International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2019): 7.583

Strategic Methods for Carbon Capture and Correlation for CO_2 Emission, GDP and GDP Per Capita

Dakshinamurthy Thangaraj ME., MBA[1], Dr. Mukund[2]

[2]Assistant Professor, IIM Tiruchy, India

1. Introduction

Climate change mitigation is about reducing the release of greenhouse gas emissions from our planet. Mitigation strategies include retrofitting buildings to make them more efficient; supporting renewable energy sources such as solar, wind and small hydropower cities develop more sustainable transport, such as rapid transit buses, hybrid cars an and promoting green energy. The paper describes various innovative methods for c capturing and strategic economic and technical feasibility of the proposed methods.

The paper also discusses correlation and regression method of analysis for co2 release, with other factors like gross domestic product, population, GDP per capita and co2 percapita. The paper uses the 2017 data and giving much emphasis according to paris Climate conference

Country	Mt co2 2017	GDP in trillion USD	GDP Percapita	CO_2 per capita	Population
United States	6673.4497	19.49	59,939	16.1	325,084,758
China	12454.711	12.24	8,612	8	1,421,021,794
Japan	1353.3473	4.87	38,214	9.4	127,502,728
Germany	894.057	3.69	44,680	9.1	82,658,409
India	2379.1668	2.65	1,980	1.9	1,338,676,779
United Kingdom	546.2641	2.64	39,532	5.6	66,727,463
France	440.8485	2.58	39,827	5	64,842,513
Brazil	1017.8745	2.05	9,881	2.4	207,833,825
Italy	420.8244	1.94	32,038	5.8	60,673,694
Canada	738.3825	1.65	44,841	16.1	36,732,091
Russia	2199.1173	1.58	10,846	12.1	145,530,091
South Korea	673.5412	1.53	29,958	13.6	51,096,408
Australia	580.0997	1.32	53,831	16.8	24,584,619
Spain	306.6117	1.31	28,175	6	46,647,425
Mexico	733.0104	1.15	9,224	3.8	124,777,326
Indonesia	744.3403	1.02	3,837	2.1	264,650,969
Turkey	408.4574	0.85	10,498	5.1	81,116,451
Netherlands	186.7775	0.83	48,796	9.5	17,021,343
Saudi Arabia	546.8181	0.69	20,747	18.6	33,101,183
Switzerland	51.5705	0.68	80,296	4.8	8,455,797

Correlation

	Mt co2 2017	*GDP in trillion USD*	*GDP Percapita*	*CO_2 percapita*	*Population*
Mt co2 2017	1				
GDP in trillion USD	0.806245197	1			
GDP Percapita	- 0.173356921	0.162972451	1		
CO_2 percapita	0.115974556	0.248941835	0.378315018	1	
Population	0.751041541	0.437375064	-0.457108297	-0.25312323	1

CO2 Capture & Recovery

Carbon capture and storage techniques are been introduced by various startups, R&D centers and universities across the globe. But economical way of capturing, storing and recycling is still not available. In such a situation a startup from India called Carbon Capture solutions helps the industries across globe in capturing carbon di oxide in the process more efficient and affordable way. And the captured co2 is recycled and stored for future use. Other companies like clime works from Switzerland uses technology for direct air capture with giant machine that takes air in atmosphere. Also country like Canada has three large scale commercial projects for CCS, like SaskPower's CCS plant at the Boundary Dam Power Station near Estevan, Sask., the Weyburn Midale enhanced oil recovery facilities run by Cenovus Energy and Apache Canada, and the Shell Quest project at the Scotford oil sands upgrader near Edmonton. The use of CCS in the industrial and power generation sectors will allow the use of fossil fuels to continue with a substantial reduction in CO2 emissions

Satellites for Monitoring Methane Leaks

With some 5,000 satellites now orbiting our earth on any given day, an rising number of photographs taken from space shed new light on the mounting environ. It helps understand why organizations and companies are beginning to us station, detect methane leakage and demonstrate climate change impacts.

Methane can be spectroscopically identified. It absorbs light at character is r gases. It is possible to examine light reflected from Earth for gas signals won a satellite. Thanks to satellites, we now have the actionable data on oil and natural gas well pollution which contributes to greenhouse gas emissions at a time when. The Greenhouse Gasses Observing Satellite (GOSat) is an Earth observation satellite and the world's first greenhouse gas monitoring satellite from Japan. It monitors carbon dioxide and methane densities from 56,000 Earth atmosphere locations.

