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Various Methodology and Implementation Challenges for Achieving Low Carbon Emissions

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ABSTRACT

At present energy saving and emissions reduction has become the main thing for social and economic development. Low carbon emission is the main key for develop the low carbon economy. Climate change is becoming a worldwide phenomenon. Day by day population increases thus results in increasing of greenhouse emissions. Temperatures have increased and the planet has eventually become warmer as a result of rising greenhouse gas emissions from various economic activity. Low carbon is a term used to describe reduced carbon dioxide. The principal greenhouse gas, carbon dioxide, is emitted into the atmosphere as a result of human activity. The rise in global carbon emissions as a result of human activity is the primary cause of climate change and global warming. Carbon emissions are rapidly increasing as a result of human-made activities like burning coal, destroying forests, consuming other fossil fuels, etc... And from factories and usage of vehicles has to led increase the CO2 emissions. In order to reduce greenhouse emissions or CO2 emissions we have to take some preventive measures. Low carbon can be achieved by decreasing the amount of CO2 from the industries. To reduce the carbon emission, we have to take several measures. Instead of driving an IC engine vehicle drive electric vehicle. Recycling of air from the industries will reduces the gas emissions equal to taking 5 million cars off the roads as per the recent researches. We have to grow plantation or reforestation. Environmental protection comes through recycling and reusing items like paper and bottles. Carbon dioxide emissions can be cut by 1,000 pounds annually just by cutting your rubbish by 25%. We have to reduce the carbon emissions by choosing the renewable resources over the non-renewable resources etc….

Keywords: carbon emissions, greenhouse effect, climate change, economic growth

1. INTRODUCTION:

The collection of greenhouse gases (GHGs), primarily carbon dioxide, is regarded to be the primary factor contributing to global warming (CO2). The rise in temperature has caused various changes around the world, including the decline in food production, the melting of glaciers, the rise in sea level, the extinction of species, and climatic disturbances (alterations in precipitation frequency and intensity) [1]. There are various methods for capturing and storing the CO2. The technologies for carbon capture and storage (CCS) contain the techniques that have been thoroughly researched. Three steps are covered by CCS: capturing, moving, and storing carbon dioxide. In significant sources of carbon dioxide, such as cement factories and power plants, the capture is typically carried out. The following techniques can be used to achieve this goal: cryogenic distillation, gas separation membranes, adsorption, absorption [2-5]. After being compressed into a liquid and supercritical fluid, the generated combination of gas (which has a huge CO2 content) is then carried or pumped to the location where it will arrive. kept [6-7]. And also, there are some other techniques to reduce co2 emissions. They are by adsorption and separation of co2 in metal organic frame works, by converting non-renewable sources into renewable sources, using just solar energy to transform co2 from the atmosphere (CO2) into value-added compounds, especially methanol. Numerous contaminants are produced when fossil fuels are used to generate power, including CO2, SO2, and NOX, all of which are extremely harmful to people.

2. Literature review:

The research on carbon emission modelling is summarised in this section. The journal describes the various methodologies that are used to reduce co2 emissions.

2.1 Employing microalgae to take in carbon dioxide from flue emissions:

Using a membrane, cryogenic fractionation, molecular sieves, carbon nanotubes, calcium oxides, hydrotalcites, lithium zirconate-activated carbon or zeolite, the gas from gas segregation technology separates CO2 from the flue gas. Provision to a medium for microalgal production. These adsorbents typically use one of two techniques for the Swinging pressure (PSA) from high pressure for gas adsorption to low pressure for desorption is used in the adsorption and recovery of carbon dioxide. In order to recover the carbon dioxide gas that has been released into the atmosphere, the second technique, known as temperature swinging (TSA), requires raising the temperature absorbed. Solvents from CO2 capture are delivered directly to the microalgal culture. Biofixation or dissolution in the media are two ways to get rid of flue gas that gets into the microalgal medium. The inorganic biofixed. A little amount of biofixer may be lost through photorespiration or as an extracellular organic molecule. Cell components are built using nitrogen and sulphur oxides, two additional important flue gas constituents. In addition to the advantages that employing microalgae for CO2 capture has for the environment, it also has financial advantages because the creation of valuable chemicals can help offset the expenses of biomass production and CO2 collection. The key to using microalgae for CO2 capture is to I lower biomass output and (ii) improve CO2 diffusion in the growth medium. By using this methodology, we can capture co2 from flue gases.

