CARBON CYCLE

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CARBON

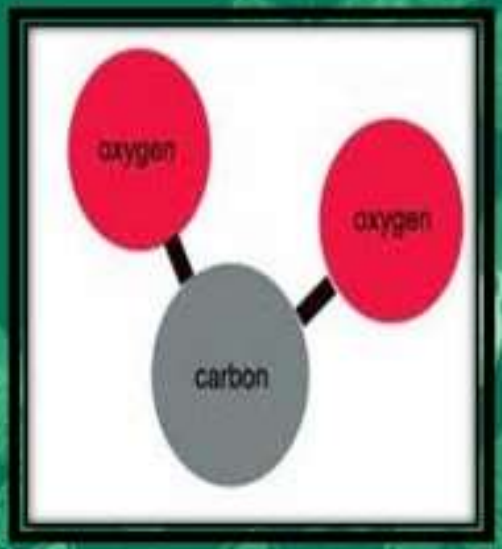
- **Carbon** is virtually important molecule in the carbon cycle.
- Proteins, nucleic acids, lipids, carbohydrates, and other molecules essential to life contain carbon.

- Carbon is present in the atmosphere as the gas carbon dioxide (CO_2), which makes up approximately 0.04% of the atmosphere.

- It is also present in the ocean and fresh water as dissolved carbon dioxide. Carbons are also present in rocks such as limestone ($CaCO_3$).

CARBON DIOXIDE

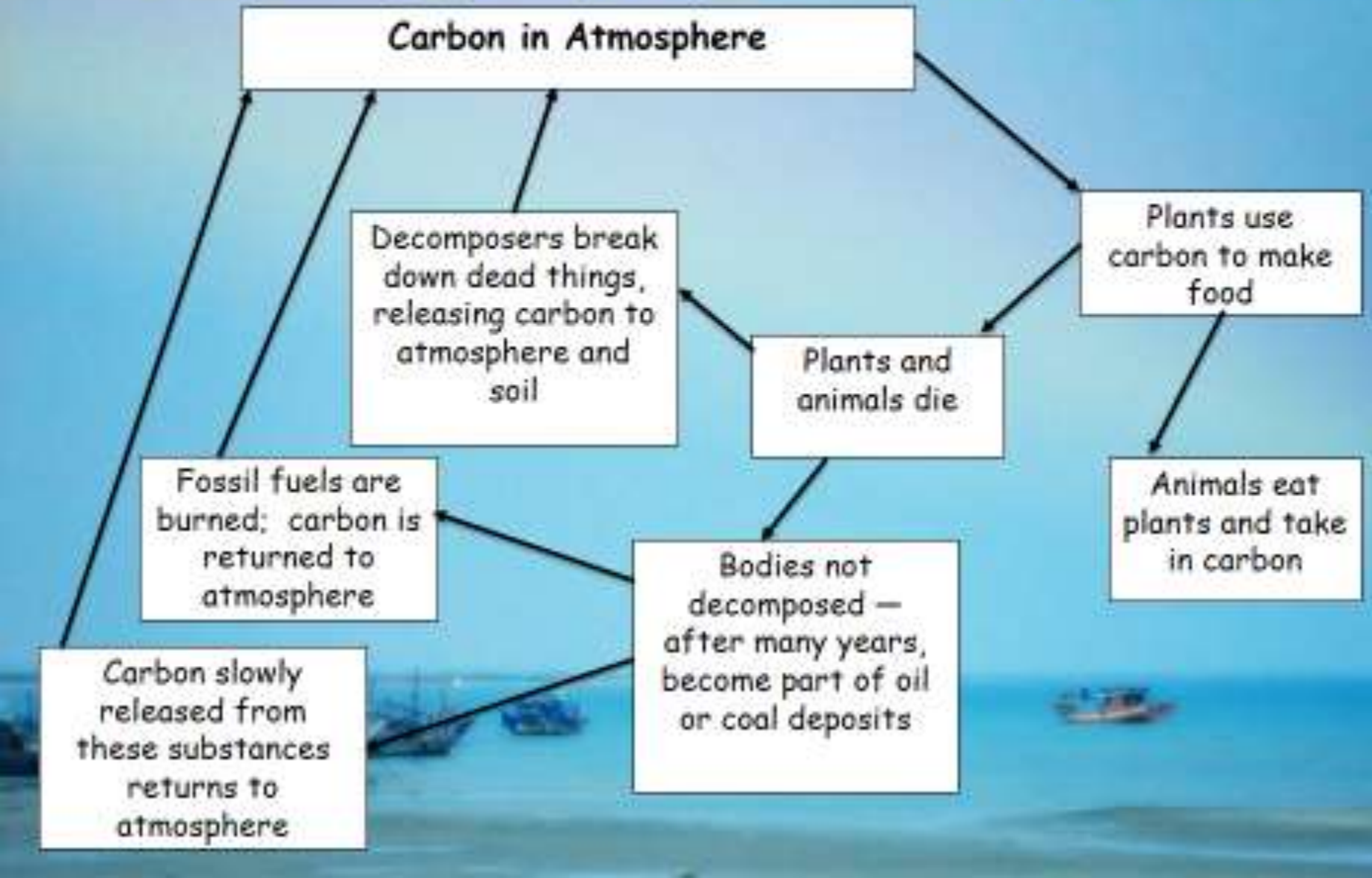
Carbon Dioxide is a greenhouse gas and traps heat in the atmosphere. Without it and other greenhouse gases, Earth would be a frozen world. But humans have burned so much so fuel that there is about 30% more carbon dioxide in the air today than there was 150 years ago. More greenhouse gases such as Carbon Dioxide in our atmosphere are causing our planet top become warmer.



