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# How to Control Carbon Dioxide Gas in the Earth's Atmosphere to Reduce Global Warming

**Tayeb Hamed [1*] and Farahi Mohammad Husain[2]**
[1]Department of Physics, Faculty of Education, Farah University, Farah, Afghanistan
[2]Department of Mathematics, Faculty of education , Farah University, Farah, Afghanistan
*Corresponding author: Hamedtayeb1369@gmail.com

## ABSTRACT
The burning of fossil fuels causes the release of greenhouse gases which acts like a wrapped blanket around the earth and traps the heat of the sun and increases the temperature, as well land clearing and deforestation also play a major role in increasing the carbon dioxide of the earth. The main greenhouse gas which causes climate change is carbon dioxide, based on the research conducted, the removal of carbon dioxide from the earth's atmosphere is inevitable, which is currently mainly has been established in the form of conventional methods in development countries. It is important to note that all possible scenarios for the reduction of carbon dioxide gas have been investigated and the method of removing carbon dioxide(RCD) from the earth is specially considerable. The application of carbon dioxide removal at the Gt level requires significant development of new technologies. Our findings form the main lines of research that can be considered for the construction of devices capable of potentially effective removal of carbon dioxide from the surface of the Earth and space, and allow us to identify sources of emission from point sources before fuel and collect carbon dioxide gas after fueling the earth's atmosphere in order to prevent global warming.

**Keywords:** Climate change, Carbon dioxide, devices, global temperature, fossil fuels, atmosphere

## INTRODUCTION
Carbon dioxide is a natural gas that exists in the earth's atmosphere; Carbon dioxide, which consists of one carbon atom and two oxygen atoms, plays an important role in climate change and is one of the main ingredients of photosynthesis, the process by which plants produce their food from sunlight. Without carbon dioxide, plants cannot survive on earth, similarly, carbon dioxide plays an important role in maintaining the habitable climate on this planet, and as a greenhouse gas, carbon dioxide traps heat in the atmosphere and they keep our planet warm even when the sun is not shining, yet outdoor carbon dioxide levels have increased due to human activity. Fossil resources are huge deposits of carbon dioxide, which are located underground in the absence of air. The access of humans to these resources has caused the fuel of machines, industrial companies, cement companies, etc. to be supplied from these fossil resources, which as a result of the burning of fossil resources causes the release of carbon dioxide gas, this gas from the surface of the earth. They escape under the troposphere layer, about 8-12 km from the earth(pathak et al, 2022). Which has caused the temperature of the earth's node to rise. Achieving the goal of reducing global temperatures requires rapid decarbonization of industry, transportation, heating and power systems. But carbon dioxide removal should be combined with technology (Riahi et al, 2022). Decarbonization methods may be numerous, but in this research we have chosen two methods: 1- the method of removing and storing carbon dioxide from point emissions such as vehicles, power generation devices, factories, etc., which this method it can be in two ways before fuel and after fuel. 2 - The method of removing and storing carbon dioxide from the atmosphere. The second method that can directly remove carbon dioxide from the atmosphere and provide its stable storage includes afforestation, reforestation and coastal carbon management and etc. We can also absorb and store carbon dioxide from the earth's atmosphere with devices(Fuss et al, 2018). But other so-called new methods of removing carbon dioxide are in the first stages of development are in the experimental stages(Smith et al, 2023).

## RESULTS
### *Carbon capture and storage*
Carbon dioxide absorption and storage can refer to the process of carbon dioxide absorption from large-scale point emission sources such as fossil fuel power generating stations or industrial power plants, and also carbon

dioxide absorption from the earth's atmosphere (Dawson & Spannagle, 2009). Therefore, we can absorb and store carbon dioxide in two ways.

***Carbon capture from emission point sources***

All the systems that consume fossil fuels and produce carbon dioxide, such as vehicles, power generation devices, industrial companies, etc., are called point sources of carbon dioxide emissions (Herzog & Golomb, 2004). Absorption of carbon from these sources allows us to prevent the release of carbon dioxide into the atmosphere and control the global temperature. Therefore, controlling the sources of carbon dioxide gas point emission can be our path in two ways.

