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Carbon Capture and Its Exigent Need to Mitigate Climate Change

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ABSTRACT

"Our planet's alarm is going off, and it is time to wake up and take action!"

-Leonardo DiCaprio[1]

The recent reports on Climate change issued by various international forums state our planet Earth is getting degraded day by day and the same is reflected by the unprecedented events of simultaneous natural disasters as floods, tsunamis, earthquakes, forest fires, cyclones, diseases, etc. all over the world. Therefore, there is an urgent need to wake up and take efforts to mitigate the loss and leave a better place for our upcoming generations to live in. Because we have not inherited this planet from our ancestors rather, we have borrowed it from our children.

Carbon Dioxide (CO2) is one of the greenhouse gases responsible for the rapid rise in global temperature and in turn climate change. Around 60% of worldwide temperature alteration impacts are credited to carbon dioxide emanation. In recent times, CO2 is at present viewed as an undesired side-effect of our normal exercises, which shatteringly affects the environment. In general, there are a few carbon capture approaches are accessible to lessen the absolute CO2 outflow into the climate of which Carbon Capture and Sequestration (CCS) is the chief innovation by which CO2 is captured and put away from the climate for extremely prolonged stretch of time. CCS is thought of as a fundamental system for meeting CO2 emanation decrease targets.[2] However, sequestration rules the current attitude toward momentary clarifications to an Earth-wide temperature boost.[3] Evidently CCS has various huge downsides, for example, high beginning up cost; high-energy data sources and trouble in tracking down appropriate destinations, as well as shagginess with respect to CO2 spillage in groundwater and soil.

The current paper would ascertain the need of carbon capture and how it would be utilized towards mitigating the climate related issues and suggesting changes and mitigative techniques on that behalf.

Keywords: carbon dioxide, carbon capture, climate change, temperature, mitigation, etc.

INTRODUCTION

As of late this conventional rush to-the-base legitimization has been tested. Regulation and financial matters researchers have hypothesized that states in fact may take part in one or the other a "rush to the top," in which wards fix natural guidelines as an approach to receiving the rewards of stricter principles for their residents while pushing the monetary expenses of such guideline onto other jurisdictions[4], or what could be known as a "rush to results," in which contest among locales trying to offset financial prosperity with the proper degree of natural guideline prompts socially ideal outcomes.[5]

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[1] Available on https://www.ecomena.org/inspirational-quotes-environment/

[2]IPCC Special Report on Carbon Dioxide and Carbon Capture, available at https://www.ipcc.ch/site/assets/uploads/2018/03/srccs_wholereport-1.pdf

[3] Joanna Foster, "Carbon Capture: Reversing Climate Pollution" (2022) available at https://www.edf.org/article/carbon-capture-fight-climate-change-stop-climate-pollution#:~:text=A%20rapid%20growth%20in%20carbon, essential%20to%20slow%20global%20warming.

[4] David Vogel, Trading Up: Consumer And Environmental Regulation In A Global Economy (1995).

[5] Richard L. Revesz, Rehabilitating Interstate Competition: Rethinking the "Race-to-the-Bottom " Rationale for Federal Environmental Regulation, 67 N.Y.U. L. REV. 1210, 1211-12 (1992)

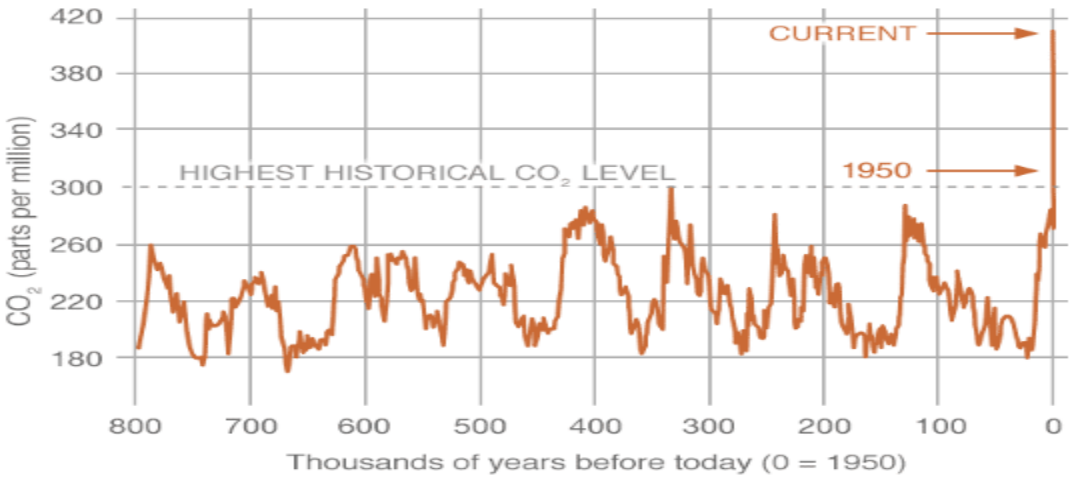

Figure 1. Global Distribution and Variation of Concentration of CO2[6]

