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DOES INDIA STANDS AS A CARBON NEGETIVE COUNTRY IN GLOBAL SCENARIO BY CONTROLING THE CO_2 EMISSIONS TO REDUCE THE GLOBAL WARMING

Dr. SUNANDA. I. KITTALI,
Assistant Professor, Dept. of Geography,
Rani Parvati Devi Arts and Commerce College, Belagavi, Karnataka State, India,
e-Mail ID: sikittalibelagavi@gmail.com

ABSTRACT:

As the world's third largest contributor of greenhouse gas emissions, India may be in a unique position to affect atmospheric levels of CO_2. While its total emissions level are rising as per 2014 IPCC report, its per-capita emissions at 1.9 metric tons are a third of the global average, a quarter of China's and tenth of the USA's. The rising CO_2 levels have been linked to rising ocean and land temperatures as well as rising sea levels over the past 35 years. **The main objectives of this paper are**: to estimate the annual carbon releasing level of India in Global scenario, to how rising CO_2 levels have affected India specifically and to suggest the remedial ways to reduce the CO_2 in negative level. When we observed the recent IPCC report, it warns that the Himalayan whole glaciers would melt away in the near future and it has proven based on the existing CO_2 level. However, as we observed in a series of national and international CO_2 concerned studies have shown that unseasonal rain and erratic weather is directly impact on Indian agriculture and leads to increase the Indian farmer's problems and suicides. Therefore, it is urgent need to improve the agriculture economy by implementing CO_2 reducing measures, but it is not possible in India by political aberrations. India is the world's third-largest emitter of CO_2 and it is renewed push by industrialization and urbanization in India, because it adopts the MAKE IN INDIA schemes in 2015-16, it will have a significant impact on increasing the CO_2 level and it will horn the bell of global warning by increasing global warming. India's present government enforcing the "MAKE IN INDIA schemes" in recent time, impacts on increase the warming by increasing the pollution in cities. In India urgent need to reduce the 70% of CO_2 emissions by ban or control the burning fossil fuels. Therefore it helps to protect the 30 percent of deforestation and other land use changes. It is right time to India, to take an uncompromising decision towards to control the CO_2 emission at maximum level and need to get the position in carbon negative countries list at global level to protect its land, water, human resources by its own interests. At present Bhutan is only country has come

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Vol-10 Issue-6 No. 6 June 2020

forwarded, achieved and get name and fame as Ist carbon negative country in global scenario. Bhutan neutral, it's also a carbon sink making country in the world to have negative carbon emissions.

Key Words: Global Warming, Global Warning, Carbon Negative, Threaten, Control.

INTRODUCTION:

The Earth climate has always changed and evolved. Some of these changes have been due to natural causes but others can be attributed to human activities such as deforestation, atmospheric emissions from industry and transport, which have led to gases and aerosols being stored in the atmosphere. These gases are known as greenhouse gases (GHGs) because they trap heat and raise air temperatures near the ground, acting like a greenhouse on the surface of the planet. Recent research indicates that the climate system is influenced by human activity and has led to warming of climate system since 1950. The Fifth Assessment Report of IPCC (2014) has indicated that, the human influence on the climate system is clear and recent anthropogenic emissions of GHG are the highest in history. Recent climate changes have had widespread impacts on human and natural systems. Warming of the climate system is unequivocal and since the 1950s, many of the observed changes are unprecedented over decades to millennia.

The atmosphere and ocean have warmed, the amounts of snow and ice have diminished and sea level has risen. Oceanic uptake of carbon dioxide (CO_2) resulted in acidification of oceans warming of 0.850^{o} C increased during 1882-2012 and sea level rose by 0.19 meter during 1901-2010. Continued emission of greenhouse gases will cause further warming and long lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks. Multi-model results show that limiting total human-induced warming to less than 2° C relative to the period 1861-1880 with a probability

ISSN: 2278-4632
Vol-10 Issue-6 No. 6 June 2020

of more than 66 percent would require cumulative CO_2 emissions from all anthropogenic sources since 1870 to remain below 2,900 giga-tones of CO_2 (with a range of 2550-3150 giga-tones of CO_2 depending on non-CO_2 drivers). About 1,900 giga-tones of CO_2 had already been emitted by 2011. Climate change will amplify existing risks and create new risks for natural and human systems. Risks are unevenly distributed and are generally greater for disadvantaged people and communities in countries at all levels of development.

Many aspects of climate change and associated impacts will continue for centuries, even if anthropogenic emissions of GHG are stopped. The risks of abrupt or irreversible changes increase as the magnitude of the warming increases. Adaptation and mitigation are complementary strategies for reducing and managing the risks of climate change. Substantial emissions reductions over the next few decades can reduce climate risks in the 21st century and beyond, increase prospects for effective adaptation, reduce the costs and challenges of mitigation in the longer term and contribute to climate-resilient pathways for sustainable development. Effective decision making to limit climate change and its effects can be informed by a wide range of analytical approaches for evaluating expected risks and benefits, recognizing the importance of governance, ethical dimensions, equity, value judgments, economic assessments and diverse perceptions and responses to risk and uncertainty. Without additional mitigation efforts beyond those in place today and even with adaptation, warming by the end of the 21st century will lead to high to very high risk of severe, widespread and irreversible impacts globally (high confidence). Mitigation involves some level of co-benefits and of risks due to adverse side-effects, but these risks do not involve the same possibility of severe, widespread and irreversible impacts as risks from climate change, increasing the benefits from near-term mitigation efforts. Adaptation can reduce the risks of climate change impacts, but there are limits to its effectiveness, especially with greater magnitudes and rates of climate change. Taking a longer-term perspective, in the context of sustainable development, increases the likelihood that more immediate adaptation actions will also enhance future options and preparedness.

