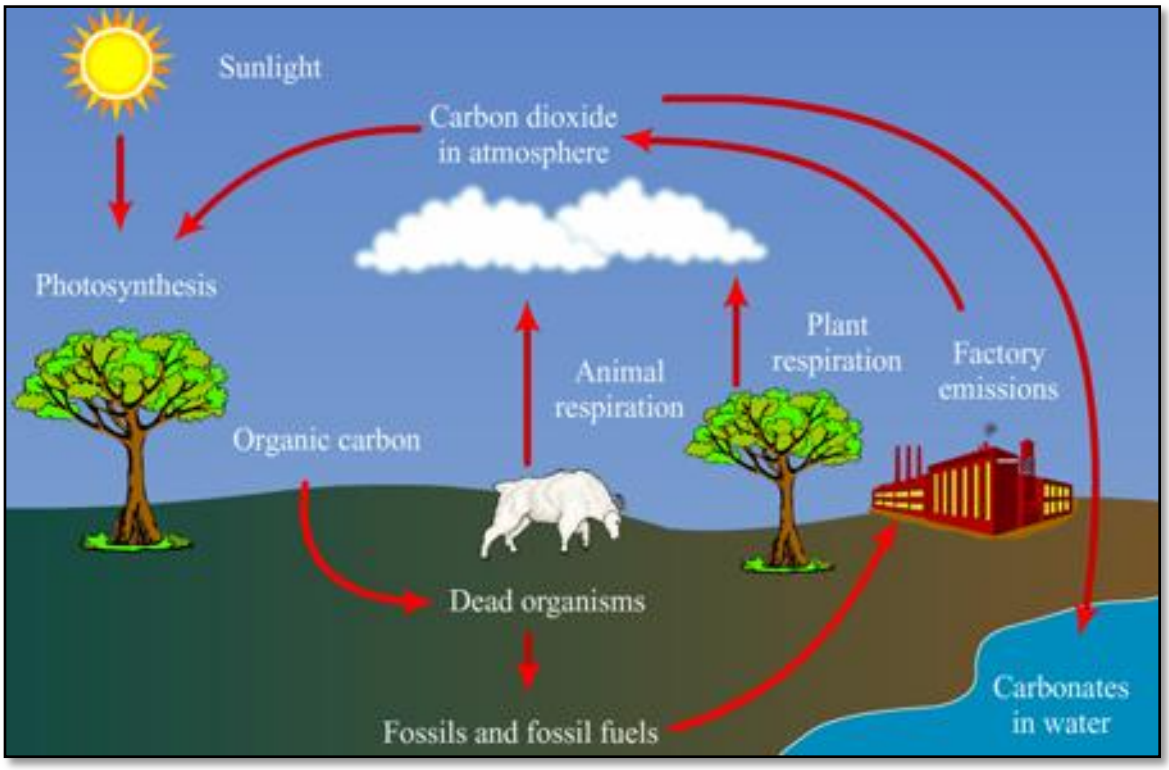
Student Sheet 1

CRITICAL THINKING ACTIVITY:
WHAT GOES AROUND COMES AROUND!

How does carbon move through our planet? How long does it remain in the different reservoirs? Understanding the carbon cycle is critical to determining how long CO_2 will stay in the atmosphere. Since CO_2 is the most important greenhouse gas, this knowledge is vital for our ability to predict how climate change will occur.



The Carbon Cycle

All life is based on the element carbon. Carbon is the major chemical ingredient of most organic matter, from fossil fuels to the complex molecules (DNA and RNA) that control genetic reproduction in organisms. By weight, however, carbon is not one of the most abundant elements in the Earth's crust. In fact, the lithosphere is only 0.032% carbon by weight. In comparison, oxygen and silicon respectively make up 45.2% and 29.4% of the Earth's surface rocks.

Student Sheet 2

Where does CO_2 come from? All living things give it off when they extract energy from their food during cellular respiration. CO_2 bubbles out of the Earth in soda springs, explodes out of volcanoes, and is released when organic matter burns (such as during forest fires).

- Anything that releases CO_2 into the atmosphere (living, dead, or non-living) is considered a ***source***
- Anything that absorbs and holds CO_2 from the air or water is considered a ***sink.***

Over geologic time, CO_2 sources and sinks generally balance. In today's atmosphere, however, CO_2 levels are climbing in a dramatic and easily measurable way, providing evidence that there are now more CO_2 sources than sinks.

Plants and animals give off CO_2 while alive and respiring and when dead and decaying. Plants are important carbon sinks, taking up huge quantities of CO_2 through the process of photosynthesis. While plants also release CO_2 through the process of respiration, the amount of CO_2 taken up by plants through photosynthesis and released through respiration roughly balances out.

Carbon is stored on our planet in the following major sinks: (a) in living and dead organisms found in the biosphere; (b) as the gas carbon dioxide in the atmosphere; (c) as organic matter in soils; (d) in the lithosphere as fossil fuels and sedimentary rock deposits such as limestone, dolomite and chalk; and (e) in the oceans as dissolved atmospheric carbon dioxide and as calcium carbonate shells in marine organisms.

Carbon sources include the burning of fossil fuels and other organic matter, the weathering of limestone rocks (which releases CO_2), and the respiration of living organisms. Volcanic activity, forest fires, and many human activities release the carbon.

Student Sheet 3

STUDENT ACTIVITY: SOURCE OR SINK? Label each of the processes below as a SOURCE or a SINK for carbon.

PROCESS	SOURCE OR SINK	DISCUSSION
Animal respiration		
Plankton growth		
Ocean acidification		
Microbe respiration		
Cement production		
Sediment deposition		
Plant respiration		
Rock formation		
Volcanic eruption		
Coal formation		
Shell formation		
Decomposing dinosaur		
Burning fossil fuels		
Photosynthesis		
Deforestation		