As evolved countries investigate each choice for lessening an Earth-wide temperature boost contamination, they are progressively zeroing in on the possible capture and storage of carbon (CCS) innovation to eliminate emanations arising out of coal-terminated power plants and other covered emanations bases. Simultaneously, emerging nations that are not yet expected to check emanations are expanding their dependence on coal power with no motivating force to seek after CCS. Thusly, the inquiry emerges whether the Clean Development Mechanism (CDM), which permits agricultural countries to bring in cash for deliberate discharges decreases, ought to be changed to incorporate CCS projects. This note contends that the CDM ought to incorporate a predetermined number of CCS projects, given that those ventures convey super durable and extra
outflows decrease; support maintainable development; and don't cause exorbitant relocation of other CDM project-types.

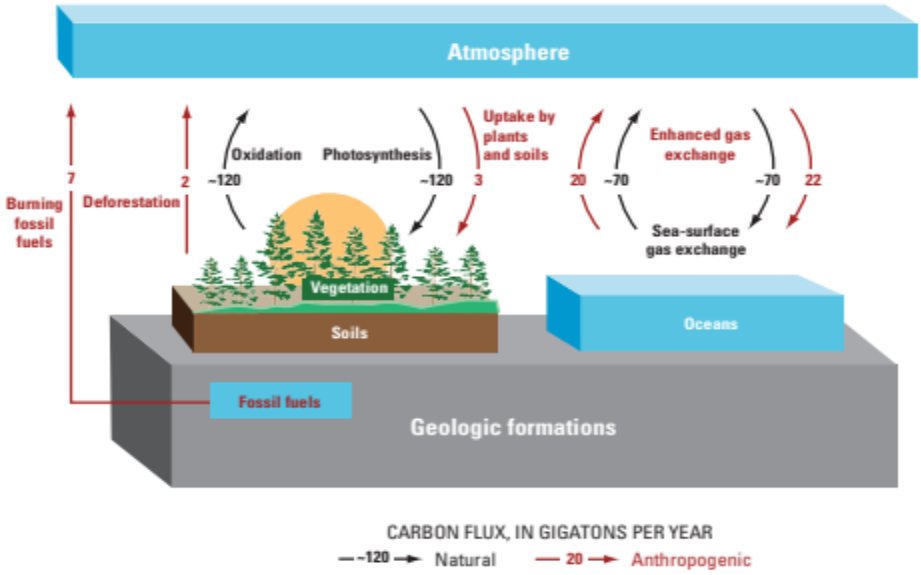

Figure.2. Carbon Flux[7]

The worldwide carbon cycle is represented in Figure 1. Carbon normally moves, or cycles, between the climate what's more, vegetation, soils, and the seas over the long haul scales going from years to centuries and longer. Human exercises, principally the consuming of petroleum derivatives and getting free from woods, have expanded the move of carbon as CO2 to the climate. Albeit a portion of this anthropogenic CO2 is taken out

[6] Carbon Dioxide available at https://climate.nasa.gov/vital-signs/carbon-dioxide/
[7] Carbon Sequestration to Mitigate Climate Change available at https://pubs.usgs.gov/fs/2008/3097/pdf/CarbonFS.pdf

from the climate by the normal take-up processes ("sinks") of the carbon cycle, a lot of it stays in the environment and causes rising CO2 fixations. The objective of purposeful carbon sequestration is to diminish the net transition of CO2 to the climate by sequestering carbon in the seas, vegetation, soils, and permeable stone arrangements.

CO2 emanation is a significant ecological issue. Existing strategies to sequester CO2 gas are forestation, sea treatment, mineral carbonation, underground infusion and direct sea dump. CO2 sequestration methods are energy consumable as well as more expensive and it's anything but a practical choice. Long haul storage of CO2 will cause difficult issues to the climate and consequently forces future expenses. The use, instead of storage of CO2, is without a doubt more appealing, particularly assuming that its transformation to helpful mass items is prudent. From the perspective of ecological assurance and asset usage, it is vital to change CO2 into helpful synthetic compounds effectively. Unique accentuation is required on compound use of carbon dioxide to stay away from ecological issues. Use of waste CO2 as a wellspring of carbon for significant compound creation is a greener pathway to safeguard our climate as well as to diminish CO2 discharges.