There are multiple mitigation pathways that are likely to limit warming to below 2° C relative to pre-industrial levels. These pathways would require substantial emissions reductions over the next few decades and near zero emissions of CO_2 and other long-lived GHGs by the

ISSN: 2278-4632
Vol-10 Issue-6 No. 6 June 2020

end of the century. Implementing such reductions poses substantial technological, economic, social and institutional challenges, which increase with delays in additional mitigation and if key technologies are not available. Limiting warming to lower or higher levels involves similar challenges, but on different timescales. Many adaptation and mitigation options can help address climate change, but no single option is sufficient by itself. Effective implementation depends on policies and cooperation at all scales and can be enhanced through integrated responses that link adaptation and mitigation with other societal objectives.

BACKGROUND SCENARIO RELATED TO CLIMATE CHANGE:

Awareness on the impact of climate change has been increasing since 1960 when a group of people gathered together protesting against a polluting industry in Great Britain. The thinkers and social scientists have recognized the impacts of climate change since then and a **movement to save the earth** and the precious life on it gained momentum. The Stockholm Conference in the year 1972 was the first international recognition and manifestation of the urgency to address climate change as it affects both the developed and developing countries, though, the degree of impact could vary. The atmosphere is a global public good and it is commonly shared by all living beings in the earth ecosystem. The awareness on the degradation of the environment and its impact on the climate system and the natural resources have gained momentum after the efforts of the United Nations, especially after the Stockholm Conference held during June, 1972. The Stockholm conference recognized the concept of Sustainable Development and the impact of development and industrialization on the environmental quality of a nation. To providing sustainable development for all people of the world is fighting to control the climate change and this is the major challenges of the today world. The **main theme of this paper is** to "**Exploring Sustainable Low Carbon Development Pathways**" and its aims to point out the ways to combine the climate protection and sustainable development. In the quest for an international climate agreement on actions to address the climate change crisis, three aspects have to be the basis simultaneously: the environmental imperative (E), the developmental imperative (D) and the equity imperative (E). This EDE formula requires that the different pieces of the climate negotiations be seen and addressed as a whole, in a holistic way. In particular, setting the global goal for emission reduction has to take account of the environmental imperative and also deal with the emission reduction.

ISSN: 2278-4632
Vol-10 Issue-6 No. 6 June 2020

STUDY AREA:

India is located in South Asia and it is the seventh-largest country by geographical area, the second-most populous country (with over 1.21 billion people) and the most populous democracy in the world. Its population grew by 17.64 percent during 2001–2011 compared to 21.54 percent growth in the previous decade (1991–2001). The human sex ratio is 940 females per 1,000 males. The young people were 24.9 percent as per the 2011 census. The first post-colonial census, conducted in 1951, counted 361.1 million people. Medical advances made in the last 50 years as well as increased agricultural productivity brought about by the "Green Revolution" have caused India's population to grow rapidly. India continues to face several public health-related challenges. Life expectancy in India is at 68 years with life expectancy for women being 69.6 years and for men being 67.3. The number of Indians living in urban areas has grown by 31.2 percent 2011and nearly 70 percent people lived in rural areas. The level of urbanization increased from 27.81 percent in 2001 to 31.16 percent in 2011. According to the 2011 census, there are 53 million-plus cities in India, among them Mumbai, Delhi, Bangalore, Hyderabad, Chennai, Ahmedabad and Kolkata are most populous cities. India is home to an extraordinary variety of climatic regions, ranging from tropical in the south to temperate and alpine in the Himalayan north, where elevated regions receive sustained winter snowfall. The nation's climate is strongly influenced by the Himalayas and the Thar Desert. Agriculture plays a vital role in India’s economy. Over 58 per cent of the rural households depend on agriculture as their principal means of livelihood. Agriculture, along with fisheries and forestry, is one of the largest contributors to the Gross Domestic Product (GDP). India's forest cover increased from 18.22 to to 21.34 percent of country's total geographical area in the first decade of 21st century.

The service sector makes up 55.6 percent of GDP, the industrial sector 26.3 percent and the agricultural sector 18.1 percent. Currently, the Indian economy is the world's seventh-largest by nominal GDP and third-largest by purchasing power parity. Following market-based economic reforms in 1991, India became one of the fastest growing major economies, it is considered a newly industrialized country. However, it continues to face the challenges of poverty, corruption, malnutrition and inadequate public healthcare..

ISSN: 2278-4632
Vol-10 Issue-6 No. 6 June 2020

OBJECTIVES:

The main objectives of this study are:

- to find out the CO_2 emission level of India and its position in world scenario.
- to analyze the causes for CO_2 emission in India
- to analyze the impact of CO_2 emission on Indian socio-economic structure.
- to suggest the remedial measure towards to controlled the CO_2 emission level foe sustainable development.
- to explore the full terrestrial balance by individual to determining which ecosystems dominate the terrestrial balance.

DATA COLLECTION:

The necessary data for analyzing the CO_2 emission level, past and present scenario, causes and effect and its severity level etc are collect from various published data available in the Indian UNO Data center. The data concerned to country-specific Carbon balances and specifically pertains to the temperature and rainfall data gathered from IMD in annual/biannual published reports and these are helps to estimates the level of Climate Change in India. The IMD Draft Report of 2010, 2012, 2015 help to frame work for Climate change Statistics and recommendations.

The Compendium of Environment Statistics helps to analyze the climate change is an ongoing phenomenon and its historical information to identify changes in the long run. So, time series data were collected from various department/ organization of India and abroad. The data on Mitigation and Adaptation activities has been obtained from the nodal ministries so that the same could be used for analyzing the extent and reach of the activities undertaken by them. The analysis would help to identify the strengths and weaknesses of the Environmental Balance Missions. The researcher has attended various Seminars and conferences for discussion the matter with academicians, researchers, DES officers and data users. The Framework and the reports of the Expert Committee has been observed and discussed in detail during the Seminar. As per the recommendations of the Seminar certain modifications were incorporated. The researcher has prepared the framework of this paper after incorporating the suggestions and recommendations.

ISSN: 2278-4632
Vol-10 Issue-6 No. 6 June 2020

METHODOLOGY:

With the latest technology data collected from various current sources. A techno-economic model was constructed to modularize the process in different combinations of technology components, as illustrated in the text. Although other technologies are also included in the model, for simplicity, only the main technologies chosen for CSP extraction, gasification and transe-sterification are used to analyze the CO_2 emission level.

