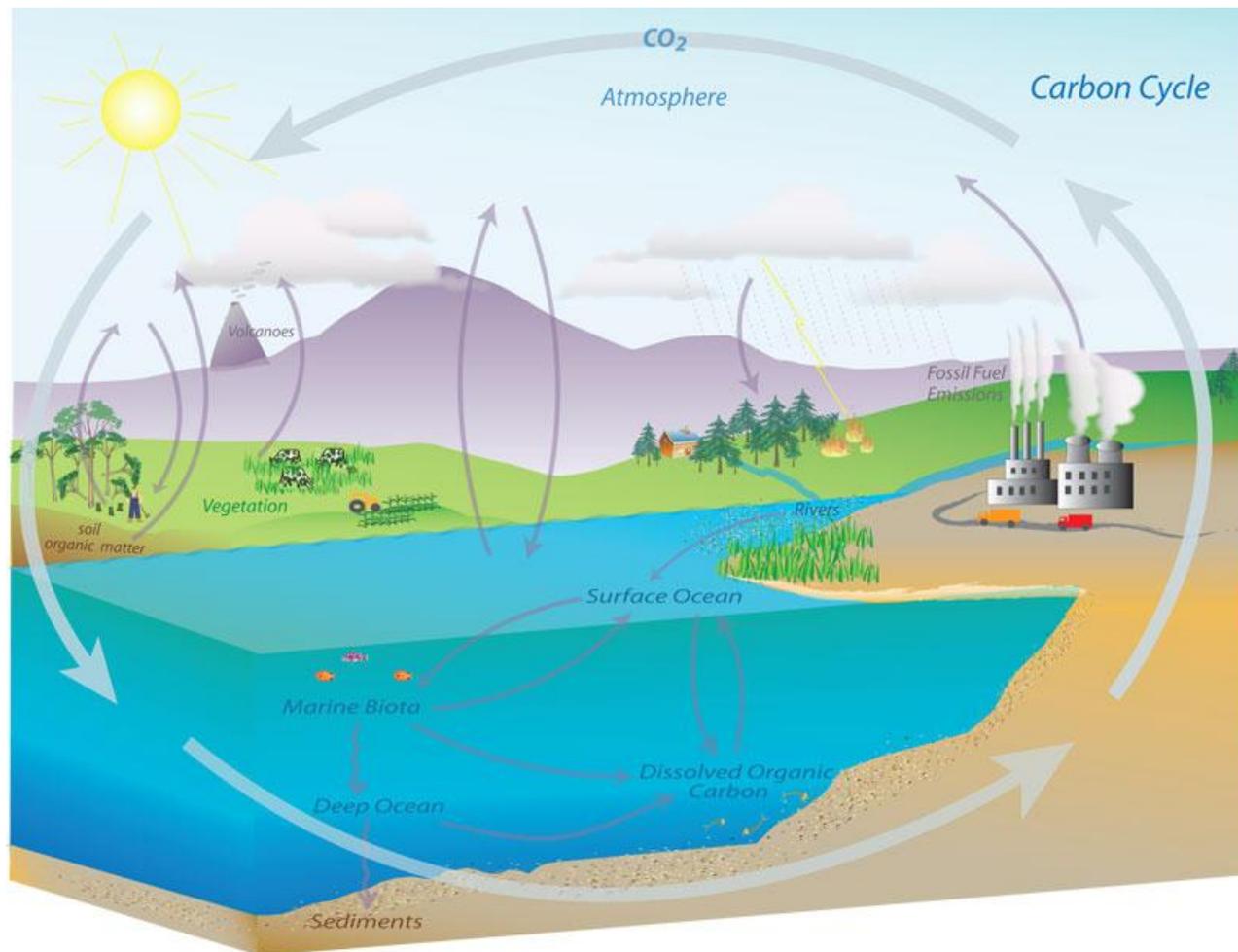


# The Carbon Cycle

## Overview of the Carbon Cycle

The movement of carbon from one area to another is the basis for the carbon cycle. Carbon is important for all life on Earth. All living things are made up of carbon. Carbon is produced by both natural and human-made (anthropogenic) sources.



## Nature's Carbon Sources



Carbon is found in the **atmosphere** mostly as carbon dioxide. Animal and plant respiration place carbon into the atmosphere. When you exhale, you are placing carbon dioxide into the atmosphere.



Carbon is found in the **lithosphere** in the form of carbonate rocks. Carbonate rocks came from ancient marine plankton that sunk to the bottom of the ocean hundreds of millions of years ago that were then exposed to heat and pressure.

Carbon is also found in fossil fuels, such as petroleum (crude oil), coal, and natural gas.

Carbon is also found in soil from dead and decaying animals and animal waste.



Carbon is found in the **biosphere** stored in plants and trees. Plants use carbon dioxide from the atmosphere to make the building blocks of food during photosynthesis.