INTERNATIONAL FRAMEWORK

The "United Nations Convention on the Law of the Sea (UNCLOS)1982" is an arrangement, which guards every single marine region; the "London Convention of 1975" and its overriding "London Protocol of 1996", were established to safeguard the maritime setting and forestall contamination brought about by the unloading of waste. The global maritime administrative framework can't be read in remoteness; astringent gatherings to the resolutions and conventions talked about above are additionally often gatherings to regional agreements. In the European Union the most significant regional legislation relating to CCS is the "OSPAR Convention", which administers the safety of the maritime setting in the North Sea and North Atlantic region.

The UNCLOS does not have any kind of reference in relation to capture and storage of carbon in the body of the text but certainly does not preclude it explicitly as it embodies various safeguards towards the maritime setting and contamination of the sea space. It is clearly seen from the Convention that the capture and storage of the carbon would not directly contaminate the sea setting under the definitions present in the body of the text yet, there is need to officially administer change for the Convention to take into account the need of carbon capture and its storage.

The 1996 Protocol and the London Convention can be considered as international laws towards the storage of the amount of CO2 in the environment. The Convention was the primary arrangement which was formulated to give safeguards to the marine setting and the careful setting towards the storage and removal of squnders. But the Protocol of the Convention changed its structure and hold greater power as compared to the Convention.

The "United Nations Framework Convention on Climate Change (UNFCCC), 1992", is of a framework nature and forces an overall prerequisite upon contracting gatherings' states, to take on strategies and make different responsibilities towards the stabilization and possible reduction of ozone depleting substance absorptions. The 1977 Kyoto Convention obliges the parties to restrict the ozone depleting and harming emissions to protect the ozone layer and by that try to adopt a way to carbon capture and storage to reduce the emissions of CO2 in the atmosphere. The Protocol in complementarity to the standards established by the Convention requires the parties or the signatories to reduce the emissions of nursery gases and establish ways for the carbon reduction. The UNFCCC is the parent legal framework in line of which the Protocol is formed and that results in the reduction of the CO2 in the environment.

The CDM mechanism is a remedial measure which creates acclaims that might be utilized by the signatories to reduce carbon emissions and develop alternative measures for the protection of the environment by capturing the carbon for some specific purpose. It is provided under Article 12 about the "Guaranteed Emission Reductions (GERs)" to be produced by CDM projects, which to target emissions.

CARBON CAPTURE/ SEQUESTRATION

CCS is an interaction by which CO2 is isolated from different emanations of force plants or modern offices and put away to accomplish long haul seclusion from the climate.[8] In the principal period of the CCS cycle, managers of huge point sources either decarbonize the fuel before start or separate the CO2 from other vaporous outpourings after burning. Accessible catch development could diminish CO2 releases from a power plant 80-90 percent following addressing the extended energy input expected for catch and tension.[9] After the CO2 is assembled and thought, it is moved to a capacity site. Pipelines are the leaned toward decision for delivery a ton of CO2s for distances as much as 1000 kilometers, while ships are more useful for moving two or three million tons for greater distances or abroad. The CO2 is then put away through techniques that incorporate land

[8] IPCC Special Report: Carbon Dioxide Capture and Storage - Summary for Policymakers 2 (2005).

[9] Intergovernmental Panel On Climate Change, Carbon Dioxide Capture And Storage 4 (2005).

sequestration (GS), dumping towards the deep ocean or inorganic industrial use.

There are various stages in the CCS process: (1) capture, separation, and compression; (2) transportation; (3) underground injection; (4) closure; and (5) post-closure.[10]

