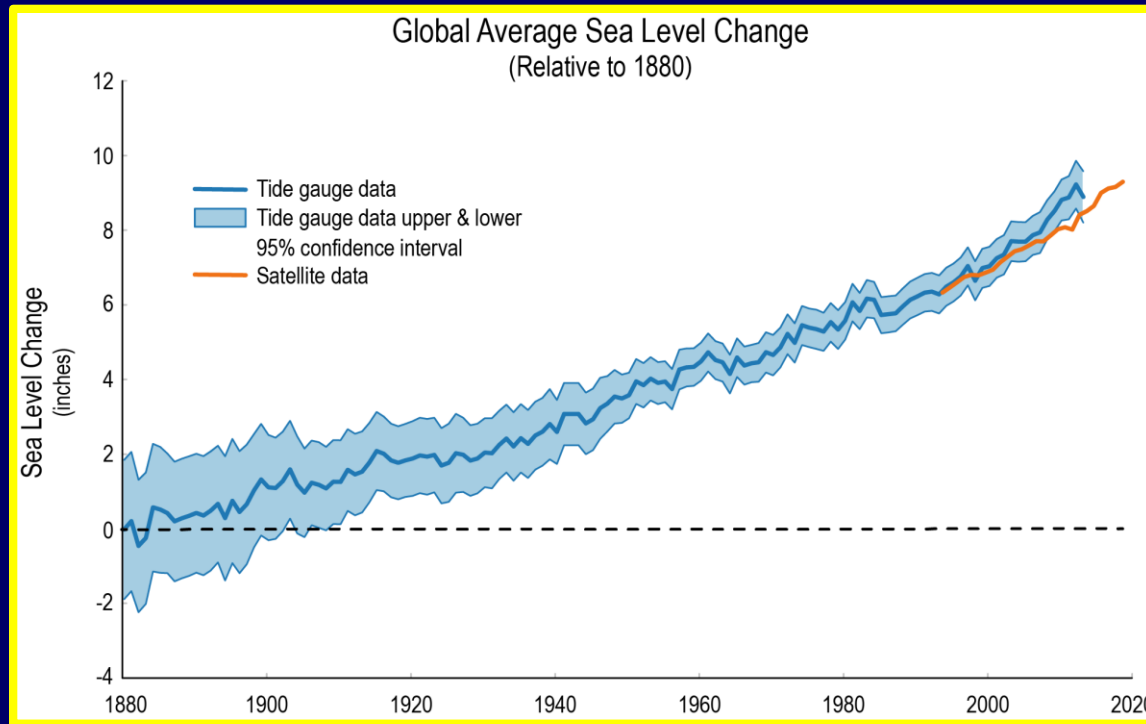
Last summer, Greenland experienced its highest recorded temperature, in history, reaching over 75 °F



In one day alone, over 12 billion tons of water melted away permanently from the Greenland glaciers.

Impact on Sea Level Rise

Since glaciers and ice sheets are on land, when they melt, the water flows into the ocean and cause the overall sea level to rise.



Since 1880, sea level has risen about 8 inches.

Impact of Sea Level Rise

At the current rate of ice melt, sea level could rise over 6 meters or 20 feet.



All the areas in red would be under water.

Sunny Day Floods

Miami already experiences what are called Sunny Day Floods, which occur during high tide and water flows up through storm drains onto the streets.



Impact of Sea Level Rise

Besides Miami, most major cities around the world are located near the ocean, due to easier transport and export of goods.



This means large populations of people will be displaced, which will affect everyone.

Impact of Sea Level Rise

Many island nations are near sea level and may be completely under water with even a small rise in sea level.