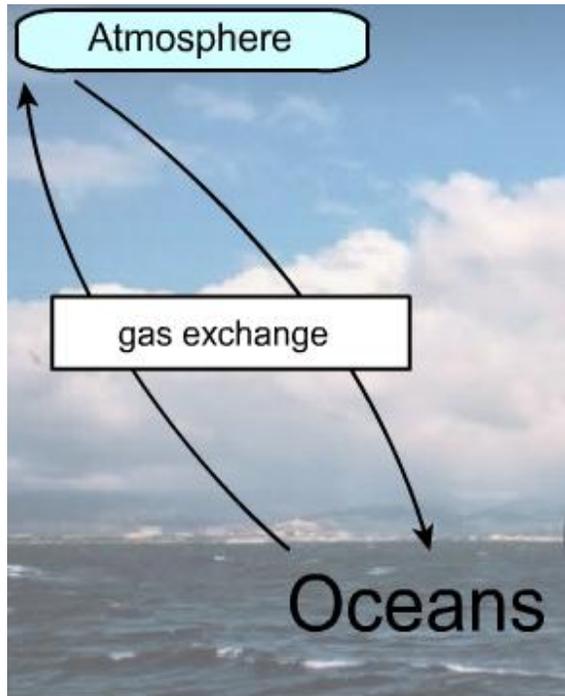


Carbon is found in the **hydrosphere** dissolved in ocean water and lakes.

Carbon is used by many organisms to produce shells. Marine plants use carbon for photosynthesis. The organic matter that is produced becomes food in the aquatic ecosystem.

## Natural Carbon Releases into the Atmosphere

Carbon is released into the atmosphere from both natural and man-made causes. Here are examples to how nature places carbon into the atmosphere.



Gases containing carbon move between the ocean's surface and the atmosphere through a process called diffusion.



Volcanic activity is a source of carbon into the atmosphere.

## How Do Humans Place Carbon in the Atmosphere?

Humans place carbon into the atmosphere in a variety of ways.



Deforestation. When we cut down trees and forests, they can no longer remove carbon dioxide from the air. This results in additional carbon dioxide placed in the atmosphere.



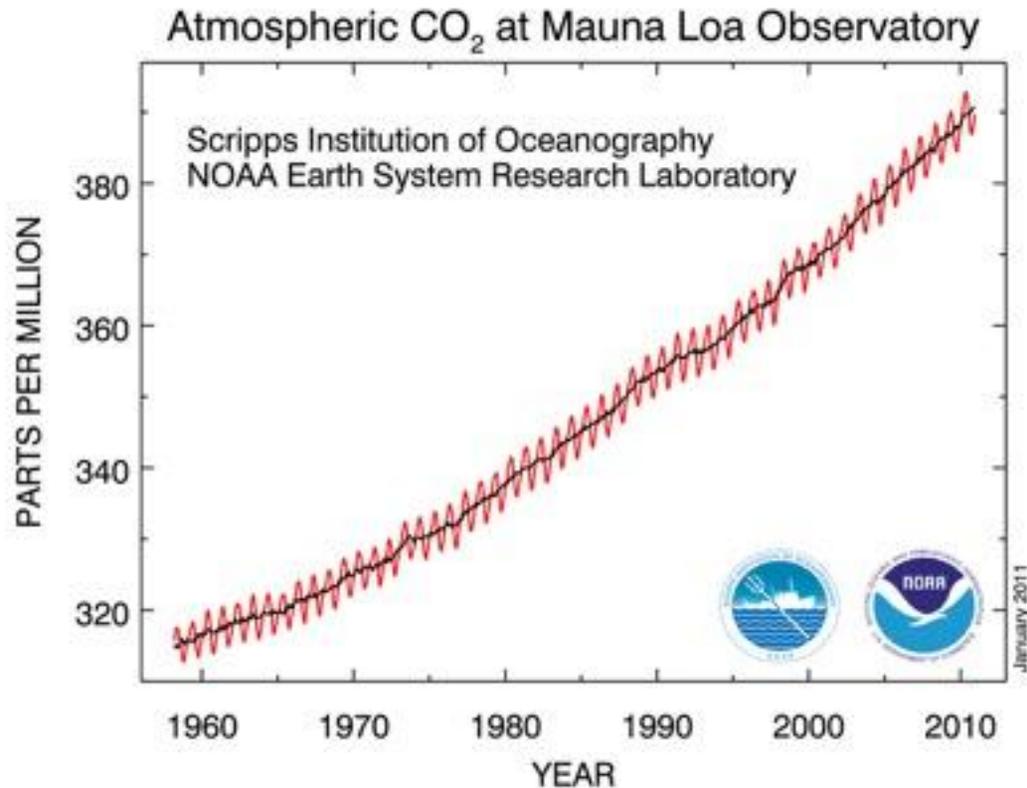
Wood burning. When we burn wood, the carbon stored in the trees becomes carbon dioxide and enters the atmosphere.