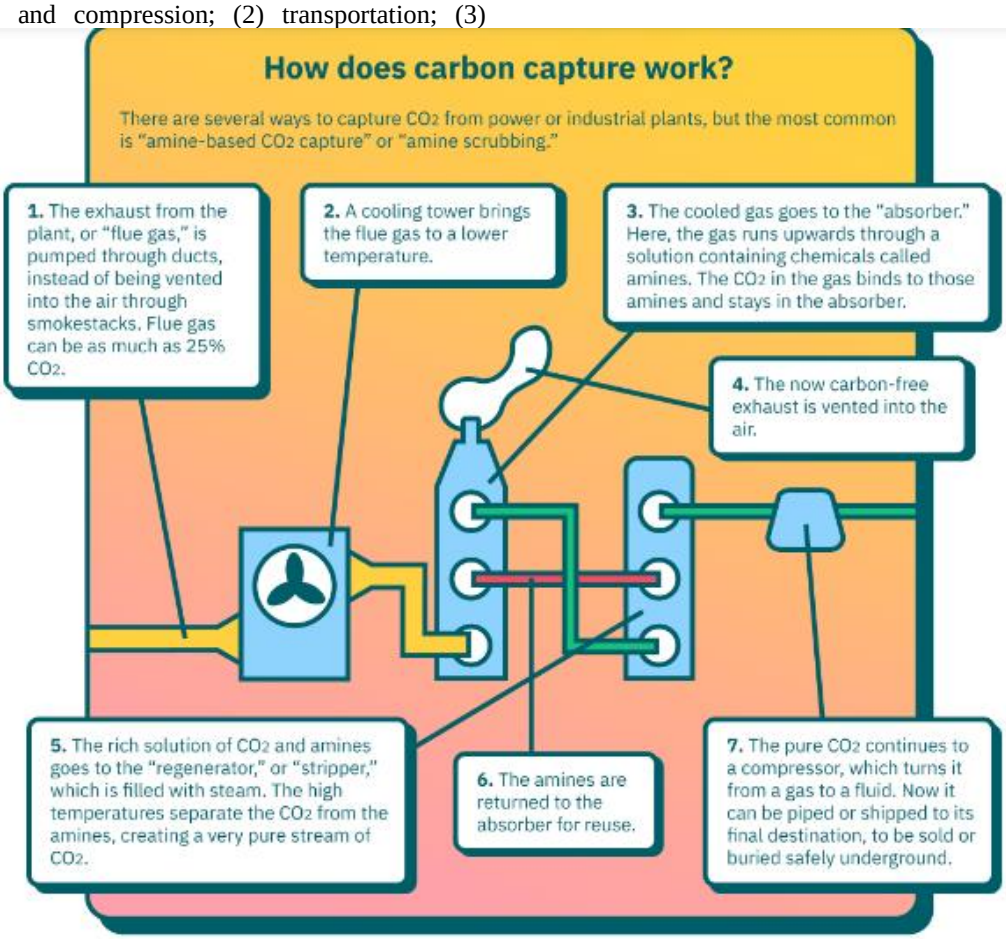

***Figure 3.* Working *of Carbon Capture*[11]**

The process of carbon capture are as follows:

Capture: Carbon capture is probably going to happen at large-point sources. These sources incorporate huge petroleum derivative or biomass energy offices, significant CO2-producing businesses like concrete makers, processing plants, iron and steel fabricating, oil sands creation and updating (counting offices to deliver hydrogen from flammable gas to use in the refining and oil sands overhauling interaction), and petrochemicals and petroleum gas creation (particularly where the gas stream incorporates a high CO2 content. All types of capture include a huge energy punishment since the capture cycle requires the consumption of energy.[12] Given the expenses of capture, that's what observers recommend early CCS tasks ought to zero in on those point sources that produce CO2 streams with a higher CO2 content since the per unit expenses of capture will probably be lower. Such undertakings will incorporate petroleum gas projects, where the methane stream has a high CO2 content which needs to be eliminated to meet pipeline and advertising particulars, and petrol refining and overhauling projects which produce hydrogen from petroleum gas by a cycle known as steam methane changing which delivers a flood of almost unadulterated CO2. Various motivations may be formulated to support the reception of capture innovation, including carbon charges and a cap furthermore, exchange system.

Transportation: Once captured and packed, CO2 can be promptly moved from the capture site to a storage/removal (infusion) site. While different choices might be achievable, huge volumes are probably going to be moved by pipeline, at high strain, in a thick or

[10] Michael G. Massicotte, Alan L. Ross & Chidinma Thompson, The Changing Legislation and Regulation of Carbon Capture and Storage: Impacts on Purpose, Policy, and Projects, 49 ALTA. L. REV. 305 (2011).

[11] Howard Heroz, "Carbon Capture" (2020)

[12] Kyoto Protocol 1997

supercritical stage. Most locales control CO2 pipelines in similar way as they manage petroleum gas pipelines. A key concern is to guarantee that the CO2 stream is dried to kill the chance of erosion from the arrangement of carbonic corrosive. Potential motivators to energize this period of CCS incorporate public subsidizing for CO2 pipeline foundation.