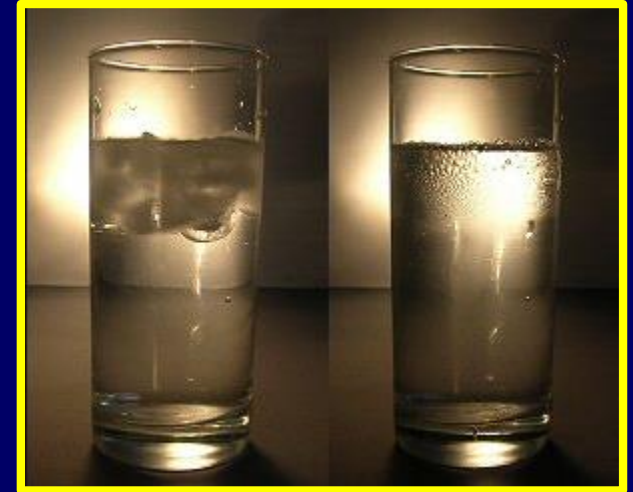
Impact on Arctic Ice

The arctic ice at the North Pole continues to have record low ice thickness

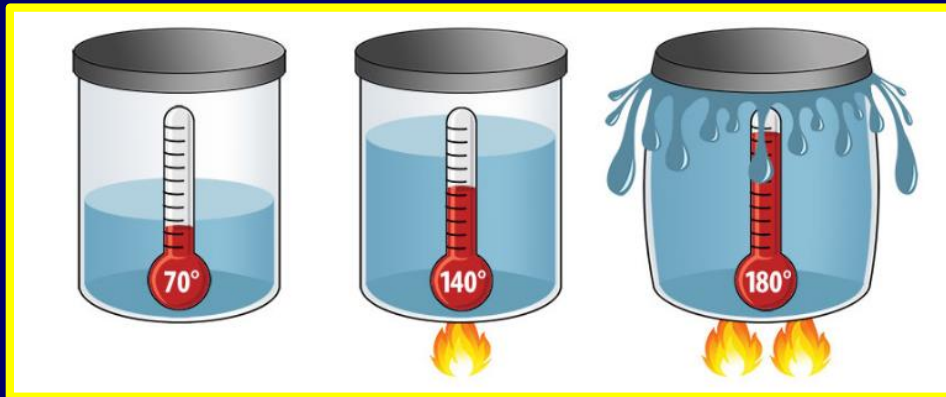


Impact of Melting Arctic Ice

The arctic ice floats on the water, it doesn't sit on land. As such, the melting of arctic ice won't raise sea level directly.



However, the arctic ice reflects a lot of sunlight.



With less arctic ice, the ocean will absorb a lot more heat, become warmer, expand, and contribute to sea level rise.

Impact on Ice Sheets

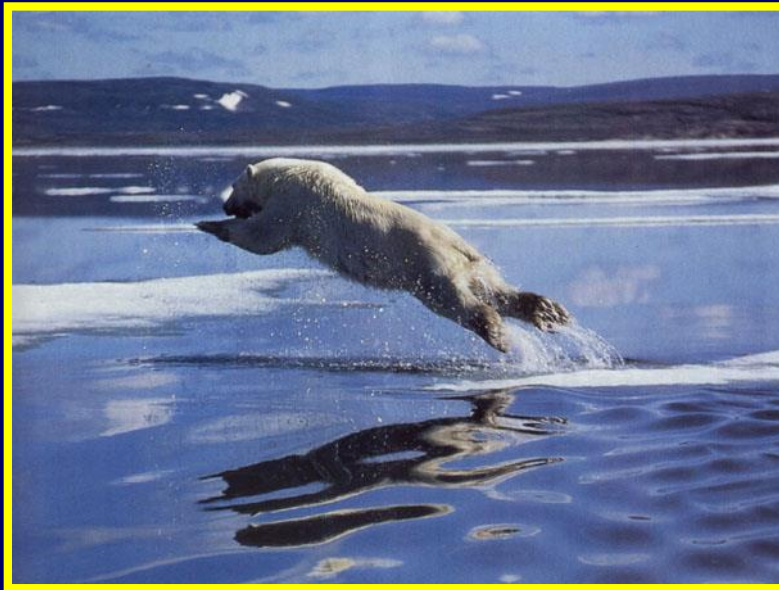
Over the past 20 years, ice sheets in Hudson Bay, Alaska have experienced 20 less days of being frozen each year.



This has had a great impact on the Polar Bears who mainly hunt for seals on the ice and eat relatively nothing while on land and must rely upon stored fat.

Impact of Melting Ice Sheets

In 2010, the polar bears went 3 weeks longer than previous years without food.



Many younger and weaker bears simply could not make it through the summer, resulting in a 22% decrease in their population.