DRIVING FORCES OF CLIMATE CHANGE:

Basic economic developments are the main drivers behind human induced climate change. Increased production of goods and services, changes in the production structure, increased transportation, a higher demand for all kinds of consumer goods, etc., contribute to a higher pressure on the atmosphere thereby increasing the greenhouse gas concentration. Particularly important is, of course, the ever increasing demand for energy. At present the world economy runs on fossil fuels. The combustion of coal, oil and natural gas and derived products provide energy to nearly all economic activities. The emission of Carbon Dioxide (CO_2) is a residual product of burning these fossil fuels. Also changes in land use pattern, deforestation and land clearings are important driving forces leading to a rise in Carbon Dioxide emissions.

ASSESSMENT OF CLIMATE CHANGE:

According to scientists, the long-term goal of international climate policy is clear to de-carbonize the global economy within a few decades. They warn that without a global transformation of the energy system, the world will exceed 2° C global warming and suffer from increasingly severe devastation, which will undermine development. To keep global warming below 2°C, CO_2 concentration in the atmosphere must not exceed 450 ppm, according to the Intergovernmental Panel on Climate Change (IPCC).

Table No:1. Accommodation Capacity of CO_2 in Earth Atmosphere.

Space Availability	Time	Released Quantity of CO_2 (in giga-tones)
1st Stage	1901 to 2010	**2,900**
2nd Stage	2010 to 2100*	1,000
In whole atmospheric area		**2,900**

Note: * Estimated quantity to be released.

ISSN: 2278-4632
Vol-10 Issue-6 No. 6 June 2020

The 5th Assessment Report IPCC calculates the global carbon budget in a 2° C world with **2,900 giga-tones** (billion tons) CO_2, of which **1,900 giga-tones** have already been emitted. The remaining atmospheric space to store CO_2 is hence limited to **1,000 giga-tones of CO_2.**

To remain within these limits, global greenhouse gas emissions must be reduced by 40–70 per cent by 2050 compared with 2010 and almost completely phased out by 2100, according to the 5th AR. Global CO_2 emissions from the energy supply sector must be reduced even more quickly: emission cuts by 90 per cent or more between 2040 and 2070 compared with 2010 are necessary. This means completely phasing out fossil fuels by mid century. The vast majority of developing countries is even calling for reducing global warming below 1.5° C. The 5th AR also includes respective emissions reduction scenarios. To maintain a 50 percent or better to keep global warming below 1.5° C, 70 to 95 per cent of all emissions and not just those from the energy sector have to be eliminated by 2050. Such an emissions trajectory is only feasible with a much quicker phase-out of fossil fuels. Simultaneously the global mean sea-level rise will continue during the 21st century, very likely at a faster rate than observed from 1971 to 2010. Sea level rise will not be uniform across regions. By the end of the 21st century, it is very likely that sea level will rise in more than about 95 percent of the ocean area. About 70 percent of the coastlines worldwide are projected to experience a sea-level change within ± 20 percent of the global mean.

The transformation is achievable without frictions in the fight against poverty, moreover the ambitious climate action would not end global growth. Annual consumption growth would be reduced by just 0.06 to 2.94 per cent global growth (instead of 3 per cent under business-as-usual), according to the 5th AR. Climate resilient, low carbon development has to become the new vision, backed by massive change every-where. Taking the 1.5/2°C defense line seriously means accepting that the world has to decarbonizes by 5 per cent each year until 2050, which is an unprecedented speed of innovation e.g., ten times faster than during the Industrial Revolution. Renewable energies, as well as energy and resource efficiency, can achieve this and at the same time lift all people in the human development index rankings to at least upper middle income if the political will is there. There are strong indications that decarburization has already started globally, after decades of the continuous and steep increase of emissions, this trend seems to have come to a halt since 2012. It is likely that 2014 will be the first year

ISSN: 2278-4632
Vol-10 Issue-6 No. 6 June 2020

with slightly lower emissions from the energy sector. All OECD countries have started to decarbonizes and China as the biggest transition state (see Table No:2).

BOOSTING FIELDS OF CARBON EMISSION:

A carbon footprint is historically defined as the total set of greenhouse gas emissions caused by an individual, event, organization, product expressed as CO_2e. A carbon footprint is the set of greenhouse gas emissions caused by something. It can be calculated for a product, service, person or even a country, and is used to understand the impact human activity is having on the earth's climate. A global carbon budget of how much more emissions should be allowed between now and 2050 should be fixed and also how that budget should be allocated especially between developed and developing countries. Thus a fixing of a temperature target and of a global emissions reduction goal must be done within a paradigm or framework for the equitable sharing of the atmospheric space and the development space. The UN Climate Convention recognizes the equity principle, that developed countries take the lead in emission reduction and that developing countries have development imperatives and their ability to undertake climate actions depend on the extent of support they receive from the developed countries. Most of the world leading countries will agree full incremental costs of implementing developing countries' climate policy measures.

Table No:2. Major Country-wise Specific Carbon Balances and their Uncertainties of Grassland, Forest land, Cropland and Peat lands.
(both in g/CM $^{-2}$ to total land area yr $^{-1}$).

Sl. No	Name of Country	Grass land	SD Values	Forest land	SD Values	Crop land	SD Values	Peat lands	SD Values	Total	SD Values
1	China	25.5	25.9	49.7	19.9	-16.2	5.5	0.2	1.0	99.3	44.6
2	United States	8.9	9.0	89.9	36.0	-20.4	5.0	0.1	30.0	-20.4	38.7
3	European Union	15.8	12.8	12.7	5.1	-9.1	11.1	-59.1	5.0	10.3	24.4
4	India	6.8	6.9	41.0	16.4	-31.4	19.8	-9.1	1.0	16.7	18.6
5	Russia	6.8	6.9	43.6	17.4	-19.8	5.2	0.2	1.0	30.3	25.7
6	Japan	6.7	6.8	30.4	12.2	-15.8	17.6	-0.3	1.0	21.9	30.4
7	Germany	6.6	6.7	49.4	19.8	-35.8	8.9	0.2	15.0	19.5	27.8
8	Iran	2.6	2.6	11.6	4.2	-39.9	22.0	-0.7	13.0	-31.8	28.1
9	South Korea	2.2	2.2	34.2	13.9	-39.7	22.8	-6.0	6.0	-29.0	13.0
10	Canada	5.6	4.3	25.6	10.2	-5.5	20.5	-26.2	1.0	12.9	14.1
11	Brazil	12.0	4.7	25.9	10.4	-19.1	3.2	-12.8	3.0	18.2	34.4
12	Saudi Arabia	13.6	6.4	64.5	25.8	-28.3	8.2	-0.7	1.0	433	4.5
13	Mexico	2.8	1.9	5.2	2.1	-10.1	21.7	-6.4	1.0	-2.6	29.9
14	Indonesia	6.3	6.4	37.5	15.0	-44.8	3.4	-0.5	26.0	-7.4	61.2
15	United	21.2	55.9	6.4	2.6	-12.3	25.0	-6.4	1.0	-37.4	16.0