Storage: There are four fundamental sorts of land storage/removal destinations: (1) drained oil and gas repositories; (2) profound saline developments; (3) (unminable) coal beds; and (4) salt caves. Each has various qualities and potential. Likewise, and specifically noteworthy in the short term, delivering oil and gas repositories offer extensive open doors for CO2 infusion as part of EOR activities and maybe improved gas recuperation (EGR). Steady income from these exercises might be utilized to counterbalance capture and storage costs. Further motivators that may invigorate this piece of the CCS cycle incorporate carbon charges or a cap-and-exchange framework, too as additional designated projects, for example, eminence impetuses for EOR projects.

There are other methods of carbon capture and they are:

Normal Carbon Sequestration: It is the cycle by which nature has accomplished an equilibrium of carbon dioxide in our climate reasonable for supporting life. Creatures oust carbon dioxide, as do plants during the evening. Nature gave trees, the seas, earth and the actual creatures as carbon sinks, or wipes. All natural life on this planet is carbon based and when plants and creatures pass on, a large part of the carbon returns into the ground where it lightly affects adding to an Earth-wide temperature boost.

Artificial Carbon Sequestration: Artificial carbon sequestration alludes to various cycles by which carbon outflows are captured at the place of creation (for example Plant Chimneys) and afterward covered. One proposed technique is sea sequestration by which carbon dioxide is infused profound into the sea, shaping pools of CO2. In principle, the CO2 will remain down profound because of the strain and temperature of the encompassing water, steadily dissolving into that water over the long haul. Another model is land sequestration where the carbon dioxide is siphoned into underground loads, for example, old oil supplies, springs and coal creases that can't be mined.

CO2 captured utilizing CCUS advancements is changed over into fuel (methane and methanol), refrigerants and building materials. The captured gas is utilized straightforwardly in fire dousers, pharma, food and refreshment enterprises as well as the agrarian area. CCUS advancements can undertake a noteworthy part in congregation net zero goals with responses to challenge outflows from heavy industry and to remove the emissions of carbon from the environment. CCUS is viewed as a significant device to assist nations with dividing their outflows by 2030 and arrive at net-zero by 2050. These objectives are pivotal to meet the Paris Agreement targets for limiting an Earth-wide temperature boost to 2 degrees Celsius (°C), and desirable over 1.5°C, over pre-modern levels.[13]

TYPES OF CAPTURE

Oceanic Capture

The world's oceans are the fundamental long stretch sink for human-caused CO2 spreads, at present addressing an overall net take-up of around 2 gigatons of carbon yearly. This take-up isn't an outcome of cognizant sequestration, in any case, happens ordinarily through compound reactions among seawater and CO2 in the air. While charming natural CO2, these reactions make the oceans end up being more acidic. Various marine living creatures and organic frameworks rely upon the improvement of carbonate skeletons and leftovers that are weak

to breaking down in acidic waters. Research office and handle assessments show that CO2-provoked maturation may at last reason the speed of crumbling of carbonate to outperform its speed of improvement in these organic frameworks. The impacts of ocean maturation and deliberate ocean arrangement on ocean front and marine food organizations and various resources are insufficiently seen. Scientists are thinking about the effects of oceanic carbon sequestration on these critical circumstances.

Terrestrial Capture

Terrestrial sequestration (sometimes named "regular sequestration") is generally accomplished through forest and soil conservation practices that redesign the capacity of carbon, (for example, restoring and spreading out new woodlands, wetlands, additionally, grasslands) or lessen CO2 releases, (for example, decreasing cultivating refined and smothering quickly spreading fires). In the United States, these practices are executed to meet a grouping of land-the board objectives. The net natural take-up changes offset around 30% of non-sustainable power source CO2 releases, somewhat a piece of this take-up results from practices embraced expressly to sequester carbon.[14] The greatest net take-up is supposed

[13] Key aspects of the Paris Agreement available at https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement/key-aspects-of-the-paris-agreement.

[14] Nature and Net Zero (2021) available at https://www.mckinsey.com/~/media/McKinsey/Business%20Functions/Sustainability/Our%20Insights/Why%20investing%20i

basically to advancing customary regrowth of forest areas that were harvested during the nineteenth and mid 20th century. Existing terrestrial carbon stockpiling is defenseless against agitating impacts like fire, ailment, additionally, changes in climate and land use.

