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Tax and Pandemic; Curbing Carbon Burden of India's Blue Sky

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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Original Research Article

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ABSTRACT

Out line: Carbon dioxide is one of major signatures of Anthropocene. Energy sector contribute maximum to CO_2 emission. Reaching 1.4billion population, India must strides to provide affordable, riskless, secure, uninterrupted and cleaner energy with energy security prioritized. The CO_2 emission in India was 2201.865 MT CO_2 e in 2019 matched to 2172.19 MT CO_2e in the previous year. The apocalyptic pandemic of COVID19 have shut down the cities and forced people to migrate to native places as a result the carbon dioxide level has reduced in the sky.
Methodology: After carbon tax implementation from 2010 and post Paris Agreement surge in Carbon tax in India's climate from 2015 there was slow decline of CO_2 level in the ever rising global grey sky. The carbon tax had raised faster rate but its effect was slow. Lockdowns, closures and confinement during the pandemic COVID-19 from March 2020 in India is the real-life experience explaining the additive control of carbon level of polluted air along with the burden of carbon tax globally including India.
Discussion: The socio-economic impact of shutdowns of all industrial units, power generation and transport sectors along with immediate migration of all workers to their native place have dropped carbon level in air and initialized the concept of blue sky thinking. The present apocalyptic complex pandemic without vaccine has forced the government machinery to be utilized for life, neglecting

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livelihood. Presently after 4 stages of lock downs, the uplift of restrictions in 5th stage is allowed for lively hood and socio-economic sustenance.
Conclusion: As post pandemic measures under economic bankruptcy, the Indian government should initiate strategic plans to restore the socio-economic normalcy and relax the heavy carbon tax on Indians as the carbon level is reduced as a major impact of COVID-19 during 2020.

Keywords: Carbon tax; carbon dioxide; anthropocene; COVID-19 pandemic; lockdown.

ABBREVIATIONS

BAU : Business-as-usual
CDR : Carbon dioxide removal;
CO_2 e : Carbon dioxide equivalent;
COPD : Chronic obstructive pulmonary disease;
CREA : Creating Resources for Empowerment in Action -2000;
CRI : Coke reactivity index;
GHG : Green House Gases;
HPP : Hydro Power plant;
IAMS : Integrated Assessment Models;
IMD : India Meteorological Department;
IPCC : Intergovernmental panel on climatic change;
ITCZ : Intertropical Convergence Zone;
MJO : Madden Julian Oscillations;
NDC : Nationally Determined Contributions;
NAPCC : National Action Plan on Climate Change;
NOAA : National Oceanic and Atmospheric Administration;
SPP : Solar power Plant;
TPP : Thermal power plant
UNFCCC : United Nations Framework Convention on Climate Change;
NAAQS : India's national ambient air quality standards;
NCAP : National Clean Air Programme;
OSHA : Occupational Safety and Health Administration

1. INTRODUCTION

CREA during 2020 has reported that the total CO_2 emission in India during 2018 and 2019 were 2.172 MMt CO_2e and 2.202MMt CO_2e (equivalent) respectively. But it was 2.573MMTCO $_2$ e (less from 3.571MMt CO_2e) during 2015, Myllyvirta L et al., CREA 2020 [1]. India is the 3rd largest emitter among the leading carbon emitting countries of the globe. The slow decline was observed after 1970 in the CO_2 level due to weakening of coal demand. Thermal power plants (TPP's), cement industries, fossil fuel burning, the agriculture and the bovines are the chief fonts of greenhouse gasses (GHG) including carbon emissions, The CO_2 is rising abruptly since year 1980, the assumed golden spike period of the Anthropocene Epoch in India Mishra S. P. 2017 [2]. India has pledged in the Paris agreement 2016 to reduce 33-35% GHG emission intensity by 2030 compared to that of 2005 by replacing the nonrenewable to renewable sources, (Fig. 1). https://www.carbonbrief.org/the-carbon-brief-profile-india

1.1 Black Carbon: India and the Globe

The total generation of carbon emission though high in India, the per-capita emissions of CO_2 is below the global average. With vast area, 2nd highest demography and anthropogenic pressure is most susceptible to climate vulnerability. The proxies can be well visualized through deglaciation of Himalayas, haze in the metropolis, erratic monsoon and westerlies, rise in consumption of cement, Coal and biofuel. CO_2 level conc. in air was measured since 1958 to 1990, at Mauna Loa laboratory, Hawaii by C D Keeling. Later it has been estimated by satellite imageries since 1990. The CO_2 levels of different cities are also measured by NOAA, CRI, IMD and various organizations. India measures it's CO_2 level at Cape Rama, CRI, Goa since 2003 to 2011 and reported there is increase of the average level CO_2 level at Cape Rama, CRI, India was 24pp (@2ppm/year), https://shodhganga.inflibnet.ac.in/bitstream/10603/126303/14/11.