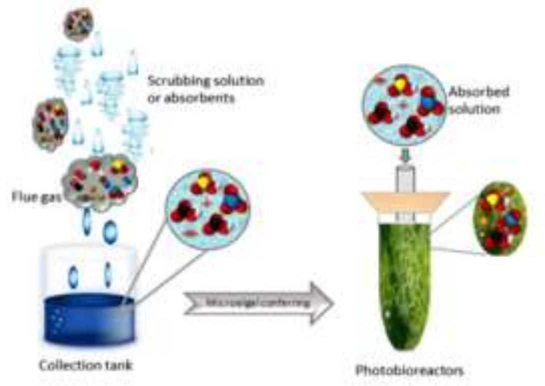

Fig [1] showing evolution of flue gases using microalgae [9]

2.2 Reduction of carbon emissions with renewable electric generation

Now a days we are generating electricity by non-renewable sources like coal, nuclear, diesel etc…If we use renewable sources over non-renewable sources, we can reduce carbon emissions. A great approach to cut your carbon emissions is by installing solar panels. Unlike finite fossil fuels, solar energy can be regenerated, making it a natural, renewable resource. Pollution is minimal or absent when solar energy is transformed into electricity. Solar power generation one of the most often used technology to get rid of pollution caused by petrochemicals and generating stations. In viewing all the aspects regarding carbon emissions, recent studies showed that moving towards solar power we can generate 1Megawatt of power in 4 acres.

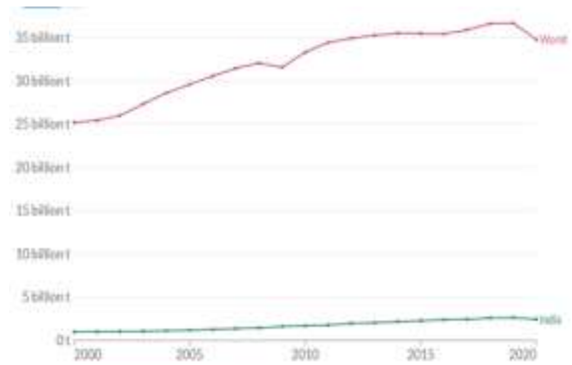

Fig [2] shows how much billion tonnes of co2 emissions are released throughout world and India during 2000-2020[10]

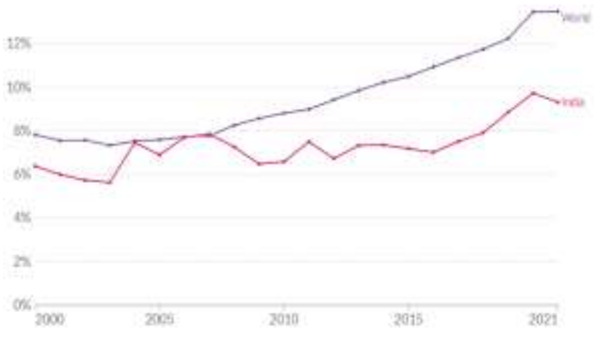

Fig [3] shows evolvement of renewable sources utilization by comparing India among other nations [10]

2.3 Methanol production from atmospheric co2 as a possible liquid fuel

A stoichiometric process can turn the CO2 into methanol. It is well known that no external thermodynamic energy sources are needed for stoichiometric reactions to take place because they are not non-spontaneous and are simply fuelled by chemical potentials. Ammonia borane (AB), a reducing agent that generates hydride ions, has been utilised to successfully catalysts made of frustrated Lewis pairs (FLP) based on aluminium may convert CO2 into methanol [11]. With the aid of AlX3, tris(2,4,6)-trimethylphenyl phosphine (PMes3) (Mes142,4,6-C6H2Me3) stoichiometrically transforms CO2 into methanol (X14Cl or Br). A Levin acid and a base can be combined to create FLP properties [12]. The best outcomes were obtained when the acid to base ratio was kept at 2:1. Whenever an excess of the AB was used under ambient circumstances and quenched with water, it was demonstrated that the stoichiometric CO2 conversion into methanol occurred quickly. In this method, an average yield of 37-51% was observed. As an alternative, the tetramethylpiperidine/B(C6F5)3 was also used as FLP and after 6 days at 160 °C, a 24% methanol yield was observed in this stoichiometric process. Additionally, the homogenous Zirconate complexes were employed as catalysts in the CO2 reduction with hydro silanes to produce methane[13]. Silanes served as a source of hydrides while N-heterocyclic carbines (NHCs) served as catalysts in the transformation of CO2 into methanol in a separate stoichiometric procedure.. In the latter process, a sizable amount of methanol was produced with selectivity of 490%.

