

# [The history about the carbon cycle environmental sciences essay](https://assignbuster.com/the-history-about-the-carbon-cycle-environmental-sciences-essay/)

How can we manipulate biological systems to reverse the greenhouse effect? The burning of fossil fuels and deforestation has increased the concentration of carbon dioxide in the atmosphere since the mid-eighteenth century. The average CO2 concentration in 1850 was estimated to be 274 ppm and this has increased to exceeding 385 ppm today. This increase in concentration of carbon dioxide and other greenhouse gases has led to an increase in the average temperature of the Earth’s surface. The resulting ‘ greenhouse effect’ occurs because the greenhouse gases in the atmosphere intercept solar radiation and absorb it. The infrared radiation is reflected back towards the earth and the temperature increases. The process of manipulating a biological system with the aim of reversing the greenhouse effect as a whole is known as geoengineering. This can be divided into two categories or ways of reducing global warming. They are called Carbon sequestration and solar radiation management. Carbon sequestration is the process in which atmospheric carbon dioxide is captured and then stored in order to reduce carbon dioxide emissions especially from power stations. Storage usually occurs in deep underground reservoirs. There are a number of biological processes which affect the carbon cycle. These can be altered in certain ways by geoengineers in order to help the overall process of sequestration. These processes include reforestation whereby trees are replanted with the goal of incorporating atmospheric carbon dioxide into biomass. An increase in the number of trees means that the uptake of carbon dioxide will increase for photosynthesis. This process relies on the trees growing indefinitely without being burnt down or affected in any way that would return the carbon to the atmosphere. Another method of sequestration is through the use of agricultural methods that retain biomass within the soil and also provide the suitable conditions for crops to store carbon in its simplest form. These methods include the use of grasses and weeds to cover the land between seasons in order to keep the most carbon in the soil. The introduction of iron into the upper layers of the ocean is another technique used in order to remove carbon from the atmosphere. This is otherwise known as iron fertilisation and is meant to create a phytoplankton bloom which uses carbon from the atmosphere for photosynthesis. Intervention can also occur in physical processes to reduce the levels of carbon in the atmosphere. One of the most common forms of intervention within these processes is the injection of carbon dioxide into any depleted reservoirs of oil or gas. This first occurred on a large scale in 1996 in the North Sea where carbon dioxide from the atmosphere was captured and introduced into a saline water table. As well as capturing the carbon released by power stations and then storing it underground in reservoirs, landfills are also a method of sequestration. The thermochemical decomposition of organic matter (biomass) creates a charcoal that can be added to a landfill site and will remain with the soil. This thermochemical process renders the carbon nearly inert so that it is unable to oxidise into carbon dioxide. The other form of geoengineering with the aim of reversing the greenhouse effect is solar radiation management. The basic principle of this is to reflect sunlight thereby reflecting heat away from the earth surface. This ‘ global dimming’ could be the result of a number of different techniques. It already occurs as a result of natural processes such as volcanic eruptions but the actual interception within the biological process is a method used by geoengineers. One technique studied by scientists for management of solar radiation is the use of stratospheric aerosols. These would contain gases such as sulphur dioxide which is reflective with the intention of reflecting some of the sunlight away from the surface of the Earth. The aerosols would be released by using aircraft or balloons. Geoengineers have estimated that if this technique was used, it could counteract the effect on the Earth’s temperature of a doubling in the concentration of carbon dioxide. Another technique suggested by scientists was that of cloud whitening. In order to increase cloud reflectiveness, seawater could be sprayed into the atmosphere which would increase the radiation that is reflected. Astronomers have suggested that they can reverse the effects of global warming by building a sun shield which would be 100, 000 kilometres wide. This would be made of trillions of mirrored discs which would effectively reflect act as a giant sunshade for the entire planet by limiting the amount of the Sun’s energy that can reach the Earth. All of these methods in manipulating biological systems to reverse the greenhouse effect are all good ideas but they have limitations. Carbon is compressed into a liquid form before being stored in underground reservoirs (carbon sequestration) but there is still a risk of the gas leaking out from underground. If the gas that escaped mixed with ground water it could be detrimental to humans and if gas stored below the ocean leaked out, it could alter the carbon dioxide content in the sea bed disrupting the whole ecosystem. A limitation with iron fertilisation is that phytoplankton blooms give rise to chemicals that are involved in the depletion of the ozone layer. Ozone depletion is also a possible side effect of solar radiation management using stratospheric aerosols. This technique would also alter the earth’s climates which could have potentially disastrous effects. Research by some scientists suggested that cloud whitening would only have a little effect if any and may even decrease the brightness of the clouds in some instances. There are many possible techniques that geoengineers have come up with in order to reverse the greenhouse effects. They all have limitations – perhaps there main one is cost and some of them may not be entirely plausible with the technology of the present day.