

# INQUIRY 3: HOW MUCH CARBON IS HELD BY THE WORLD'S FORESTS?

**THE SITUATION:** Carbon dioxide is a gas that is made up of carbon and oxygen. Carbon dioxide has always been present in Earth's atmosphere. Carbon dioxide plays an important role in regulating Earth's climate through a process called the carbon cycle (Figure 22). Earth will cool if the carbon cycle removes too much carbon dioxide from the atmosphere. If the carbon cycle generates too much carbon dioxide, Earth will warm. As you can see from the carbon cycle, carbon is both held on Earth and released into the atmosphere as carbon dioxide.

Since the end of the last ice age, the amount of carbon dioxide in the atmosphere has remained fairly constant. In recent years however, the amount of carbon dioxide in the atmosphere has been rising. The rising amount of carbon dioxide may be related to

roots. Most of the carbon stays in the tree until the tree is destroyed by fire or decay (Figure 23). Other plant matter in forests also contains carbon. Examples include fallen leaves, fallen dead wood (Figure 24), and shrubs. The soil also contains carbon.

Scientists believe that higher levels of carbon dioxide in the atmosphere are causing the world's climate to change. Since trees absorb carbon dioxide when they grow and other material in forests contain carbon, forests help reduce the amount of carbon dioxide being released to the atmosphere. FAO wanted to discover how much carbon is held by forests worldwide. The amount of carbon held in a tree is equal to about half the tree's weight after all water has been removed. The amount of carbon, therefore, can be calculated if the number and size of trees and

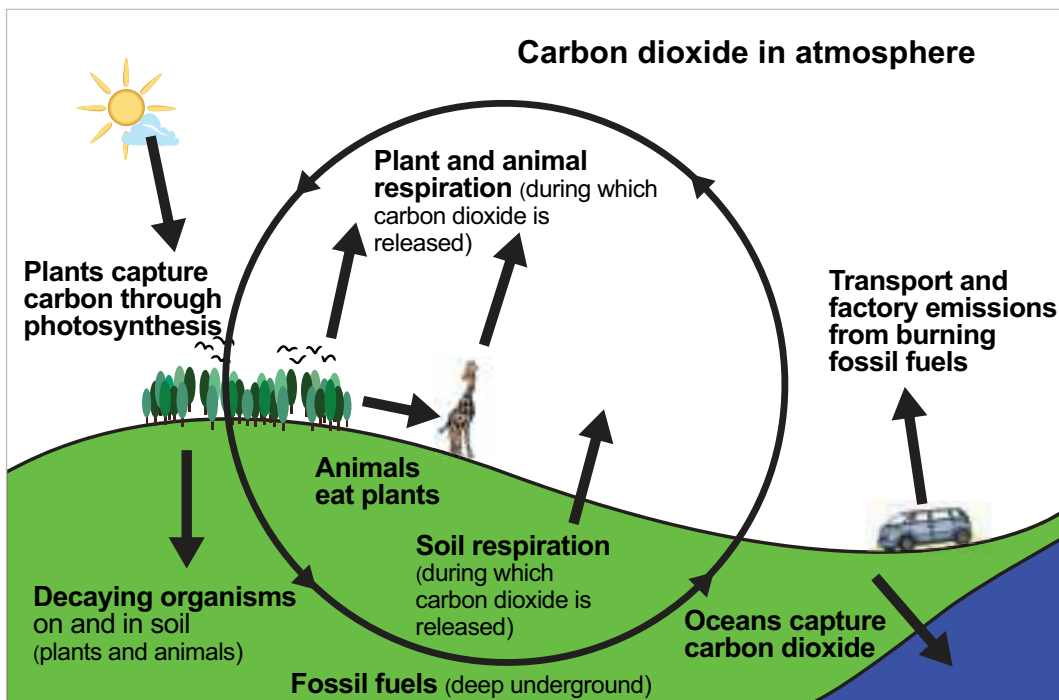


Figure 22. The carbon cycle

the increase in some types of human activity, such as burning *fossil fuels*. From Figure 22, you can see that trees and forests play an important part in the carbon cycle. As a tree grows, it absorbs carbon dioxide from the atmosphere. The carbon becomes a part of the living tree, including its

## GLOSSARY:

### fossil fuel:

Fuel, such as coal, petroleum, or natural gas, formed from the fossilized remains of plants and animals.