Combustion of fossil fuels. We extract fossil fuels (coal, oil, and natural gas) from the ground and burn them for energy at power plants. The burning of fossil fuels is called **combustion**. Fossil fuel combustion releases carbon dioxide into the atmosphere.

## How Much Carbon Is in the Atmosphere?

Climate scientist Charles Keeling measured atmospheric carbon dioxide levels between 1958-2005 at the Mauna Loa Observatory on the northern slopes of Earth's largest volcano in Hawaii. His data, shown below, show the steady increase of carbon dioxide levels in the atmosphere.

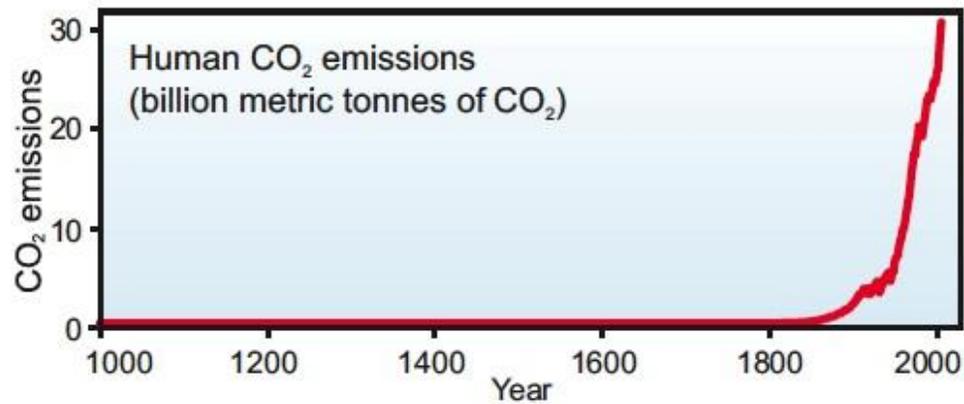


The red regular wobbles in the data reflect the seasonal growth of trees and plants in the Northern hemisphere. During the spring and summer, trees and plants absorb carbon when they undergo photosynthesis, reducing the amount of carbon in the atmosphere. During the fall and winter, they decay, releasing carbon back into the atmosphere. This famous data display is known as the **Keeling curve**.

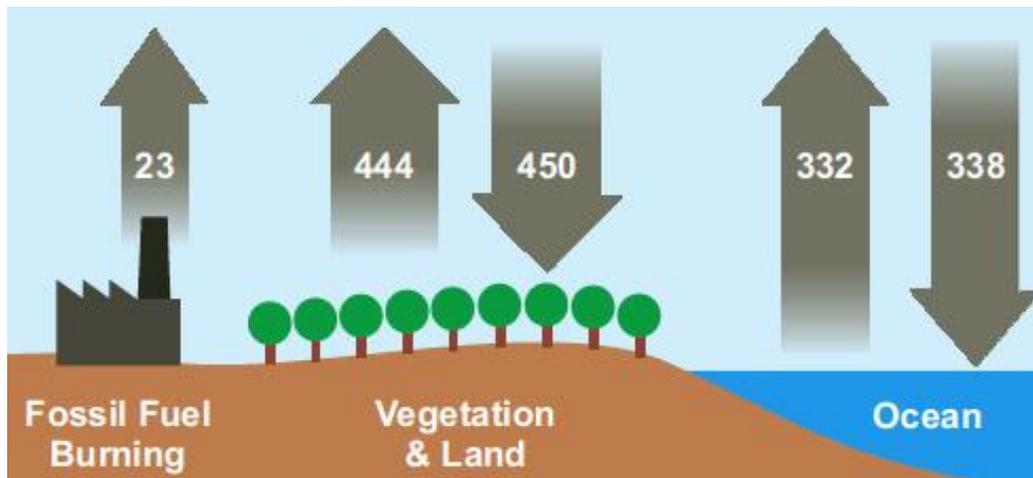
The measurements shown in this curve represent the world's longest continuous record of atmospheric carbon dioxide. This data was the first to confirm the rise of carbon dioxide in the atmosphere caused by the burning of fossil fuels.

## How Much Carbon Do Humans Emit?

Nature absorbs 788 billion tonnes of carbon every year. Natural absorptions roughly balance natural emissions. Humans upset this balance. While some of our human-produced carbon dioxide emissions are being absorbed by the ocean and land plants, around half of our carbon dioxide emissions remain in the air.



Human produced carbon dioxide emissions have been increasing since the Industrial Revolution.



The arrows in the image to the left show the amount of carbon that is exchanged between the atmosphere and the other Earth spheres. The numbers are in billions of tonnes of carbon dioxide.