



GEOLOGIC CARBON SEQUESTRATION: A WAY TO MITIGATE GLOBING WARMING

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ABSTRACT:

Many activities of human life have changed the carbon cycle by increasing the amount of CO₂ produced. For example, power generating facilities, petrochemical plants, cars and trucks, industrial processes and agricultural practices all produce CO₂ and release it into the environment. This increased amount of carbon dioxide in environment produces greenhouse effect which causes global warming. To mitigate this carbon dioxide sequestration is one best step. This CO₂ is sequestered naturally in oceans, plants, and soils which reduce global warming, but an increasing amount is making its way into the atmosphere. This CO₂ is either removed from the atmosphere or diverted from emission sources and stored in the ocean, terrestrial environments and geologic formations is called carbon sequestration. One of the carbon sequestrations is Geologic carbon sequestration in which carbon dioxide (CO₂) is trapped in the form of liquid and buried in deep geologic formations to prevent its release to the atmosphere and contribution to global warming. In this method CO₂ released from above processes is compressed to a fluid state, and injected deep underground into permeable and porous geologic strata. The technology for sequestering CO₂ is still being developed, but very few industry running carbon sequestration projects worldwide. For geologic sequestration places in India are basalt formations including inter bedded sedimentary beds, deep saline aquifers, unmineable coal seams. CO₂ storage in basalts and underlying sedimentary beds is best option. In Basalt rock, ions of sodium, calcium and iron consists of aluminum silicate containing, which combine with CO₂ to form carbonate minerals. This isolates CO₂ from the environment. The climate change and environmental conservation is the main issue of the world. The CO₂ storage in geologic form is increasingly being considered as a mitigation step of global warming. This manuscript describes processes for geological carbon sequestration as a step for mitigation of global warming.

Keywords: Carbon sequestration, global warming, geological carbon sequestration, Basalt sequestration.

INTRODUCTION:

Now a day many industries and power stations are dependent upon the exploitation of fossil fuels, like coal, oil and natural gas to meet their demands. These fuels are of hydrocarbons and primarily release carbon dioxide on combustion. This causes the movement of carbon into the earth's atmosphere which becomes part of Earth's carbon cycle. This increases amount of carbon in atmosphere which results in global warming. Global warming is nothing but an increase in average global temperatures. Therefore it is important to understand Carbon cycle, how it increases amount of carbon in atmosphere, how it results in global warming and how this can be mitigated? To avoid this, carbon which is released by different industries should be captured and should be buried deep in earth

crest. This process is called as geological carbon sequestration. Geologic sequestration of CO₂ begins with capturing CO₂ from the exhaust of fossil-fuel power plants [1].

Capture of the CO₂: The processes of capturing of CO₂ are done by liquid sorbents, membranes and other materials that can extract CO₂ from a mixture of gases associated with power generation plant. The first step is Capturing CO₂ to separate CO₂ from other gaseous substances. The chimney smoke of power-plants contains near about 12% CO₂. This process is known as carbon capture. Technologically, this is considered to be the most difficult part of the entire carbon capturing mechanism. Also, carbon capture happens to be an expensive process as per the current developments. Capturing CO₂

can be achieved using different methods. Geological carbon sequestration is one of the best methods because it has no adverse environmental effect such as soil pollution, water pollution. Liquid carbon which is extracted from chimneys of power plant is buried deep in earth's crust, after some years get converted into carbonates. Due to this there is reduction or elimination of the emission of CO₂ into the atmosphere.

2. Types of Geologic carbon sequestration opportunities in India

(a) Basalt sequestration: Underground space for waste disposal is a rare resource. In India River Basalt occupies much area. The injected CO₂ can be fixed in a basalt aquifer within a few years. In India basalt area like Deccan where basalts are strategically located. The Deccan traps are one of the largest volcanic provinces in the world which contains inter trappean and infra trappean sedimentary beds. It is a good alternative for the minimization of CO₂ emissions into the atmosphere.

(b) Geo-sequestration: Geologic sequestration begins with capturing CO₂ from the exhaust of fossil-fuel power plants. The captured CO₂ is piped 1 to 4 kilometers below the land surface and injected into porous rock formations. Larger rates of sequestration are envisioned to take advantage of the potential permanence and capacity of geologic storage. The permanence of geologic sequestration depends on the effectiveness of several CO₂ trapping mechanisms. After CO₂ is injected underground, after some years it is trapped beneath an impermeable barrier, or seal. In principle, this physical trapping mechanism is identical to the natural geologic trap-ping of oil and gas. This carbon remains for thousands to millions of years below earth crest.

(c) Oceanic carbon sequestration- In this processes there is chemical reaction between sea water and carbon dioxide emitted by different industries. CO₂ is absorbed in sea water. But due

to this processes sea water become more acidic. Due to this marine food web get affected [3].

3. Basic concepts of geological carbon sequestration:

Increasing amount carbon dioxide in environment can be moderated by either reducing anthropogenic emissions or sequestering carbon dioxide emitted by different industries. For this atmospheric carbon dioxide should be transformed liquid form or solid form in such a manner that it is not reemitted into the atmosphere in the near future. This is called as sequestration. Depending on the processes and technological innovations, there are three main types of Carbon sequestration. (i) Bio sequestration - based on the natural process of photosynthesis and conversion of atmospheric CO₂ into biomass, humus and other components of the terrestrial biosphere; (ii) Geological sequestration- involving converting carbon dioxide converting into liquid form or solid form and buried deep into earths crest. (iii) Oceanic carbon sequestration-. Among these, the Geological carbon sequestration is more safe and no adverse effect on environment. After capturing CO₂, is carried through pipeline or through container and injected underground. This injected CO₂ after long time react with ground water and rock get converted into in the form of carbonate minerals. In India there are so many sites where geological carbon sequestration can be done such as marble mines, depleted oil and gas reservoirs and barren lands. The capacity for geologic carbon sequestration is constrained by the volume and distribution of potential storage sites.