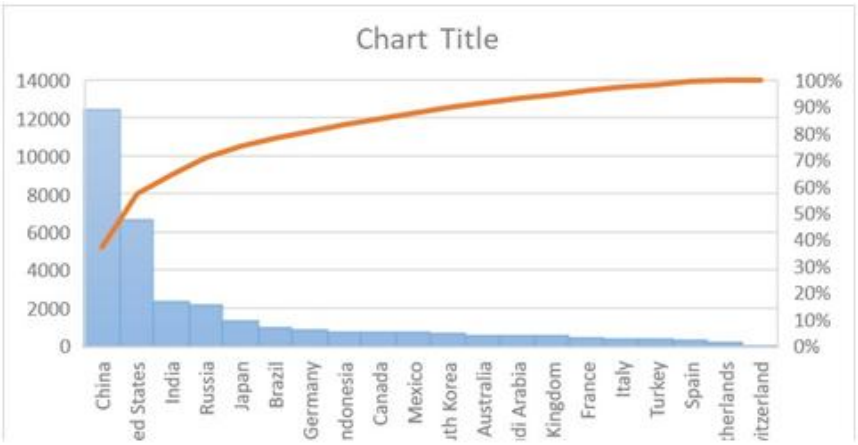
Innovation in battery technology

Today, the lithium ion battery is the industry norm for electronics and electric vehicle (EV) batteries but lithium metal batteries are capable of providing twice the energy density. The problem is that batteries made from lithium metal are extremely reactive. Small needle like structures called dendrites can form between layers during the charge cycle, and shorten the cells of the battery. Penn State University researchers are working on engineering and chemical- based approach, an interphase of solid electrolytes (SEI). It uses nanosheets, which serve as a mechanical buffer to prevent the formation of dendrites. If researchers can perfect this innovative technology, the improved battery efficiency could give EVs twice the range.

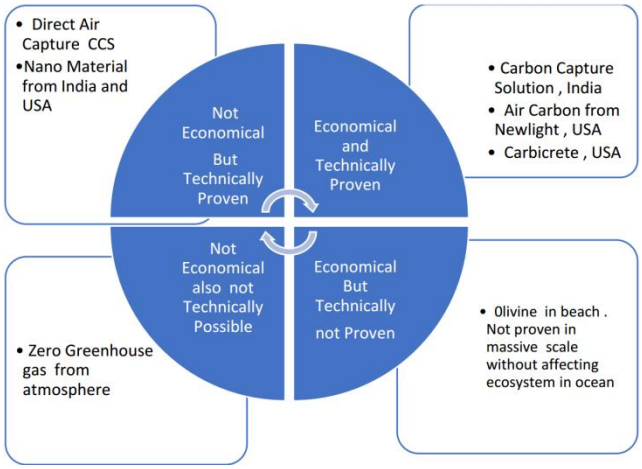
Reducing carbon footprint in Concrete

Concrete production is an effective greenhouse gas emitter. The main contributor is approximately one ton of CO2 is sprayed into the atmosphere for each ton of Portlanapping heat and contributing to climate change. Concrete is the base for many house Footprint. Carbicrete a technology enables high quality concrete to be manufactured using mineral waste and CO2 as raw materials. Using a method called carbonation ac the need for concrete cement by replacing it in the mix with ground steel slag, a steel product. Like standard concrete, the concrete mix is poured into molds, and then cured using CO2. Carbicrete's method prevents GHG emissions from cement production (about 2 kg of CO2 per concrete block of standard size) and instead injects CO2 (1 kg per block) into its items. Since more CO2 is absorbed during the process than emitted, it is carbon negative, enabling consumers of the system to reduce the carbon

Pareto Chart
X Axis: Country list
Y Axis: Million Tons of Co2 emitted as per 2017 (Paris Conference)



Strategic Chart for Economic Feasibility and Technical Feasibility of Carbon Capture Methods



The most common mineral on earth is olivine (Mg_2SiO_4). Professor Schuiling had been studying the reaction between dissolved CO_2 and Olivine since the sixties. Moreover, heat is released, and the CO_2 binds to the innocent bicarbonate, which can later become precipitated as lime. When the Olivineis ground to powder, the CO_2 absorption is perfect. Olivine dispersal is possible in highways, green strips close to roads and industrial areas, parks, gardens, beaches, and school sandpits. Olive transforms CO_2 into calcium, thereby reducing airborne CO_2 emissions.