	Kingdom										
16	Australia	12.7	2.9	31.7	12.7	-19.5	5.0	-52..7	6.0	22.1	30.4
17	South Africa	2.9	2.9	48.8	19.5	-44.1	9.3	-2.8	1.0	-0.3	35.1
18	Turkey	3.2	3.3	38.2	15.3	-60.8	22.8	-7.9	1.0	-21.7	6.7
19	Italy	2.8	2.8	0.0	0.0	-12.0	31.4	-2.4	1.0	-9.2	28.3
20	France	4.8	4.9	12.5	5.0	-49.0	6.0	0.0	23.0	-31.7	39.7
21	Poland	18.4	23.0	21.6	8.6	-25.4	27.4	0.0	1.0	-32.5	7.7
22	Taiwan	3.6	3.6	16.5	6.6	-2.2	21.0	-47.1	13.0	17.3	30.3
23	Thailand	8.5	8.6	32.0	12.8	-36.9	1.1	-0.6	1.0	-22.5	15.6
24	Ukraine	4.5	4.0	17.9	7.2	-38.1	22.6	-26.2	1.0	-16.7	30.5
25	Spain	11.1	11.3	56.4	22.6	-30.7	13.0	-2.0	1.0	36.6	22.1
26	Kazakhstan	11.4	11.6	28.9	11.5	-25.8	17.2	-0.2	1.0	14.7	54.8
27	Malaysia	12.2	12.4	127.9	51.1	-24.7	14.8	0.2	1.0	114.7	57.2
28	Egypt	3.7	3.7	142.5	57.0	-8.2	15.2	-0.7	1.0	138.4	12.2
29	United Arab Emirates	20.7	5.0	8.9	3.6	-4.7	4.7	0.5	1.0	24.4	12.5
30	Argentina	1.2	3.3	29.7	11.9	-6.5	10.5	-0.4	1.0	24.8	26.5
31	Venezuela	40.1	40.7	29.5	11.8	-10.5	1.7	0.4	1.0	-17.8	26.2
32	Vietnam	10.5	10.6	22.3	8.9	-39.1	5.3	-0.3	2.0	-6.3	8.1
33	Netherlands	24.2	19.9	10.6	4.2	-13.7	21.9	-11.4	13.0	5.4	6.2
34	Pakistan	8.4	8.3	24.3	18.1	-23.5	17.6	27.5	13.0	14.5	9.2
35	Algeria	2.3	2.3	18.6	7.2	-16.4	9.1	-0.7	1.0	16.2	7.2
36	Iraq	1.8	1.8	5.2	2.1	-10.9	5.5	0.2	0.1	-3.7	6.2

Note: Positive sign showed the carbon gain. and negative sign showed the carbon loss.

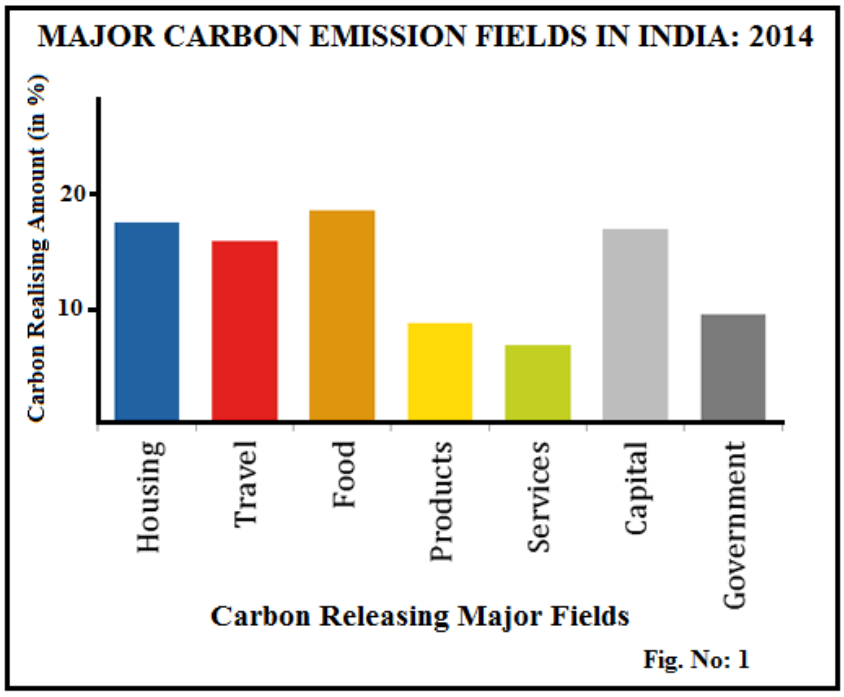

Fig. No: 1

CARBON BUDGET OF INDIA:

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Vol-10 Issue-6 No. 6 June 2020

In the historical period of India**,** about 1,280 giga-tons of CO_2 were emitted between 1850 and 2010 thus adding to the stock of CO_2 in the atmosphere. To achieve a 67 percent probability of limiting temperature rise to within 2 degrees, CO_2 emissions in 2010-2050 must be kept to below 750 giga-tons and a 75 percent probability requires a 600 giga-tons budget. In this period estimates for the fair share for developed and developing countries is based on proportion of population for 1850 to 2010. Cumulative global emissions have been totaled about 1,214 giga-tons in between 1850 -2010. Of this total, Ist category countries (see Table No: 2 & 3) accounted for 878 giga-tons or 72 percent of the total. Their share of population was about 25 percent, so their fair share was 310 gaga-tons and their overuse was 568 giga-tons. Less percentage of carbon emitted IInd category countries (see Table No: 4) accounted for 336 giga-tons or 28 percent of the total. Their fair share was 904 giga-tons and under-use was 568 giga-tons. The carbon debt of II category countries was thus 568 giga-tons for the period 1850-2008. They are still accumulating debt because their actual emissions are same in 2010 still exceeds their fair share.