Just Trying to Chill



Impact on Coral Reefs

Coral are animals that live in symbiosis with algae to produce large coral reefs that are the basis for large ocean ecosystems.



Impact on Coral Reefs

When the water temperatures become too warm, the coral expel the algae and undergo 'bleaching'. Corals can survive bleaching, but they are under more stress and are subject to high mortality.

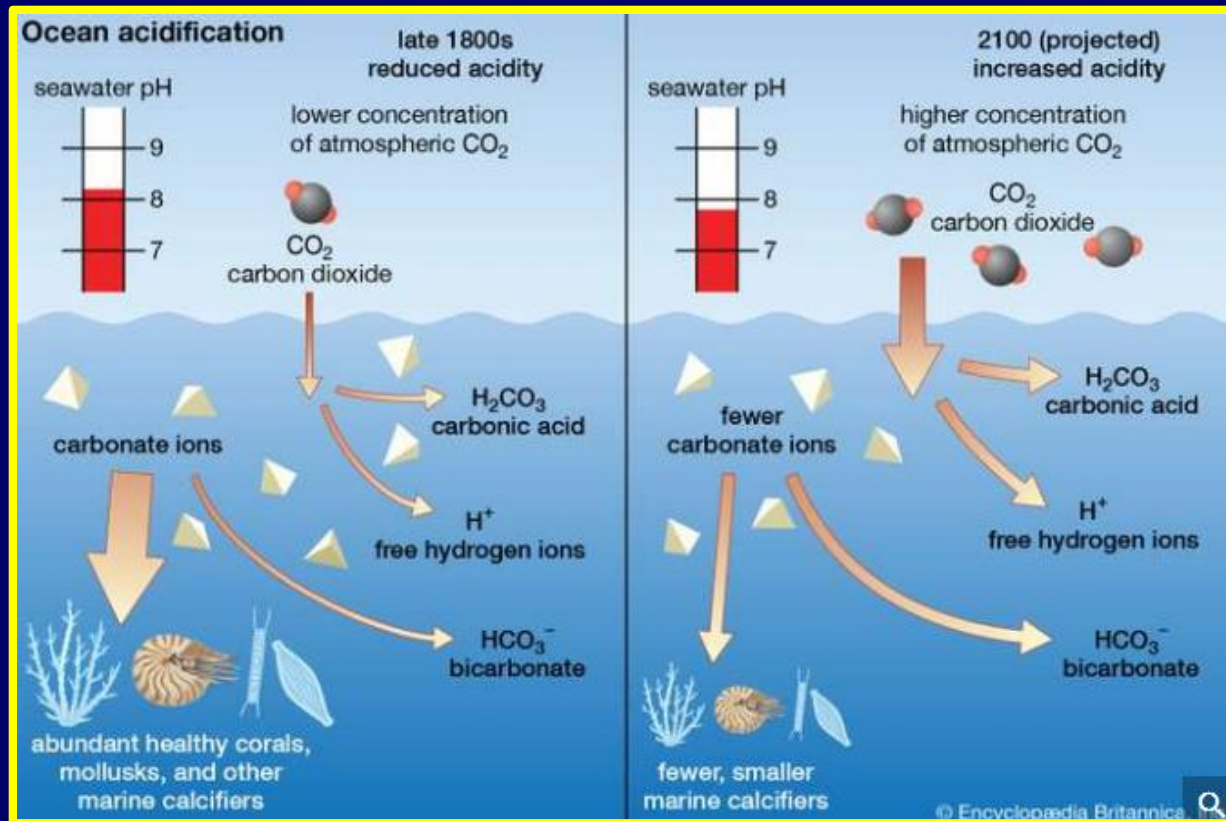


2005 Caribbean
Massive Bleaching
US lost ½ coral reefs

Water temperature
higher than past 20
years combined

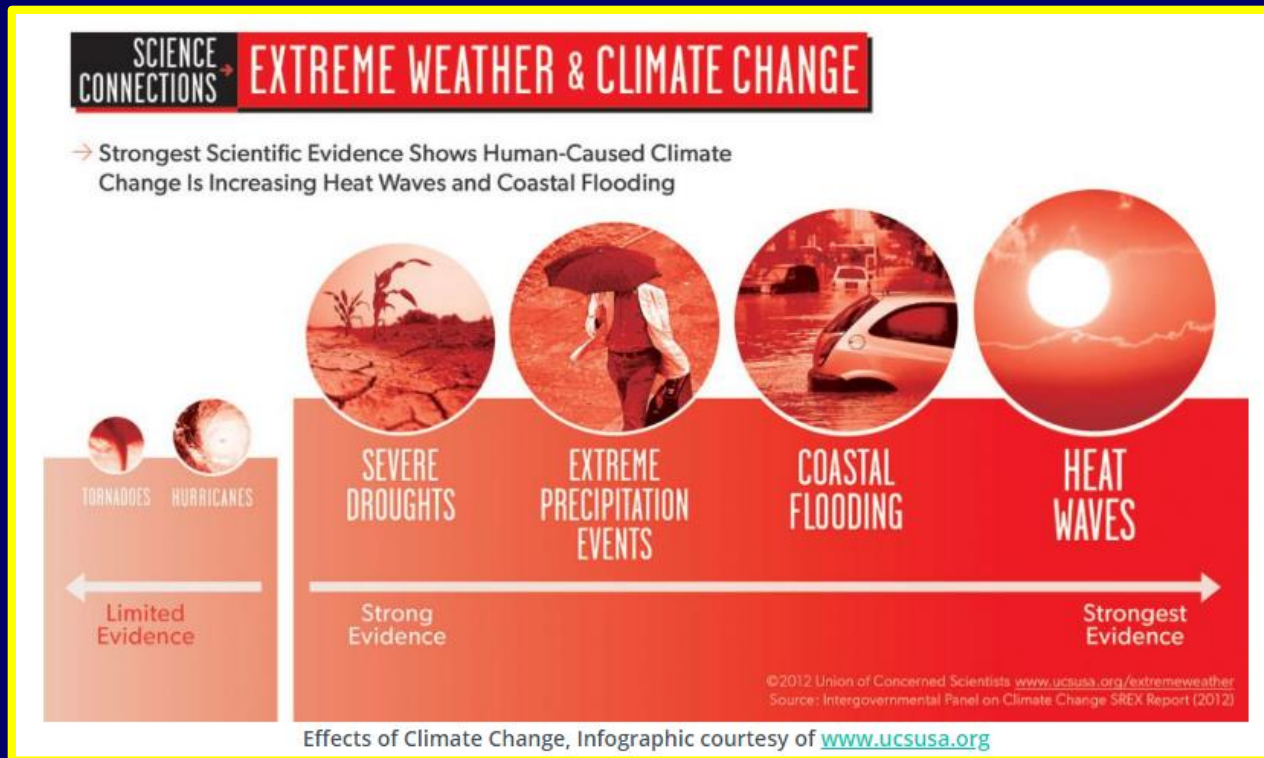
Impact on Coral Reefs

Increased levels of carbon dioxide also lowers the pH of ocean water, in a process called ocean acidification, that inhibits coral and shellfish from being able to make their skeletons and shells.



Impact on Weather

The warmer atmosphere and warm ocean will change wind patterns and ocean currents resulting in more frequent heat waves, coastal flooding, extreme precipitation events, and extreme droughts.



Impact on Droughts and Wildfires

Warmer climates will lead to more droughts due to increased evaporation.



Droughts increase the chances of wildfires.

Impact on Seasons

Seasons have changed by one week during the past 50 years.



Spring occurs a week earlier and fall begins a week later.

As an example, the Lilac festival in Massachusetts which used to be held at the end of May is now held in the beginning of May.

Impact on Animal Migration

Certain species have changed their migration patterns.