With the present carbon profile growth scenario, it is predicted that there shall be an end to the process of 6th mass extinction within the next decade. The Anthropocene period started in India from 1945 and its golden spike period from 1980. The major sources for rise in CO_2 in India are due to industrialization, urbanization, expanse of agriculture and rise in domestication Fig. 2 [3].

In 2015, India's carbon emission was 3571 $MtCO_2$e reported by the Potsdam Institute for Climate Impact Research (PIK). The global average was 404 ppm, according to reports from Mauna Loa, Chandra et al. [4], Mahesh et al. [5], Debburman et al. [6]. In India, that year, the average CO_2 level was 399 ppm in air. The safe limit is 350ppm and anything beyond that level is noxious to Human health. https://www.thehindu.com/sci-tech/energy-and-environment/at-399-ppm-india-matches-the-world -in-atmospheric-carbon-dioxide-levels /article 19150785.ece.

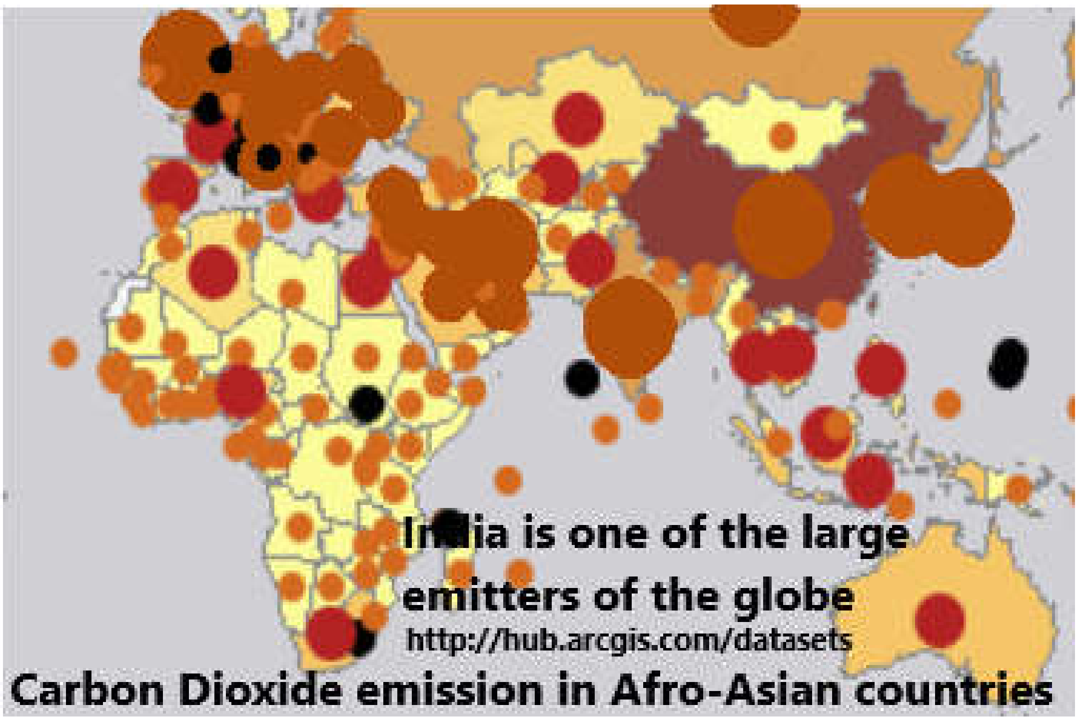

Fig. 1. India is one among the ten largest CO_2 emitters of the globe

Fig. 2. The burden of CO_2 emission in Anthropocene on modern man from food, industry, forest fire, plastic, oil spill, waste sector and many sources