Geological Capture

Geologic sequestration begins with getting CO2 from the exhaust of petroleum derivative power plants and other critical sources. The caught CO2 is piped 1 to 4 kilometers underneath the land surface and imbued into porous stone courses of action.[15] Much greater speeds of sequestration are envisioned to take advantage of the conceivable lastingness and breaking point of geologic stockpiling. The lastingness of geologic sequestration depends upon the sufficiency of a couple of CO2 getting instruments. Later CO2 is imbued underground, it will rise gently until it is gotten under an impermeable limit, or seal. On an essential level, this genuine getting instrument, which is indistinct from the typical geologic getting of oil and gas, can hold CO2 for thousands to millions of years. A portion of the imbued CO2 will eventually separate in ground water, and some might be gotten as carbonate minerals molded by manufactured reactions with the enveloping stone. These cycles are unprotected to change over the long haul following CO2 imbuement. Analysts are focusing on the lastingness of these getting components and thinking up methodologies to choose the potential for geologically sequestered CO2 to spill back to the climate. The breaking point concerning geologic carbon sequestration is obliged by the volume and scattering of potential stockpiling regions.

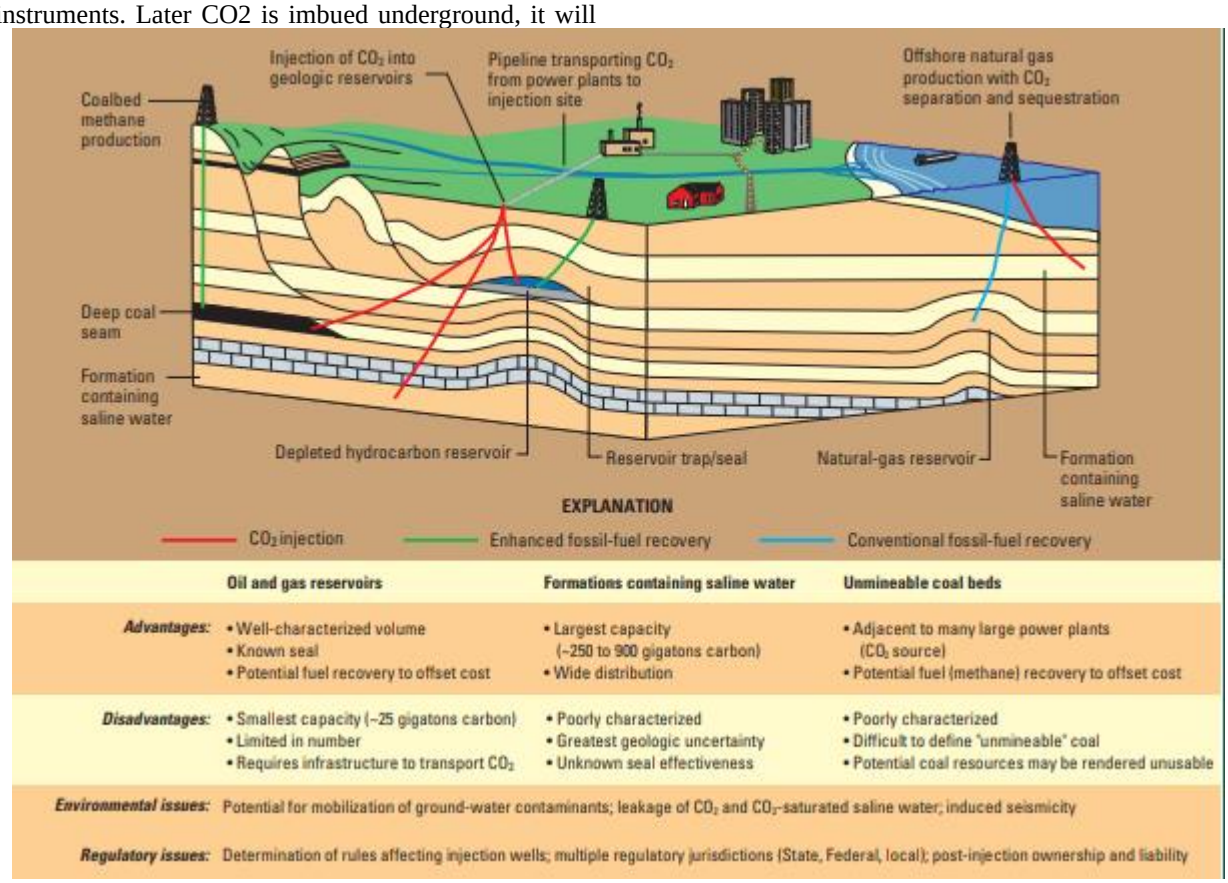

Figure 4. Geological Capture of Carbon[16]