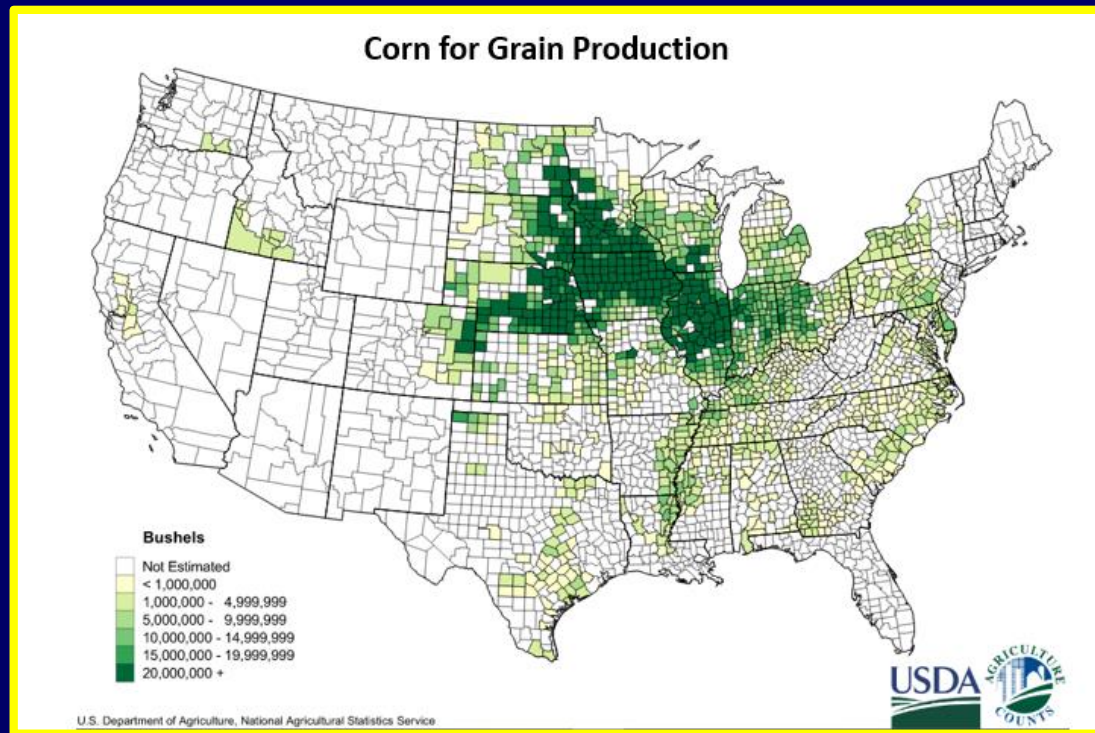


The Sooty Cooper butterfly was once common in Barcelona but now is found 60 miles north of Barcelona.

It is possible that the migration patterns and blooming seasons may not coincide, resulting in a decrease of both pollinators and flowering plants.

Impact on Crop Climates

As it becomes warmer, areas with climates that were once great for growing specific crops will change.



For example, the United States corn belt region will shift further north, possibly into Canada.

Impact on Permafrost

The permafrost in the Tundra is melting making the ground and buildings unstable. Entire towns have had to move.

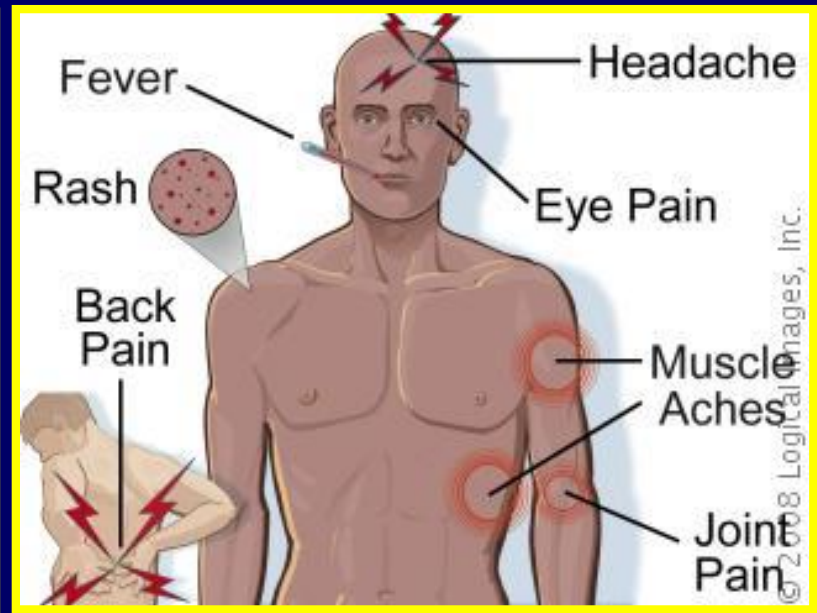
Alaskan Permafrost Melting



The permafrost has been a carbon sink, as it thaws more carbon dioxide will be released into the atmosphere, which will increase global warming even more..