4. Basic approaches to CCS to reduce carbon

emission: Reducing CO₂ emissions from the use of fossil fuel is the primary purpose of carbon dioxide capture and storage (CCS). It is a combination of technologies that addresses

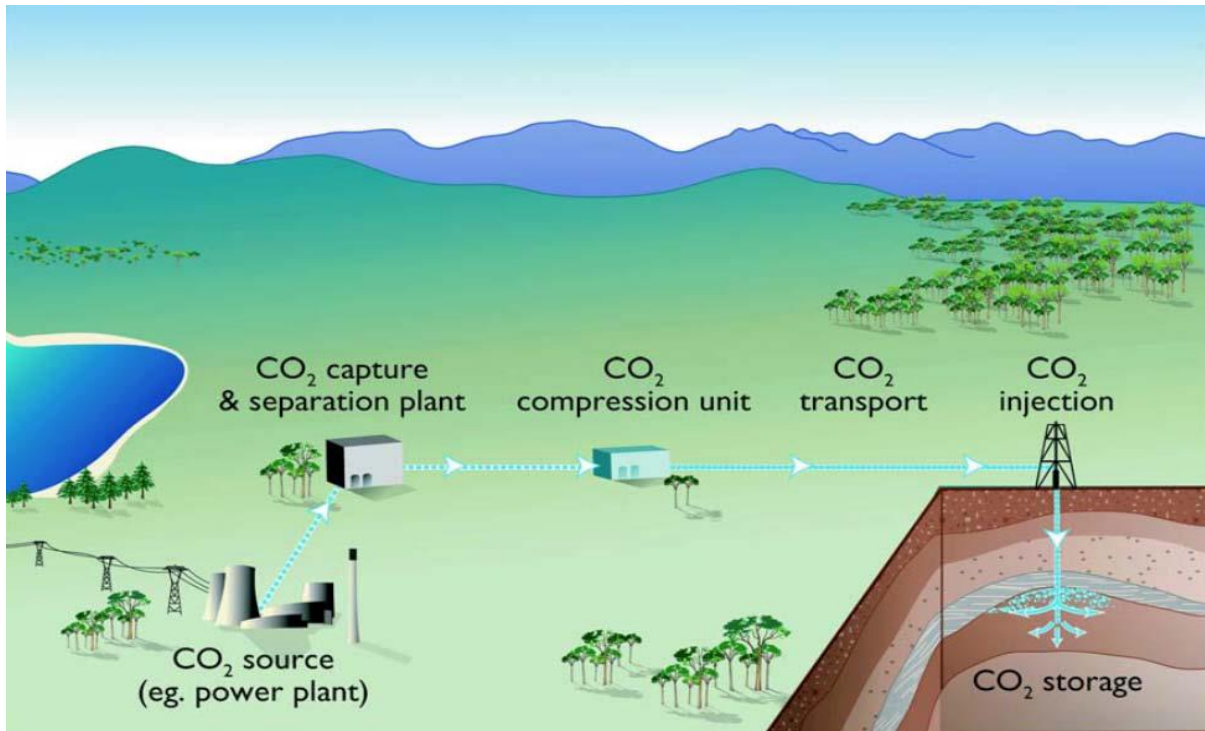
climate change by directly reducing the net CO₂ emissions arising from the use of fossil fuels as the main global primary energy source. CO₂ captured directly from the industry chimney and converted into a nearly pure form, and then pumped deep underground for long-term storage (see Picture1). The capture of CO₂ involves use of liquid sorbents, membranes, or other advanced materials that can extract CO₂ from a mixture of gases associated with power generation in which CO₂ is often a minor component at relatively low pressure [4].

CONCLUSIONS AND RECOMMENDATIONS:

Carbon Sequestration is one of the best ways in maintaining the natural carbon cycle. For this carbon sequestration is an important strategy. Sequestration of CO₂ has to increase to large scale to play a significant role in mitigation of climate change. This method can reduce GHG emissions to reduce global warming. It is seen from the analysis presented above that India has expand geological carbon sequestration technology in the future. The question is that, Can CO₂ sequestration in basalt efficiently reduces greenhouse gas effect? The answer is 'Yes'. The use of CO₂ absorbent with high capacity will be a good pathway for increasing CO₂ loading capacity. It is recommended that more detailed research work should be done on CO₂ absorbent.

REFERENCES:

- K. Lenin Babu, K V Raju (2009) "GREENHOUSE GASES EMISSION AND POTENTIAL CARBON SEQUESTRATION: A CASE STUDY OF SEMI-ARID AREA IN SOUTH INDIA, INSTITUTE FOR SOCIAL AND ECONOMIC CHANGE,
- Abhay Kumar, Swati Shabnam, Sunita Kumari P.R. Oraon and Bijay Kumar Singh August (2018) "CARBON SEQUESTRATION AND CARBON CREDIT" An International Refereed, Peer Reviewed & Indexed Quarterly Journal in Science, Agriculture & Engineering, VOL. VIII, SPECIAL ISSUE (A) MULTILOGIC IN SCIENCE ISSN 2277-760111.
- K. Dhanwantri, P. Sharma, S. Mehta, P. Prakash, Environmental Sustainability: Concepts, Principles, Evidences and Innovations - ISBN: 978-93-83083-75-6.
- Udayan Singh (2014) 'Carbon capture and storage: an effective way to mitigate global warming' See discussions, stats, and author profiles for this publication at:<https://www.researchgate.net/publication/270159236>.



Picture.1 showing steps in Carbon dioxide capture in injection processes