The actual carbon budget (and related physical emissions reduction schedule) that countries eventually put forward as what they can physically undertake. There could be a difference between the allocation of responsibilities and rights and the actual emissions

Table No: 3. India's Position in the World leading CO_2 Emission Countries-2014.

Sl No	Name of Country	CO_2 emissions (in kilotons)	CO_2Emission Per Capita (in tons)	Sl No	Name of Country	CO_2 emissions (in kilotons)	CO_2Emission Per Capita (in tons)
1	China	10,540,000	7.6	24	Ukraine	249,000	5.5
2	United States	5,334,000	16.5	25	Spain	242,000	5.1
3	European Union	3,415,000	6.7	26	Kazakhstan	236,000	14.2
4	India	2,341,000	1.8	27	Malaysia	227,000	7.5
5	Russia	1,766,000	12.4	28	Egypt	225,000	2.7
6	Japan	1,278,000	10.1	29	UAE	201,000	21.3
7	Germany	767,000	9.3	30	Argentina	199,000	4.8
8	Iran	618,000	7.9	31	Venezuela	195,000	6.3
9	South Korea	610,000	12.3	32	Vietnam	190,000	2.1
10	Canada	565,000	15.9	33	Netherlands	158,000	9.4
11	Brazil	501,000	2.5	34	Pakistan	158,000	0.9
12	Saudi Arabia	494,000	16.8	35	Algeria	141,000	3.5
13	Mexico	456,000	3.7	36	Iraq	139,000	4.0

ISSN: 2278-4632
Vol-10 Issue-6 No. 6 June 2020

Sl No	Name of Country	CO_2 emissions (in kilotons)	CO_2Emission Per Capita (in tons)	Sl No	Name of Country	CO_2 emissions (in kilotons)	CO_2Emission Per Capita (in tons)
14	Indonesia	452,000	1.8	37	Uzbekistan	123,000	4.2
15	UK	415,000	6.5	38	Czech Republic	112,000	10.4
16	Australia	409,000	17.3	39	Kuwait	99,000	28.33
17	South Africa	392,000	7.4	40	Belgium	97,000	8.7
18	Turkey	353,000	4.7	41	Philippines	97,000	1.0
19	Italy	337,000	5.5	42	Nigeria	94,000	0.5
20	France	323,000	5.0	43	Qatar	89,000	39.13
21	Poland	298,000	7.8	44	Chile	79,000	4.4
22	Taiwan	277,000	11.8	45	Romania	78,000	3.6
23	Thailand	272,000	4.0	46	Oman	74,000	18.92
	World Total					**35,669,000**	**5.0**

Source: EDGAR database created by European Commission and Netherlands Environmental Assessment Agency, 2014.

reduction or related budgets. Therefore countries that cannot meet their allocated budget or emission cut can compensate for this unmet part of their obligation and countries that do not make full use of these rights, can obtain the funds for their actions. In any calculation of the sharing of remaining carbon space, the carbon debt owed by IInd category countries at the end of 2009, i.e. 568 giga-tons of CO_2, should be taken into account. Thus in the 2010-2050 carbon budget: If a total budget of 750 giga-tons is taken and population ratio to world population is 39 percent, then the Ist category countries (see Fig. 2,3 & 4) fair share is 120 giga-tons. However to fully discharge its carbon debt (568 giga-tons) as at 2009, its allocation for 2010-2050 is a negative budget of 448 giga-tons. Developing countries with an average population ratio of 61 percent would have a fair share of 630 giga-tons of the total 750 giga-tons budget. However since it has a credit of 568 giga-tons in 2009, its allocation for 2010-2050 would be 1198 giga-tons. A similar calculation can be done for other budgets (e.g., 600 giga-tons).

ISSN: 2278-4632
Vol-10 Issue-6 No. 6 June 2020

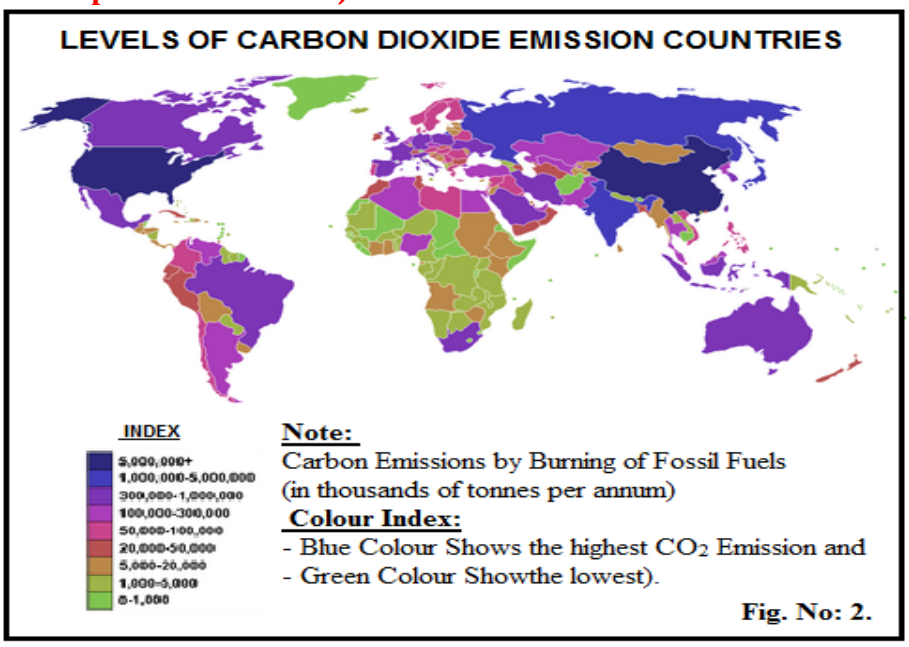

Fig. No: 2.