Impact on Human Disease

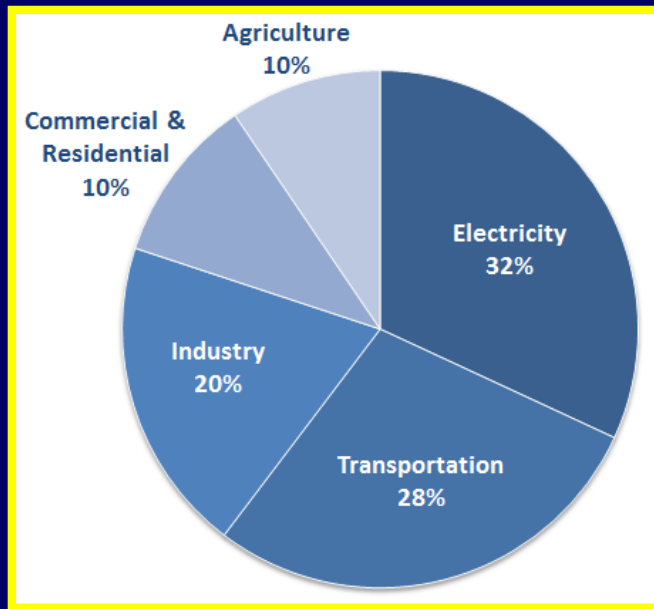
Mosquitoes that can carry malaria, dengue fever and other tropical diseases have expanded their ranges in recent decades.



In 2009, mosquito-borne dengue fever returned to the United States after an absence of nearly 75 years, infecting 22 people in Key West, Florida.

Human Sources of Carbon Dioxide

The largest contributor of carbon dioxide emissions in the United States is the burning of fossil fuels, mostly coal, for generating electricity.