## REFLECTION SECTION

Do you think Earth's climate could be changing due to human activity? Why or why not?



the amount of water held in different sizes of trees can be estimated.

**WHAT THEY DISCOVERED:**

Of the 229 countries and territories reporting to FAO, 151 countries provided estimates of the amount of carbon contained in their forests. This accounted for 80 percent of the world's forests. Based on this information, FAO estimated the amount of carbon being held by the remaining 20 percent of the world's forests.

Then they added all of the information together. The amount of carbon is measured in gigatonnes, and is written Gt. One Gt is equal to 1 billion tonnes. One tonne is equal to 1,000 kilograms or 2,205 pounds. In 2005, the total amount of carbon in forests was estimated to be 638 Gt (Figure 25).

This is more than the total amount of carbon in the entire atmosphere! This figure includes all forest vegetation, roots, dead wood, and the carbon contained in the soil. Worldwide, there was a slight decline in the amount of carbon in the world's forests from 1990 to 2005.

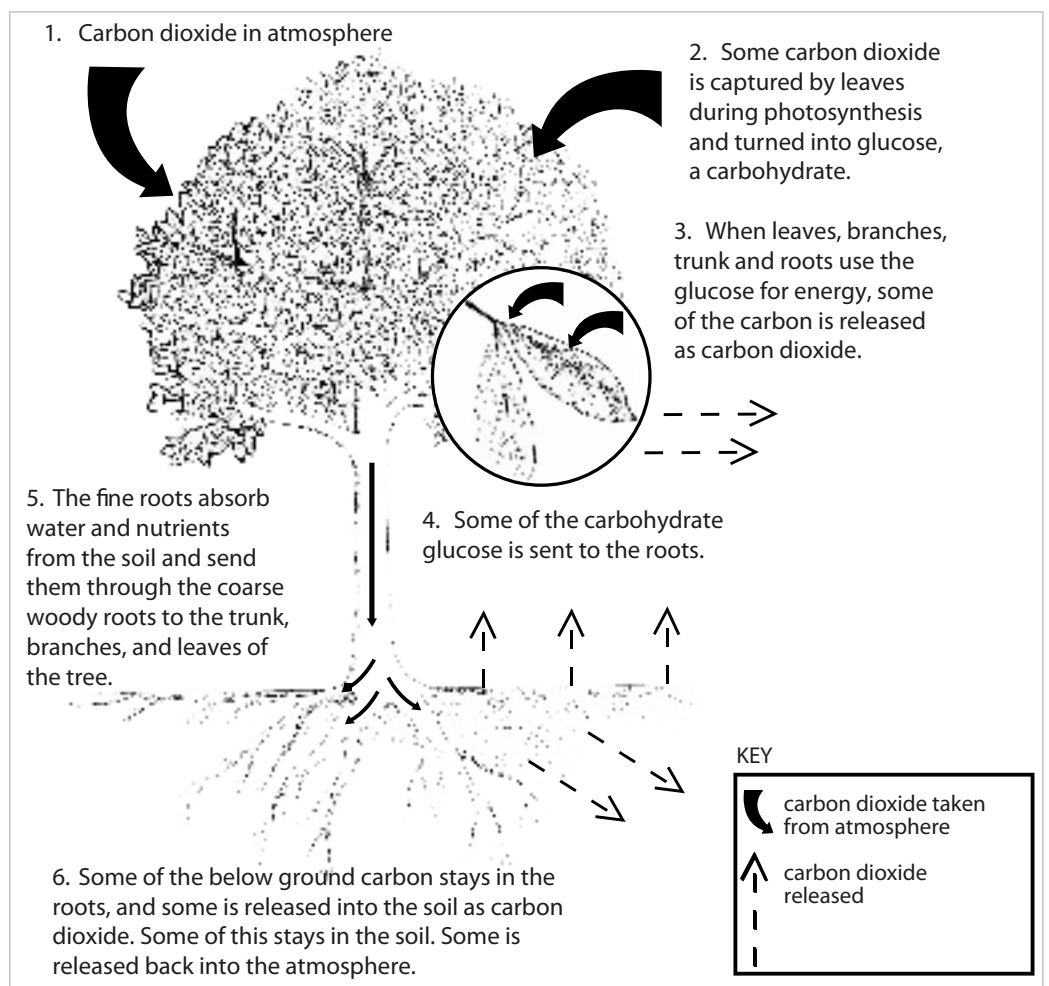


Figure 23. Trees absorb, hold, and release carbon