***Absorption of carbon dioxide from fossil materials before fuel***

Capturing $CO_2$ before combustion offers some advantages. First, $CO_2$ is not yet diluted by the combustion air. Second, the $CO_2$ containing stream is usually at elevated pressure. Therefore, more efficient separation methods can be applied, e.g. using pressure swing-absorption in physical solvents, such as methanol or polyethylene glycol. Pre-combustion capture is usually applied in coal gasification combined cycle (IGCC) power plants. This process includes gasifying the coal to produce a synthesis gas composed of CO and $H_2$, reacting the CO with water (water-gas shift reaction) to produce carbon dioxide and $H_2$; capturing the $CO_2$; and sending the $H_2$ to a turbine to produce electricity (Agency, 2022). Since the primary fuel sent to the gas turbine is now hydrogen, some can be bled off as a fuel for separate use, such as in hydrogen fuel cells to be used in transportation vehicles. One of the biggest barriers to this pathway is that currently electricity generation is cheaper in pulverized coal (PC) power plants than in IGCC plants. The pre-combustion process could be utilized when natural gas is the primary fuel. Here, a synthesis gas is formed by reacting natural gas with steam to produce carbon dioxide and $H_2$. Worldwide, gasification facilities exist today that do not generate electricity, but synthesis gas and various other byproducts of coal gasification ( Sjöstrand & Yazdi, 2009). In these facilities, $CO_2$ is separated after the gasification stage from the other gases, such as methane, hydrogen or a mix of carbon monoxide and hydrogen. The synthesis gas or hydrogen are used as a fuel or for chemical raw material, e.g. for liquid fuel manufacturing or ammonia synthesis. The $CO_2$ can also be used as a chemical raw material, for dry ice manufacturing, carbonated beverages, and enhanced oil recovery (EOR) (Herzog & Golomb, 2004).

***Absorption of carbon dioxide from fossil materials after fuel***

The post-combustion method is based on $CO_2$ separation after the fuel combustion step (Agency, 2022). This means that the technology can be installed on existing power plants without excessive interference due to the structure. The method works for solid, liquid and gaseous fuels. Combustion occurs with air, which contributes to a flue gas content of mainly nitrogen and 3-15 vol % $CO_2$. In order to separate $CO_2$ from the flue gas organic solvents such as monothiol amine (MEA) can be used. Inorganic solvents such as ammonia have proved successful for the separation of $CO_2$ as well. In the separation stage a chemical reaction between gas and liquid occurs. The flue gas is washed in a column with a suitable liquid that reacts with $CO_2$ to form other compounds. After the flue gas treatment, $CO_2$ levels could be about 90% lower than the initial value, depending on choice of reagent. All that remains now is to pressurize the disposal of carbon dioxide ( Sjöstrand & Yazdi, 2009). Obviously this is done in a closed circuit in which no new medium replenished. This means that the chemicals are used again, which is an environmental profit. In order to separate $CO_2$ from the chemicals a process called "stripping" is used. This is done in a different column where high pressure steam traps the chemical (Shahab , et al., 2022).

***Absorption of carbon dioxide from the air***

Carbon dioxide, which is the result of burning fossil materials that has already entered the air, can be generally reduced in two ways: 1- Absorption of carbon dioxide through forests. 2- Absorption of carbon dioxide through devices. Carbon dioxide absorption technology in these two ways has the potential to significantly reduce carbon dioxide emissions caused by industrial processes.

***Absorption of carbon dioxide through forests***

Carbon reduction by trees, forests and vegetation is one of the most cost-effective methods of carbon sequestration. Recent efforts in genetics and tissue culture techniques have opened new horizons for the development of new forest trees and phytoplankton's with high photosynthesis and relatively high carbon

deposition. Forestry, agricultural activities, etc (Metz et al., 2005). are effective on the amount of carbon sequestration by plants. Forests provide human ecosystem services from air and water purification to the production of food, medicines and wood and paper products. They maintain major watersheds and influence global climate and rainfall patterns. They also act as important carbon sinks and absorb about two billion tons of carbon dioxide annually. Sustainable forest management is therefore critical to closing the emissions gap, and limiting global temperature increases to 1.5°C above pre-industrial levels ( Beech, 2006).