THE CARBON CYCLE

The global movement of carbon between the abiotic environment, including the atmosphere and ocean, and organisms is known as the **CARBON CYCLE.**

Carbon Cycle Diagram



Step 1: PHOTOSYNTHESIS

- During photosynthesis, plants, algae, and cyanobacteria remove Carbon dioxide from the air and fix, or incorporate it into complex organic compounds such as glucose.
- Photosynthesis incorporates carbon from the abiotic into the biological compounds of producers.

Chemical Equation for Photosynthesis:

chlorophyll

$$CO_2 + H_2O + \text{sunlight} \xrightarrow{\text{chlorophyll}} C_6H_{12}O_6 + O_2$$

carbon dioxide + water + sunlight → glucose + oxygen

Step 2: DECOMPOSITION, ANIMAL & PLANT RESPIRATION, SOIL MICROORGANISM RESPIRATION.

- ✓ Many of the compounds are used as fuel for cellular respiration by the producer that made them, by a consumer that eats producer, or by a decomposer that breaks down the remains of the producer or consumer.
- ✓ The process of a cellular respiration returns CO_2 to the atmosphere. A similar carbon cycle occurs in aquatic ecosystems between aquatic organisms and dissolved CO_2 in water.

Chemical Equation for Cellular Respiration:

$$C_6H_{12}O_6 + O_2 \rightarrow CO_2 + H_2O + \text{energy}$$

glucose oxygen carbon dioxide water

- The process of photosynthesis incorporates the carbon atoms from carbon dioxide into sugars.
- Animals eat the plants and use the carbon to build their own tissues.
- Carnivores eat these animals and then use the carbon for their own needs.
- These animals return carbon dioxide into the air when they breathe, and when they die,the carbon is returned to the soil during decomposition.

Step 3: PARTLY DECOMPOSED PLANT REMAINS (COAL)

Millions of years ago vast coal beds formed from the bodies of ancient trees that were buried and subjected to anaerobic conditions before they had fully decayed.

THE CARBON CYCLE

FOSSIL FUELS – COAL

Step 4: MARINE PLANKTON REMAINS

- The oils of unicellular marine organisms probably gave rise to the underground deposits of oil and natural gas that accumulated in the geologic past.
- Coal, oil, and natural gas, called **fossil fuels** because they formed from the remains of ancient organisms. Fossil fuels are non-renewable resources. The Earth has a finite or limited supply of these resources.

Step 5: COMBUSTION (HUMAN & NATURAL)

- ✓ The process of burning or combustion, may return the carbon in oil, coal, natural gas, and wood to the atmosphere.
- ✓ In combustion, organic molecules are rapidly oxidized (combined with oxygen) and converted to carbon dioxide and water with release of light and heat.