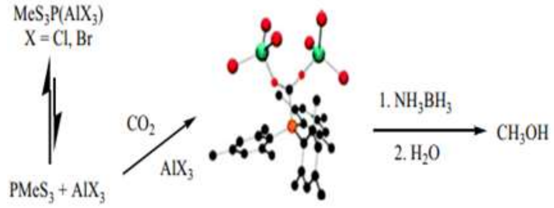

Fig [4] reveals that a stoichiometric process involving Tris(2,4,6-trimethylphenyl) phosphine (PMes3) (Mes142,4,6-C6H2Me3) and AlX3 was employed to convert co2 into methanol. [14].

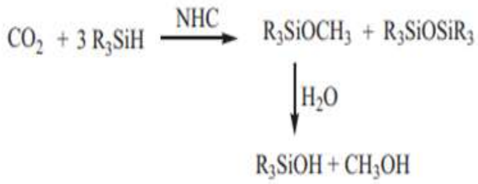

Fig [5] Silane-catalyzed CO2 reduction in general stoichiometric reaction over NHC catalyst [14]

2.4 Choose energy-efficient appliances:

In homes we use so many electric appliances like refrigerators ,dryer,stoves,air conditioners ,water heaters etc…Before buying these appliances by proper choosing appliances by their energy rating, select size and rating. By doing this we can reduce carbon emissions some what.

2.5 Recycling and re-use

items such cups and papers can be recycled and reused to help the environment. Simply cutting your rubbish by 25% will result in a yearly reduction of 1,000 pounds in carbon dioxide emissions. About 19 trees and 127 kilos of carbon dioxide can be removed from the atmosphere for every metric ton (1,000 kilogram's) of recycled paper that is produced

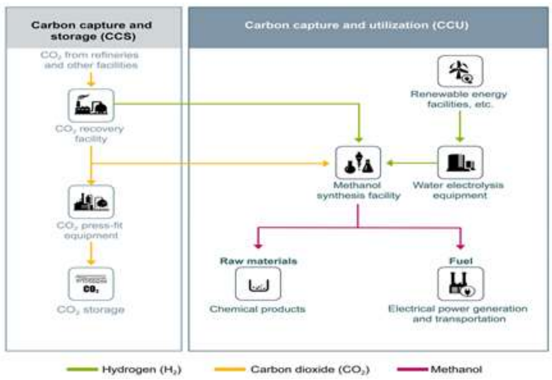

Fig [6] CO2 separation and capture using various technologies and related materials.[15]

2.6 Recycling of waste from the industries will reduces the gas emissions equal to taking 5 million cars off the roads.

Things that are thrown away in landfills degrade anaerobically. Landfills produce a significant amount of methane due to this anaerobic breakdown. Methane is a greenhouse gas with a projected greenhouse impact that is 34 times higher than that of atmospheric co2., or 34 times the potential warming effect of an equivalent amount of methane. By recycling waste using ccs techniques, carbon is being captured and stored.

3. Conclusion

This review is presented the various methodologies for reducing carbon emissions. There are so many methodologies for reducing carbon emissions some are by recycling and reusing papers, using renewable sources instead of non-renewable sources, choosing energy efficient appliances, recycling of waste and air from industries by ccs methodologies and by employing microalgae, carbon dioxide is captured from flue gases. etc... Among all the above methodologies using renewable sources instead of non-renewable sources is the most efficient method because this method will reduce more amount of carbon emissions.

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