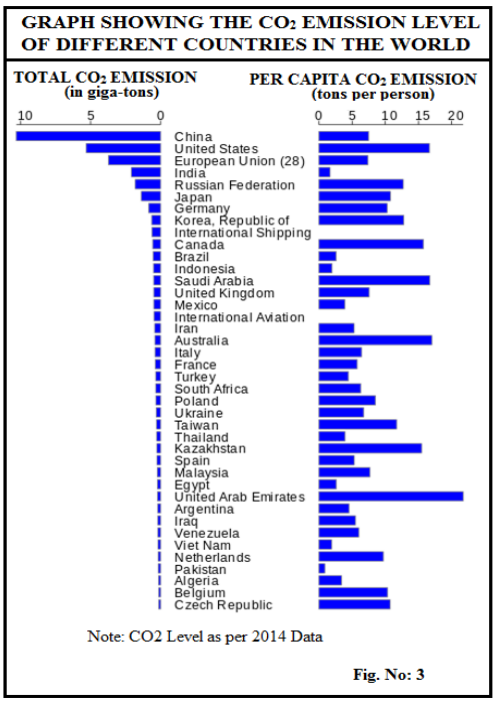

Fig. No: 3

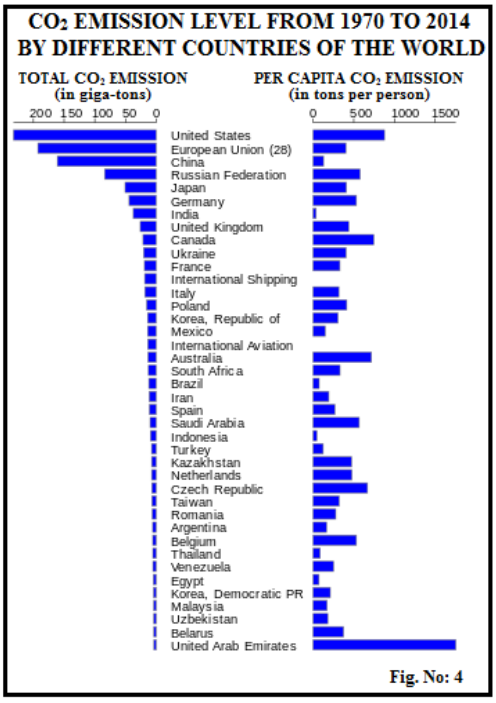

Fig. No: 4

ISSN: 2278-4632
Vol-10 Issue-6 No. 6 June 2020

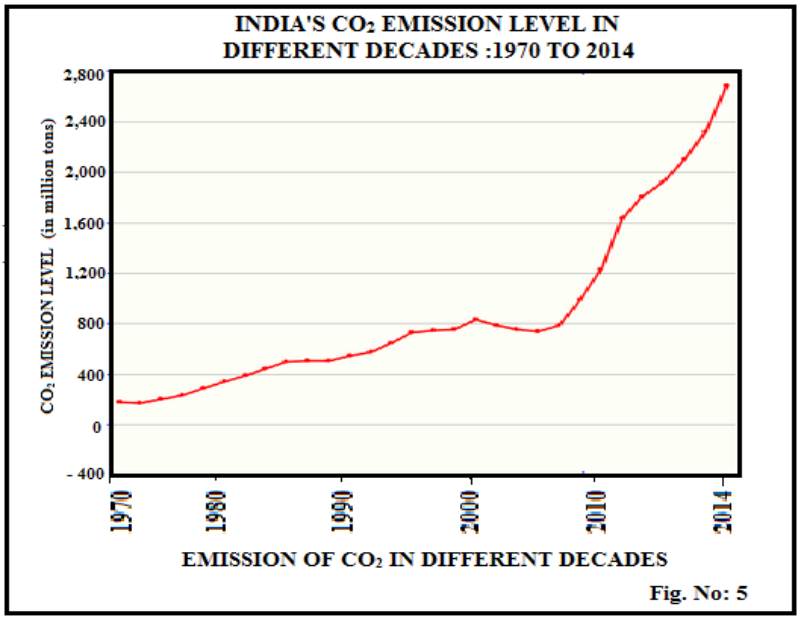

Fig. No: 5

THE IMPACT OF CLIMATE CHANGE ON THE ECONOMY:

Climate change has the potential to create a wide range of economic impacts. In all likelihood all sectors of the economy will be affected. Some impacts will gradually affect economic processes, such as the effect of increasing temperature on energy demand, whereas others may come as extreme events, such as sudden floods or forest fires. Impacts may be either negative or positive. For example, agriculture may become more productive or tourism may flourish in areas experiencing higher or lower temperatures. However, in a global level, the negative impacts will generally outweigh the economic benefits. Beside industry specific impacts, the economy as a whole may be at risk in certain areas due to an increase in sea level and an increase in runoff by rivers. Coastal zones usually contain large human populations and a high concentration of economic activities. Flooding and extreme storm events may seriously disrupt economic activities and cause loss of produced capital. The same is true for areas adjacent to major river systems which may be subject to flooding when precipitation and overland flow increases. Assessing the impact of climate change faces a fundamental challenge of complexity. The set of mechanisms through which climate may influence economic outcomes, positive or negative is extremely large and difficult to investigate. For example, a decrease in agricultural output or value added products may be induced by climate change. However, climate change is only one driver among many that will shape agriculture in future

ISSN: 2278-4632
Vol-10 Issue-6 No. 6 June 2020

decades. Other factors, such as technological developments, socio-economic factors or other environmental issues could have a similar large impact.