***Absorption of carbon dioxide through devices***

In this method, polluted air enters a large chamber through giant suction cups, and the working method is such that these air suction cups are installed on the system that is lightened by helium gas, and the engine of this system is the device that air suction cups and Filters are installed on it and are used by the fuel of nuclear reactors, and it moves in space to absorb and reduce carbon dioxide, and it separates the carbon dioxide gas in the air from the air with the filters installed in the chamber, and it remains on the surface of the filters. After closing the lid of the chamber, the carbon dioxide is stored and becomes compressed and pure with the increase in temperature, and then it is chemically reacted underground with basalt stone and finally turns into stone. This process takes two years. This method is the surest and most reliable way to remove carbon dioxide from the earth's atmosphere (Lackner, 2019).

***Computational analysis***

We know that the carbon dioxide in the earth is present in the troposphere layer up to ten kilometers above the ground; we want to calculate how much air volume needs to be purified and decarbonized.

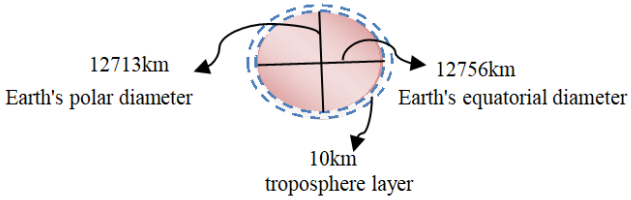


Figure 1. A picture of the Earth showing its diameter and troposphere layer.

$$\left.\begin{aligned} v_1 &= \frac{4}{3}\pi r^3 = \frac{4}{3}3.14(6367.25km)^3 = 1080747130068.1km^3 \\ v_2 &= \frac{4}{3}\pi r^3 = \frac{4}{3}3.14(6377.25km)^3 = 1085847190714.5km^3 \end{aligned}\right\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

$v_2 - v_1 = 5100060646.4km^3$ The volume of the troposphere

If we have 10,000 devices that can purify $80m^3$ air per second, we will purify approximately $1.2185\times10^{-4}$% of the total air in the troposphere in a year.

Hence, Carbon dioxide is considered the most important cause of global warming, which every year approximately 36 billion tons of carbon dioxide gas enters the earth's atmosphere, even if the release of carbon dioxide into the earth's atmosphere is zero, there is still a need to reduce carbon dioxide from the earth's atmosphere. we have the earth; Because there is more carbon dioxide than necessary in the earth's atmosphere. Therefore, for how to control and absorb carbon dioxide, there are methods that collect carbon dioxide in the same production source and basically do not let it reach the atmosphere, but this method does not absorb all carbon dioxide. be able to collect carbon dioxide from the atmosphere (artificial tree) and this cell is activated by nuclear reactors and is made light and light enough by helium gas, and it works in such a way that the air passes through the filters and the filters It is made of a special material that absorbs carbon dioxide, when the filters are saturated with carbon dioxide, it enters the water tank and the carbon dioxide gas is discharged.

## DISCUSSION

We know that climate changes are taking place and the water level is also increasing, and the reason for this is the large volume of gases, especially carbon dioxide, produced by humans (Butler, 2020), the problem of global warming will not be solved simply by producing less greenhouse gas because the level of carbon dioxide particles in the earth's atmosphere has increased enough, it is the method that collects carbon dioxide in the same production source and basically does not allow it to reach the earth's atmosphere, for example in some power plants (Dawson & Spannagle, 2009), but this method does not solve the problem of the large number of

carbon dioxide particles in the atmosphere, for this we must have a device that can collect carbon dioxide, which we call an artificial tree (Lackner, 2019), in future research, we should also keep in mind that carbon dioxide has a cycle between forests, fossil materials, and weather.

## CONCLUSION

The increase of carbon dioxide in the earth's atmosphere due to the consumption of fossil fuels has caused an increase in the temperature of the earth, which has resulted in climate changes, Therefore, it is necessary to collect carbon dioxide from the earth's atmosphere in different ways in order to reduce climate change, to reduce carbon dioxide, we chose two methods, the first one is to control carbon dioxide gas from point emission sources and the second one is to control carbon dioxide gas from the earth's atmosphere by devices.

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