TECHNIQUES FOR CARBON STORAGE

Point sources, for example, immense carbon-based energy offices, industrial facilities with significant CO2 emanations, for example, concrete assembling, steel creation, flammable gas handling, manufactured fuel plants, and petroleum product based hydrogen age

n%20nature%20is%20key%20to%20climate%20mitigation/Nature-and-net-zero-vF.pdf

[15] Kevin Bulis, "Storing Carbon Dioxide under the Ocean" (2006) available at https://www.technologyreview.com/2006/08/08/228472/storing-carbon-dioxide-under-the-ocean/

[16] Carbon Sequestration to Mitigate Climate Change available at https://pubs.usgs.gov/fs/2008/3097/pdf/CarbonFS .pdf

plants, are the most savvy spots to capture CO2. It tends to be extricated from the air too, but the lower CO2 fixations in the climate comparative with ignition sources entangles the designing and makes the entire thing more expensive.

This stage can be achieved utilizing one of the under three advancements:

Post Combustion Capture: CO2 is disconnected when petroleum derivatives are copied, and this cycle is utilized in non-renewable energy source-based power plants. CO2 is recuperated from vent gases at power plants and other point sources. Here, power offices might be moved up to coordinate CCS innovation.

Pre Combustion Capture: It is mostly utilized in compost, synthetic, and vaporous fuel (H2, CH4) producing, as well as power age. The petroleum product is somewhat oxidized in these applications, for example, in a gasifier. The CO in the resultant syngas joins with the steam, bringing about CO2 and H2. An adequately clean exhaust stream can be utilized to gather the CO2. The CO2 is dispensed with prior to consuming, consequently the H2 might be used as a fuel.

Oxy Fuel Combustion: Instead of air, the fuel is scorched in unadulterated oxygen. CO2 and water fume make up most of the vent gas, with the last option gathering as it cools. Thus, the CO2 stream is almost unadulterated. "Zero emanation" cycles are utilized to depict power plant tasks that utilization oxy fuel burning.

ADVANCEMENT AND CONCERN

The cycle would assist managing the ongoing carbon discharge from different basic sources until we change to a non petroleum product subordinate economy. It would make new areas of business age. It could assist with handling the need of the nations to follow their Intended Nationally Determined Contributions to manage Climate Change. Proceeded with innovative work could find new and better ways/innovation for the reason.

Cost is the perhaps of the main consider this interaction and financially feasible arrangements aren't exceptionally powerful. Spillage danger is the most capricious one. Long haul geographical states are difficult to anticipate and chances of normal land powers making spill focuses in the storage region are exceptionally high. Abrupt high measures of carbon spillage would be hard to handle with in future and would make unfriendly atmospheric conditions among other potential results. The innovation makes a legitimization for proceeded with utilization of non-renewable energy sources. Involving the sea for storage would expand its fermentation consequently hurting the oceanic life; it was accordingly prohibited under the various Conventions. A couple of tasks have bombed in effectively accomplishing the objective, the conspicuous one among them is the FutureGen program.

MITIGATIVE MEASURES

"Climate change is one of the most important global environmental problems facing the world today."[17] Climate change is a "significant and persistent change in the mean state of the climate or its variability," is a result of the variations in the setting, including "anthropogenic modification of the atmosphere."[18] This obligation to act brings up a significant issue how would we attribute responsibility in climate change? Relegating responsibility in climate change is an extremely monotonous undertaking since the idea of climate change is very complicated. For example, when state run administrations, nations, corporations, groups, and other human aggregates are credited moral responsibility for any unsavory practices or results, then it is an instance of aggregate responsibility. On the other hand, assuming an individual is held chargeable for a specific objectionable demonstration then it is an instance of individual responsibility. Moral responsibility can change among aggregate and individual specialists.[19]

One of the most outstanding CDR techniques has been around for quite a long time: trees. Photosynthesis pulls carbon dioxide out of the air, and gets it in trunks, branches, leaves and roots as the tree creates. The world's forest areas right presently acclimatize around 16 gigatons of CO2 consistently.[20] In any case, about part of that is lost to deforestation, fires and other agitating impacts. Completing deforestation, restoring cleared locales and allowing degraded boondocks to recuperate is a tremendously feasible, low-tech strategy for drawing down CO2.

Direct air catch, or DAC, is the mechanical course of sucking a ton of air through an engineered channel to dispense with the carbon dioxide. The CO2 may then be

[17] National Academy Of Sciences, Restructuring Federal Climate Research To Meet The Challenges Of Climate Change 1 (2009).

