

Grade: Excellence

For Excellence, the student needs to analyse human-induced change within the Earth system.

This involves discussing scientific implications of the change within the Earth system.

This student began their analysis by defining relevant concepts such as fossil fuels, the atmosphere, and the hydrosphere.

They have explained the role of CO₂ in the greenhouse effect, and they have explained how warming the ocean causes the sea level to rise. Finally, the student has discussed how the change in the atmosphere affects the hydrosphere.

Fossil fuels are fuels that are made from decomposing plants and animals which come from a long time ago. We use fossil fuels to burn them and to produce steam and to produce electricity, we also use fossil fuels to power most modes of transport. When fossil fuels are burnt it is turned into a gas called carbon dioxide (CO₂) and CO₂ is the gas that is harming the earth so much and is warming our planet by a process in which I will explain.

The atmosphere is made of different gases that surround the earth, it has oxygen which we need and protects us UV radiation. The hydrosphere is all the water on earth, from ice to the ocean and under ground reservoirs. The hydrosphere moves in a cycle called the water cycle, which involves six main stages the evaporation stage, the condensation stage, the precipitation stage, the infiltration stage, the runoff stage, the transpiration stage. the ocean is one of the largest parts of the hydrosphere at 97% and one of the most important parts of the hydrosphere.

What happens in the atmosphere when CO₂ is released? When fossil fuels are burnt, they release CO₂ in the atmosphere, CO₂ is a greenhouse gas. How the greenhouse effect works. When the sun is out, the energy from the sun heats up the earth's surface and then the earth's surface will release the energy back into the atmosphere as infrared light, but the catch is, that greenhouse gases absorb infrared light and traps the heat in the atmosphere. CO₂ then releases the heat back into the atmosphere, therefore making the atmosphere warm up. Greenhouse gases are good as long as it is kept at an optimum level because it keeps us comfortably warm and keeps the temperature warmer at night when the sun isn't out, without greenhouse effect the earth will be too cold for life to exist. Burning too much fossil fuel releases too much carbon dioxide leading to too much greenhouse effect causing global warming. Global warming means the temperature in the atmosphere continues to go up and cause lots of unthinkable consequences.

The atmosphere releases heat into the ocean by a process called heat transfer, greenhouse gases heat the particles in the atmosphere, then the particles in the atmosphere come in contact with the cool ocean particles and makes the ocean particles warmer, and therefore the sea warmer.

The hydrosphere is affected by global warming by the sea level rising, the sea level rises by the earth and the atmosphere heats up and the sea gets warmer, when the sea heats up the particles in the water start to move faster and hit into each other, so they move further apart so they don't hit each other and need more room to move so that the volume expansion occurs leading to sea level rise, sea level rising can cause coastal erosion and more flooding which can put houses near the coast and low lying houses in danger. Low level islands in the Pacific islands will become flooded and underwater causing plants and animals will become extinct. The United Nations also says that "nearly 10 percent of the global population is living in a low-lying zone" that shows how big the consequences are of global warming are and what a massive task it will be to move them all if sea level rise continues to rise.

With the green house gas's releasing so much heat into the atmosphere, the atmosphere can release some heat into the ocean, this is called a carbon sink. A carbon sink is when the ocean or anything that absorbs CO_2 and heat takes in more CO_2 than it releases. The ocean (hydrosphere) is the world's largest carbon sink absorbing around "90 percent of the excess heat generated by these emissions" says the UN, this shows how the atmosphere and the hydrosphere are connected in the way that the hydrosphere absorbs a large amount of the heat and carbon dioxide from the atmosphere, but the ocean isn't able to absorb enough heat and the atmosphere is having to take more heat and CO_2 . The ocean's currents and waves move the warm water into the cooler areas and start to warm the cooler water, and with warmer waters the polar ice melts contributing to the sea level rise, not by much, but is still a contributor to sea level rise.

In conclusion, if we continue to burn fossil fuels and produce carbon dioxide then the sea will become too high for people to live in low lying areas by the process of global warming. The ocean is a critical carbon sink and if this starts to give off more carbon dioxide than it takes in, then it will be a big problem. Global warming and sea level rising are connected by fossil fuels and too much greenhouse gases.