The cost of digging and pulverizing Olivine is about $6.5 per tonne. If you believe that another$6.5 per ton is required for transport. With the Olivine crushed to powder, CO_2 absorption is optimum.

Scattering the Olivine is possible in streets, green stripes close to roads and industrial areas, parks, gardens, beaches, and school sandpits. Olive transforms CO_2 to calcium, thereby reducing airborne CO_2 emission

Nanomaterials may help us fight climate change. They are strong and mostly recyclable catalysts. Now, they have to become economical for commercialization and better to fully replace existing technologies, Nanoparticles provide a promising solution to this, as they have a high surface-area-to-volume ratio for interacting with CO_2 and properties that make it easier to transform CO_2 into other things. The task is to make it economically viable.

Researchers have tried everything from metallic to carbon-based nanoparticles to reduce costs, but they have not been effective so far Work by scientists at the CSIR-Indian Institute of Petroleum and the Lille University of Science and Technology in France is one of the most recent points of progress in this field. The researchers developed a nanoCO_2 harvester using water and sunlight to transform atmospheric CO_2 into methanol, which can be used as a motor fuel, solvent, an antifreeze and ethanol diluent

Air Carbon
Air Carbon transforms greenhouse gases into a bioplastic material that performs on an equal basis with conventional oil-based plastics, and is more cost-effective to produce.

Air Carbon is a carbon-negative bioplastic, meaning it is generated using methane or carbon dioxide as a source of carbon and produces a net decrease in atmospheric carbon levels when generated using renewable energy. Approach use enzyme- producing microorganisms.

These enzymes induce a chemical reaction that extracts carbon from CO_2 or methane and makes it a naturally occurring biodegradable polymer Newlight Technologies produces AirCarbon in California, using it to produce seats, bags, containers, mobile phone cases, and a variety of other products. Customers include some of the largest furniture, food, and electronics manufacturers. Newlight Technologies recently signed contracts with major suppliers to the industry, including IKEA, Vinma and Paques

A carbon footprint is basically the total amount of greenhouse gas emissions that was generated by something — a individual, organization, event, or product. Greenhouse gases are the gasses that create the "greenhouse effect" in the atmosphere and contribute to global warming and climate change. Every organization should calculate the carbon foot print and it can be labeled in the product showing whether the product produces is environmental friendly or not. And this will create the awareness for consumers and they opt for products which are more environmental friendly. And the industry which produces more carbon foot print is energy and steps should be taken to see that amount of green house gases produces from this sector is reduces in coming years.

Integrated control of forest fires (IFFM) requires a comprehensive approach to forest fire control. It involves conventional fire prevention and fire control measures, as well as the use of controlled fire as an weapon, community engagement, and forest law enforcement. Wildfires are an important source of emissions from greenhouse gases, and are likely to increase their frequency due to climate change. Integrated fire management is essential for forest security, and as part of climate change adaptation strategies. Although it is difficult to give exact figure the scientist have estimated about 5 to 10 percentage of total green house gas is bee released by forest fire every year.

2. Conclusion

According to the strategic report we can opt for Carbon capture solutions, Carbicrete and Air carbon from Newlight, these methods seems to viable in both economic and technological perspective. Also from the correlation there is strong positive correlation between the CO_2 emission and GDP of a country. And positive correlation for Population and CO_2 emission. Medium negative correlation between the GDP percapita and Population. USA, China, India, Russia and Japan accounts for nearly 75 percentage of total CO_2 emitted by top twenty countries realizing CO_2. Hence Policies must be framed first for these countries.

References

[1] https://www.edf.org/climate/space-technology-can-cut-climate-pollution-earth
[2] https://www.scientificamerican.com/article/meet-the-satellites-that-can-pinpoint-methane-and- carbon-dioxide-leaks/
[3] http://carbicrete.com/technology/
[4] https://www.betterworldsolutions.eu/is-olivine-the-solution-against-climate-change-and-ocean-acidification/
[5] https://www.scientificamerican.com/article/nanomaterials-could-combat-climate-change-and-reduce- pollution/
[6] https://www.downtoearth.org.in/news/science-technology/three-ways-nanomaterials-could-help-combat-climate-change-and-prevent-pollution-58510
[7] https://goexplorer.org/carbon-negative-plastic/