INDIA'S PROGRESS IN COMBATING CLIMATE CHANGE:

In recognition of the growing problem of Climate Change, India declared a voluntary goal of reducing the emissions intensity of its GDP by 20–25%, over 2009 levels, by 2020, despite having no binding mitigation obligations as per the convention. A slew of policy measures were launched to achieve this goal. As a result, the emission intensity of our GDP has decreased by 12% between 2001 and 2010. It is a matter of satisfaction that United Nations Environment Programme (UNEP) in its Emission Gap Report 2014 has recognized India as one of the countries on course to achieving its voluntary goal. India has a definite plan of action for clean energy, energy efficiency in various sectors of industries, steps to achieve lower emission intensity in the automobile and transport sector, a major thrust to non-fossil based electricity generation and a building sector based on energy conservation. India on-going mitigation and adaptation strategies and actions are detailed in the following sections, along with the expected direction of activities in the near future.

Table No: 4. List of Negative Carbon Released Countries : 2014.

Rank	Country	1990	2000	2010	2014	Rank	Country	1990	2000	2010	2014
1.	Palestine	-	0.3	-	0.0	**34.**	Tanzania	0.1	0.1	0.2	0.2
2.	Western Sahara	0.9	0.8	-	0.0	**35.**	Cambodia	0	0.2	0.3	0.3
3.	Ivory Coast	0.5	0.4	-	0.0	**36.**	Cameroon	0.1	0.2	0.3	0.3
4.	Burundi	0.1	0.0	0.0	0.0	**37.**	Kenya	0.2	0.3	0.3	0.3
5.	Chad	0.0	0.0	0.0	0.0	**38.**	Sudan	0.2	0.2	0.3	0.3
6.	Democratic Republic of the Congo	0.1	0.0	0.0	0.0	**39.**	Togo	0.2	0.3	0.3	0.3
7.	Soviet Union	13.5	-	-	0.0	**40.**	Tajikistan	-	0.4	0.4	0.4
8.	Czechoslovakia	14.0	-	-	0.0	**41.**	Ghana	0.3	0.3	0.4	0.4
9.	Yugoslavia	5.8	-	-	0.0	**42.**	Solomon Islands	0.5	0.4	0.4	0.4
10.	Guinea-Bissau	0.2	0.2	0.1	0.1	**43.**	Bangladesh	0.1	0.2	0.4	0.4
11.	Burkina Faso	0.1	0.1	0.1	0.1	**44.**	Afghanistan	0.2	0.0	0.3	0.4
12.	Central African Republic	0.1	0.1	0.1	0.1	**45.**	Nigeria	0.5	0.6	0.5	0.5
13.	Eritrea	-	0.2	0.1	0.1	**46.**	Benin	0.1	0.2	0.5	0.5
14.	Ethiopia	0.1	0.1	0.1	0.1	**47.**	Republic of the Congo	0.5	0.3	0.5	0.5

ISSN: 2278-4632
Vol-10 Issue-6 No. 6 June 2020

15.	Madagascar	0.1	0.2	0.1	0.1	**48.**	São Tomé and Príncipe	0.4	0.3	0.6	0.6
16.	Malawi	0.1	0.1	0.1	0.1	**49.**	Djibouti	0.7	0.6	0.6	0.6
17.	Mozambique	0.1	0.1	0.1	0.1	**50.**	Mauritania	1.3	0.5	0.6	0.6
18.	Niger	0.1	0.1	0.1	0.1	**51.**	Senegal	0.4	0.4	0.6	0.6
19.	Rwanda	0.1	0.1	0.1	0.1	**52.**	Vanuatu	0.5	0.4	0.5	0.6
20.	Somalia	0	0.1	0.1	0.1	**53.**	Kiribati	0.3	0.4	0.6	0.6
21.	Uganda	0	0.1	0.1	0.1	**54.**	Guatemala	0.6	0.9	0.8	0.7
22.	Mali	0.0	0.1	0.1	0.1	**55.**	Zimbabwe	1.5	1.1	0.6	0.7
23.	Laos	0.1	0.2	0.2	0.2	**56.**	Papua New Guinea	0.5	0.5	0.7	0.7
24.	Myanmar	0.1	0.2	0.2	0.2	**57.**	Bhutan	0.2	0.7	0.7	0.8
25.	Comoros	0.2	0.2	0.2	0.2	**58.**	Nicaragua	0.6	0.8	0.8	0.8
26.	Gambia	0.2	0.2	0.3	0.2	**59.**	Paraguay	0.5	0.7	0.8	0.8
27.	Haiti	0.1	0.2	0.2	0.2	**60.**	Sri Lanka	0.2	0.5	0.7	0.8
28.	Liberia	0.2	0.2	0.2	0.2	**61.**	Yemen	0.8	0.8	1.1	0.9
29.	Sierra Leone	0.1	0.1	0.1	0.2	**62.**	Pakistan	0.6	0.7	1.0	0.9
30.	Timor-Leste	-	-	0.2	0.2	**63.**	Swaziland	0.5	1.1	0.9	0.9
31.	Zambia	0.3	0.2	0.2	0.2	**64.**	Philippines	0.7	1	0.9	0.9
32.	Guinea	0.2	0.2	0.2	0.2	**65.**	Cape Verde	0.2	0.4	0.6	0.9
33.	Nepal	0	0.1	0.2	0.2		CO_2 Negative Countries				

Source: The data were collected from the Published Report of US Energy's Department (Carbon Dioxide Information Analysis Center).

CARBON NEGATIVE EMISSION COUNTRIES:

On the basis of data given in the Table No: 4, it can be analyzed that, out of 217 countries nearly 65 small and underdeveloped countries in the world achieved by controlling the carbon dioxide emission level in drastic manner by controlling the burning of fossil fuel, production of cement industries, land use such as deforestation. These countries are given the national importance and implemented the development programmes towards to improve the aforestation level. Some of agricultural economy countries much affected by the gases such as methane and nitrous oxide and they have also taken action against to reduces these gases also. In this way India is urgently need to implement the CO_2 emission controlling measures.