Fig 24. Plant matter found on the forest floor contains carbon

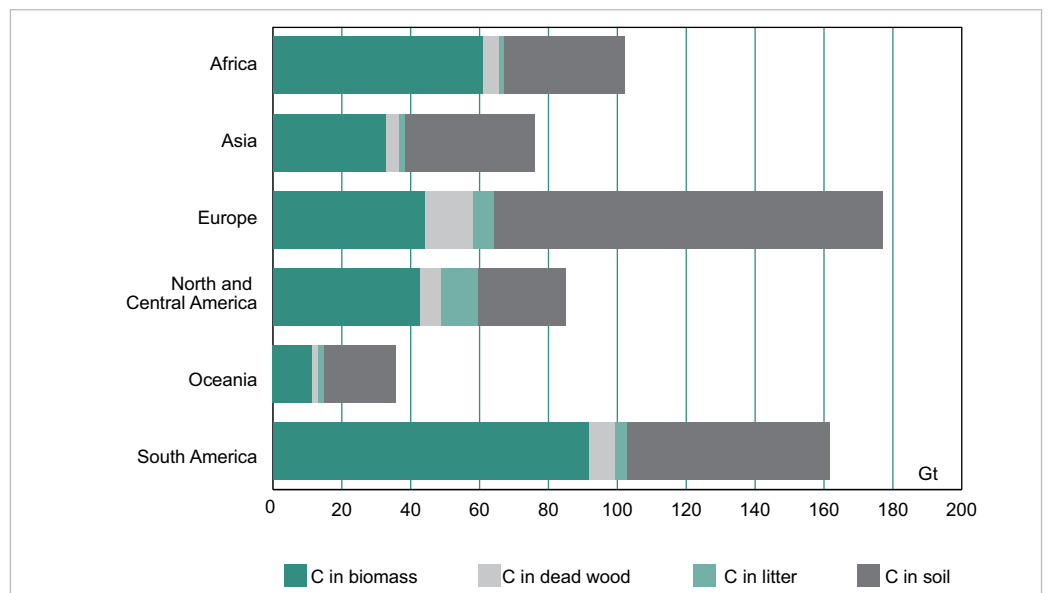


Fig 25. The total amount of carbon in forests by region in 2005 (Gt)

## You Do the Math:

Although elephants vary in size and weight, let's say the average weight of an elephant is four tonnes (Figure 26).

How many elephants would it take to equal one Gt?

To calculate this, divide 1,000,000,000 by 4.

How many elephants would it take to equal the weight of carbon in all of the world's forests?



Fig 26. The average elephant weighs about four tonnes



## REFLECTION SECTION

In Inquiry 2, you learned that more forests are being lost than are gained each year. Now read the last sentence on page 19. Does that sentence make sense in light of what you know about the loss of forests? Why or why not?

FAO scientists found that the amount of forests worldwide is declining. They also found the amount of carbon held by forests is declining. If, as most scientists believe, climate change is caused largely by an increasing amount of carbon dioxide in the atmosphere, what conclusion might you reach about the need for a greater or lesser amount of forest land?