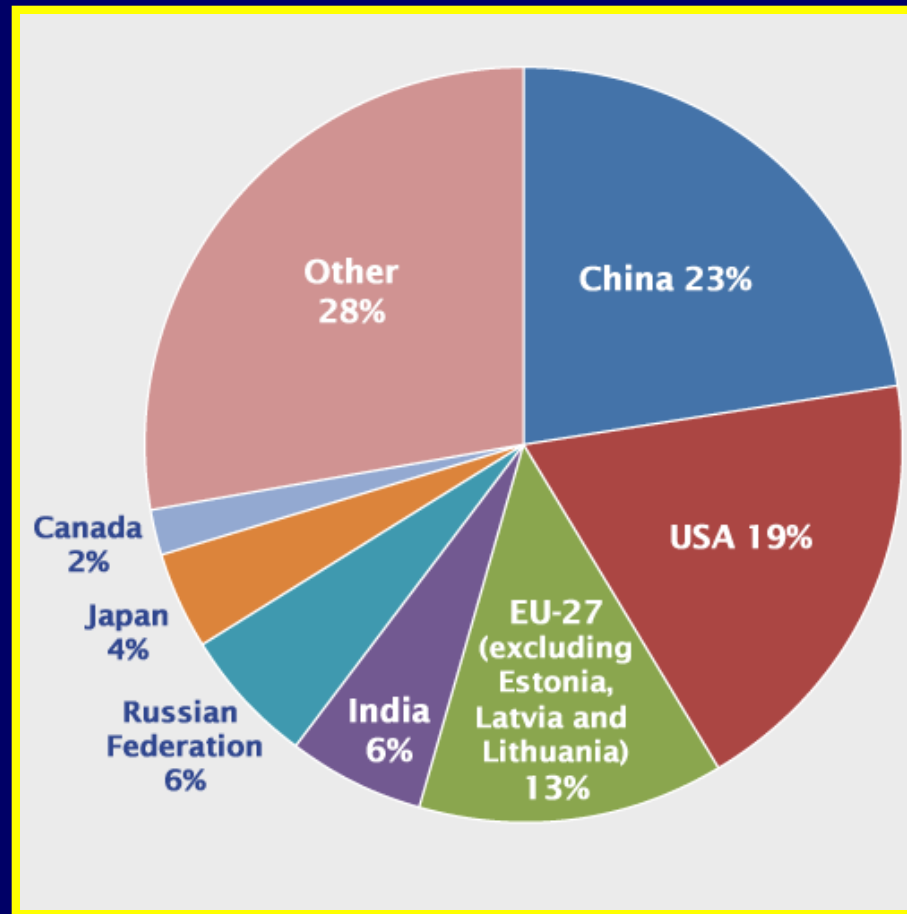


The second largest contributor is the burning of gasoline and diesel for transportation.

Industrial processes, such as the manufacturing of cement, is the third largest contributor.

Carbon Dioxide Emissions

Currently, China releases the most CO₂ emissions, followed by the United States, then Europe and India.



Global Conferences

The first world climate conference on climate change was held in Geneva, Switzerland in 1979.



It was mainly attended by scientists and called on governments to “foresee and prevent potential man-made changes to climate”

Global Conferences

In 1992, the Earth Summit took place in Rio de Janeiro. Here, the United Nations Framework Convention on Climate Change (UNFCCC) was signed by 154 nations. It agreed to prevent 'dangerous' warming from greenhouse gases and set voluntary targets for reducing emissions.



International Treaties

In 1997, the Kyoto Protocol became the first international treaty to set legally binding emissions cuts for industrialized nations. It was signed by 178 countries and came into force in 2005.



Carbon Credit/Trading

One outcome of the Kyoto Protocol was the establishment of carbon credit or emission trading.



Emissions trading works by allowing countries to buy and sell their agreed allowances of greenhouse gas emissions.

International Treaties

In 2001, one of the first acts of newly-elected President George W. Bush was to formally withdraw the U.S. from Kyoto.



Former President Bush said the U.S. would not ratify the treaty because it would damage the U.S. economy and major developing nations like China and India were not covered by its provisions.

The Bush family were billionaires from the oil industry and his campaign was financially supported by the oil industry.

International Treaties

In 2015, The Paris Accord replaced the Koyoto Protocol with the largest change being that countries agreed to voluntarily set their own CO₂ reduction goals.



International Treaties



President Obama agreed to reduce CO₂ emissions by 27%, saying “We have a moral obligation to take action on climate change and that we cannot leave our children a planet beyond their capacity to repair”.

At the same time, China agreed to peak its CO₂ emission around 2030 and to boost its share of alternative energy to around 20%



International Treaties

In October of 2019, President Trump withdrew the United States from the Paris Accord, saying the voluntary nature of nations setting their own goals for CO₂ reduction was unfair.



International Treaties

The USA has several state and federally run, voluntary initiatives that give tax breaks for reducing carbon dioxide emissions.



Grass Roots Efforts

The most effective efforts at reducing emissions have been results of voluntary grassroots efforts where cities have taken it upon themselves to reduce their emissions.



Alternative Energy

Many alternative energy practices do not use fossil fuels, so they don't release CO₂ into the atmosphere.



Wind Energy



Solar Energy



Nuclear Energy



Hydrological Energy



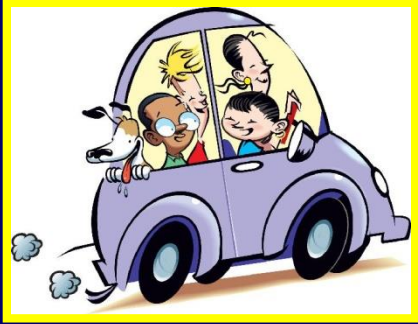
Wave Energy



Geothermal Energy

Things We Can Do

Reduce our CO2 emissions by:



Walking to the store
Riding a bike to work
Car Pooling



Using the mass transit system

Using Energy Efficient Appliances

Turning down the thermostat to 68 degrees (Winter)

Turning up the thermostat to 72 degree (Summer)

Turning off lights when you leave a room

Unplugging appliances when not in use



Things We Can Do

Since photosynthesis is the only means by which carbon dioxide is removed from the atmosphere, if we plant more trees, it would help reduce the amount of CO₂ in the atmosphere.



Me
↓



The End