MITIGATION STRATEGIES OF INDIA TOWARDS REDUCING GLOBAL WARMING:

ISSN: 2278-4632
Vol-10 Issue-6 No. 6 June 2020

Adoption of Clean and green energy system: Energy is a vital input for production and growth. Considering universal energy access and energy security as one of the fundamental development goals of our country, Government of India has undertaken a two pronged approach to cater to the energy demand of its citizens while ensuring minimum growth in carbon emissions. On the generation side, the Government is promoting greater use of renewable in the energy mix mainly through solar and wind power and shifting towards supercritical technologies for coal based power plants. On the demand side, efforts are being made to efficiently use energy through various innovative policy measures under the overall ambit of Energy Conservation Act. The energy intensity of the economy has decreased from 18.16 goe (grams of oil equivalent) per rupee of GDP in 2005 to 15.02 goe per rupee GDP in 2014, a decline of over 2.5% per annum.

PROMOTION OF CLEAN ENERGY:

India is running one of the largest renewable capacity expansion programs in the world. Between 2002 and 2015, the share of renewable grid capacity has increased over 6 times, from 2% (3.9 GW) to around 13% (36 GW). This momentum of a tenfold increase in the previous decade is to be significantly scaled up with the aim to achieve 175 GW renewable energy capacity in the next few years. India has also decided to anchor a global solar alliance, In SPA (International Agency for Solar Policy & Application), of all countries located between the Tropic of Cancer and the Tropic of Capricorn.

- Wind energy has been the predominant contributor to the renewable energy growth in India accounting for 23.76 GW (65.2%) of the renewable installed capacity, making India the 5th largest wind power producer in the world. With a potential of more than 100 GW, the aim is to achieve a target of 60 GW of wind power installed capacity by 2020.
- Solar power in India is poised to grow significantly with Solar Mission as a major initiative of the Government of India. Solar power installed capacity has increased from only 3.7 MW in 2005 to about 4060 MW in 2015, with a CAGR of more than 100% over the decade. The ambitious solar expansion programme seeks to enhance the capacity to 100 GW by 2020, which is expected to be scaled up further thereafter. A scheme for development of 25 Solar Parks, Ultra Mega Solar Power Projects, canal top solar projects and one hundred thousand solar pumps for farmers is at different stages of implementation.

ISSN: 2278-4632
Vol-10 Issue-6 No. 6 June 2020

Government of India is also promoting solarization of all the 55,000 petrol pumps across the country out of which about 3,135 petrol pumps have already been solarized.

- Biomass energy constitutes about 18% of total primary energy use in the country and more than 70% of the country's population depends on it. However, it is currently used in an inefficient manner with high levels of indoor pollution. A number of programmes have been initiated for promotion of cleaner and more efficient use, including biomass based electricity generation. It is envisaged to increase biomass installed capacity to 10 GW by 2020 from current capacity of 4.4 GW.
- Hydropower contributes about 46.1 GW to current portfolio of installed capacity, of which 4.1 GW is small hydro (upto 25 MW) and 41.99 GW is large hydro (more than 25 MW). Special programmes to promote small and mini hydel projects, new and efficient designs of water mills have been introduced for electrification of remote villages. With a vast potential of more than 100 GW, a number of policy initiatives and actions are being undertaken to aggressively pursue development of country's vast hydro potential.
- India is promoting Nuclear Power as a safe, environmentally benign and economically viable source to meet the increasing electricity needs of the country. With a 2.2% share in current installed capacity, total installed capacity of nuclear power in operation is 5780 MW. Additionally six reactors with an installed capacity of 4300 MW are at different stages of commissioning and construction. Efforts are being made to achieve 63 GW installed capacity by the year 2030, if supply of fuel is ensured.
- **Clean Coal policies:** Coal based power as of now accounts for about 60.8% (167.2 GW) of India's installed capacity. In order to secure reliable, adequate and affordable supply of electricity, coal will continue to dominate power generation in future. Government of India has already taken several initiatives to improve the efficiency of coal based power plants and to reduce its carbon footprint. All new, large coal-based generating stations have been mandated to use the highly efficient supercritical technology. Renovation and Modernization (R&M) and Life Extension (LE) of existing old power stations is being undertaken in a phased manner. About 144 old thermal stations have been assigned mandatory targets for improving energy efficiency. Coal beneficiation has been made mandatory. Introduction of ultra-supercritical technology, as and when commercially

ISSN: 2278-4632
Vol-10 Issue-6 No. 6 June 2020

available is part of future policy. Besides, stringent emission standards being contemplated for thermal plants would significantly reduce emissions.

- National Smart Grid Mission has been launched to bring efficiency in power supply network and facilitate reduction in losses and outages. Green Energy Corridor projects worth INR (Indian National Rupee) 380 billion (USD 6 billion) are also being rolled out to ensure evacuation of renewable energy.

The Government's goal of Electricity for All is sought to be achieved by the above programs that would require huge investments, infusion of new technology, availability of nuclear fuel and international support.

CONCLUSIONS:

In all major carbon emission countries need to develop carbon sinks fields like forests and grasslands. Carbon-oriented land management should be controlled. Although this should be regarded as a solution, it should not be dismissed for increase the climate warming. India needs to improve the energy efficiency, efficiency in industries, promoting waste to wealth conversion, promotion of safe-smart and sustainable green transportation network, planned afforestation and abatement of pollution.

The adverse impacts of climate change on the developmental prospects of the country are amplified enormously by the existence of widespread poverty and dependence of a large proportion of the population on climate sensitive sectors for livelihood. Hence for India adaptation is inevitable and an imperative for the development process. It is of immediate importance and requires action urgently. Vulnerabilities in India differ among states, among regions and among different groups of people within the same region due to substantial variations in topography, climatic conditions, ecosystems as well as diversity in its social structures, economic conditions and needs of different communities. A range of actions have been introduced to address it. Out of the eight National Missions on Climate Change five mission focus on adaptation in sectors like agriculture, water, Himalayan ecosystems, forestry, capacity building and knowledge management. Climate plans at the sub national level also focus significantly on adaptation. Besides these targeted programmes like **Make in India to** strengthen adaptive capacities of the vulnerable communities. At this juncture India's people

require proper training and upgrading of skills towards to reduce the CO_2 emission for sustainable development of our country.

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