[18] US Global Change Research Program, Climate Literacy: The Essential Principles of Climate 15 (2009)

[19] Scientific Consensus: Earth's Climate is Warning (2020) available at https://climate.nasa.gov/scientific-consensus/

[20] Food and Agriculture Organization of the United Nations, Forest, Biodiversity and People: The State of The World's Forests 2020 available at https://www.fao.org/3/ca8985en/CA8985EN.pdf#:~:text=The%20total%20forest%20area%20is%204.06%20billion%20hectares.,followed%20by%20the%20boreal%2C%20temperate%20and%20subtropical%20domains.

siphoned significant underground.[21] There are an unassuming bundle of little DAC lays out beforehand working in Europe and North America. Iceland's Orca plant for example, which opened in 2021, can draw down 4,000 tons of CO2 consistently.

Bioenergy with carbon catch and capacity, or BECCS, is the most widely recognized approach to consuming yields or agrarian development for power or using them to make biofuels, and sequestering the associated outflows underground.[22] It considers CDR because yields draw down carbon dioxide as they create and sequestration promises it is never re-conveyed. The National Academy of Sciences evaluates that BECCS could sequester up to 5.2 gigatons of CO2 from one side of the planet to the other reliably without immense disagreeable impacts on food security or biodiversity.

The world's soils and oceans are at this point huge carbon stores. Be that as it may, might they eventually achieve more? EDF scientists are investigating the carbon catch capacity of creating kelp in the tremendous ocean and restoring mangroves and salt marshes. They're also dissecting the way that agricultural practices, for instance, diminished furrowing and usage of cover crops impact how much carbon set aside in farmland. Analysts check that plant soils could kill 4-6% of yearly U.S. emanations.[23]

CONCLUSION

CO2 fixation in the environment has continued to increment in the last hundred years, where the ongoing fixation is 408 ppm.[24] There has been expanding tension from people in general in all nations to restrict their CO2 discharges to foster productive carbon capture frameworks. CCU has been proposed as an incomplete choice to redirect some CO2 from CCS course. The use, rather than storage of CO2, is without a doubt more alluring, particularly in the event that its change to valuable mass items is affordable in light of its overflow and ecological cordial substance reagent property. While CO2 is viewed as a thermodynamically and synthetically stable particle and is therefore not extremely responsive. CO2 can respond with other synthetic feedstock given with an adequate energy or utilizing an impetus under specific circumstances to produce esteem added item synthetic compounds.

Any reasonable framework for putting away carbon should be compelling and cost cutthroat, steady as long-haul storage, and naturally harmless. Nations ought to limit on the small bunch of advances that show more commitment and divert interest in them. Supplanting a traditional fuel with a manufactured fuel[25] like methanol delivered through CCU is probably going to be a fruitful moderation system provided that clean energy is utilized to capture CO2 and convert it into engineered fuel.

To totally assess the potential for geologic carbon sequestration, monetary expenses and normal risks ought to be thought of. Establishment costs will depend upon the areas of sensible stockpiling regions. Environmental risks might integrate seismic aggravations, bending of the land surface, polluting of consumable water supplies, and disagreeable effects on natural frameworks and human prosperity. Specialists are initiating the use of new geophysical and geochemical procedures that can be used to anticipate the possible costs and environmental effects of geologic carbon sequestration. The coal beds which are unproductive or are not mineable have been proposed for potential CO2 storage[26], however, more data is required about the storage attributes and effects of CO2 infusion in these developments. Need to create strategies to refine evaluations of the public limit for geologic carbon sequestration.

[21] Jonathan O' Callaghan, "Storing CO2 underground can curb carbon emissions, but is it safe? (2018) available at https://phys.org/news/2018-11-co2-underground-curb-carbon-emissions.html.

[22]Bioenergy, Biofuels and Biomass: What They Are and How We Use Them available at https://justenergy.com/blog/ bioenergy-biofuels-biomass-what-they-are-how-we-use/.

[23] Christian Lopez, "Plants that absorb and eat Pollution" (2019) available at https://trinjal.com/plants-that-absorb-carbon-dioxide/

[24]Rebecca Lindsey, "Climate Change: Atmospheric Carbon Dioxide" (2022) available at https://www.climate.gov/ news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide

[25] Traditional Fuels available at https://nabtu.org/energy_infra/traditional-fuels/ (emphasis supplied).

[26] The Eco-Climate Nexus (2022) available at https://www.nature.com/nclimate/.