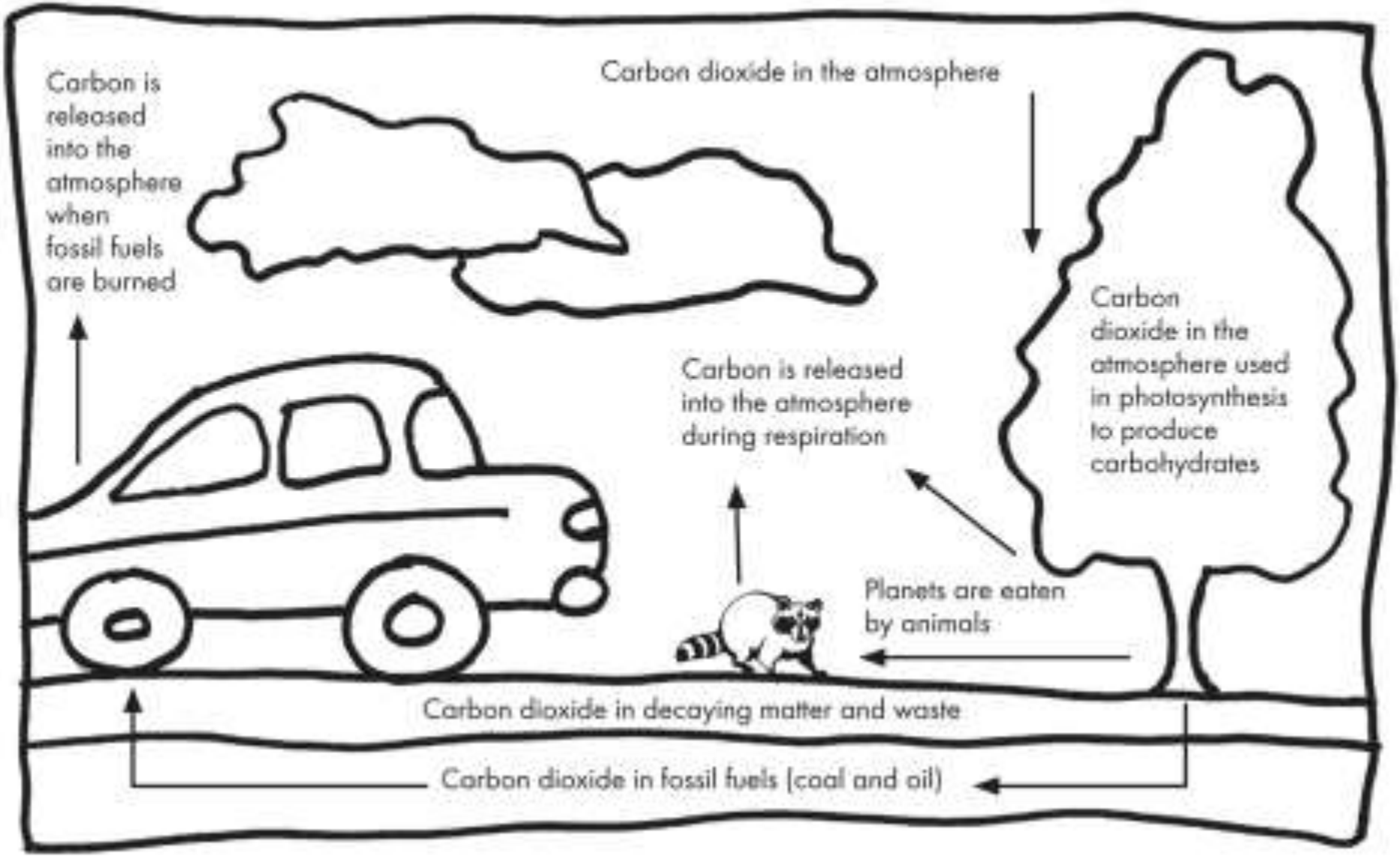
Step 6: BURIAL AND COMPACTION TO FORM ROCK (LIMESTONE)

- An even greater amount of carbon that is stored for millions of years is incorporated into the shells of marine organisms.
- When these organisms die, their shells sink to the ocean floor and sediments cover them forming cemented together to form limestone.

Step 7: EROSION OF LIMESTONE TO FORM DISSOLVED CO_2

- When the process of geologic uplift expose limestone, chemical and physical weathering processes slowly erode it away.
- This returns carbon to the water and atmosphere where it is available to participate in the carbon cycle once again.

The Carbon Cycle



- Thus, photosynthesis removes carbon from the abiotic environment and incorporate it into biological molecules.
- While, Cellular respiration, combustion, and erosion of limestone return carbon to the water and atmosphere of the abiotic environment.

Why carbon cycle is important?

- Many elements have cycle, but the cycling of carbon atoms is particularly important because:-
- Through photosynthesis and respiration, it is the way the earth produces food and other renewal resources.
- CO2 plays a key role in trapping heat in the atmosphere - one of the basic mechanisms behind the greenhouse effect.
- Carbon plays a central role in combustion.

- Through decomposition, it serves as the earth's waste disposal system.
- In addition, the carbon cycle is important because carbon-containing gases in the atmosphere affect the earth's climate.
- Increased CO2 in the atmosphere has been responsible for more than half of the climate warming observed in recent decades.

What we need 2 do?

- Burn less, especially fossil fuels
- Promote plant life, especially trees

Thank you