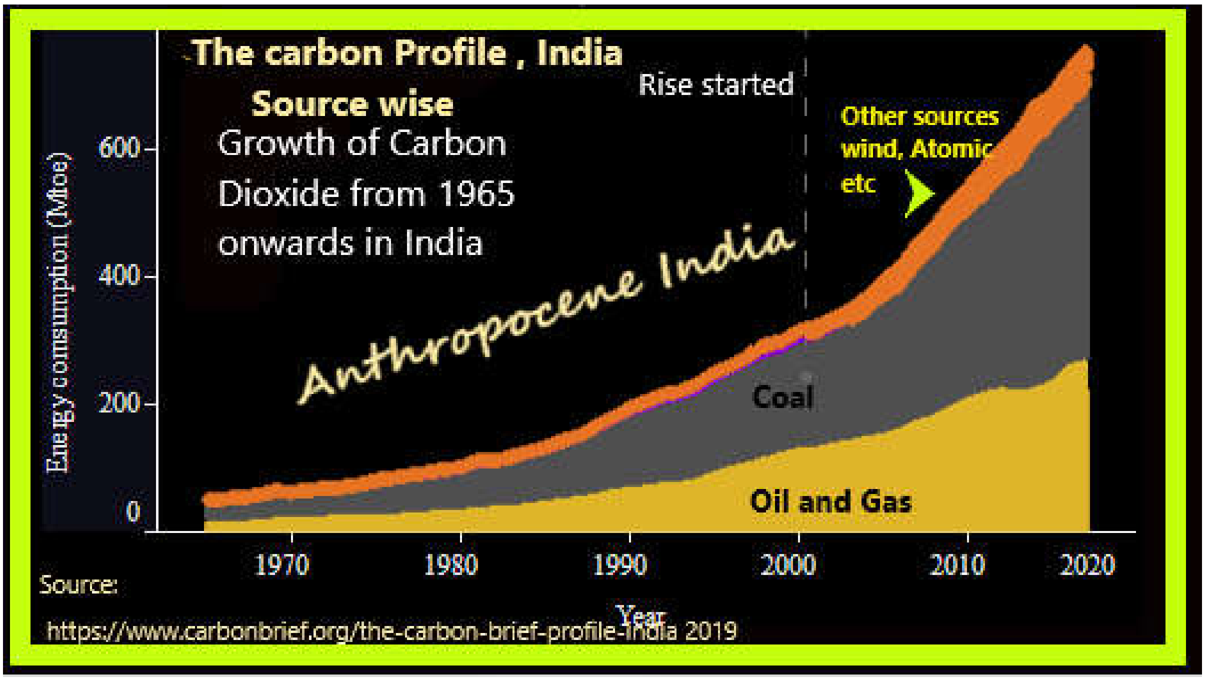

Fig. 3. The energy consumption during 21st century Anthropocene in India (S: carbon Brief)

1.1.1 India's strategy for Carbon reduction

Nonrenewable sources are planned to ousting 40% of installed TPP's by solar, geothermal and wind power generation units (PGU's) which are gaining importance to mitigate apocalyptic scenario by reducing GHG emission from 2.7tCO_2e/ capita to 1.8tCO_2e/capita . A part of the Paris Pledge -2005 aims at increasing the green vegetative cover to have cumulative sink of carbon equivalent 2.5Th MT of CO_2e to 3.0 ThMtCO_2e by 2030 by technology transfer, capacity building and climate finance (Fig. 3).

1.2 Scope of the Study

India is in the roadway of progress technologically and industrially. Use of fossil fuel in transportation, coal in electricity generation and all blast furnaces emit huge quantity of GHG gasses especially CO_2 which is burdening the India's sky and turning from blue to grey. Last four to five years the educational institutions were being closed for very high concentration (conc.) of CO_2, visibility worsened due to haze and other severe respiratory diseases (COPD and asthma *etc.*) in Calcutta, Delhi and many other industry based cities in India and the conc of CO_2.has ramped up above 420ppm where 250ppm is the normal. So it is high time to reduce the conc. of the GHG gases including CO_2 not only in India but also in all the developed and developing countries in the globe.

2. REVIEW OF LITERATURE

The CO_2 trend was 280 ± 10 ppm maintained from Pleistocene period till Industrial period i.e. 1750 but for the last 250 years anthropogenic activities have raised the level to 399ppm by 1999 and rose to 408 ppm in average by 2020.CO_2 release have surged by ≈90% due to use of fossil fuel and ≈78% rise in GHG due to industrialization between year1970 to 2011, ≈25% due to heat and electricity generation, ≈21% Industry, ≈24% through agriculture, ≈14% by transportation and ≈6% rise by civil construction (till 2010) and during 1750 it was 278 ppm, IPCC report, 2018 [7], Kishwan et al 2012 [8], Sharma et al 2013 [9], Patra et al, 2014 [10], Boden et al 2017 [11], Singh , 2018 [12], Roy et al., 2020 [13]. The carbon level increases in India by local emissions, terrestrial biota and environment, Cyclonic disturbances in North Indian Ocean including Bay of Bengal & Arabian Sea, shift of ITCZ, MJO and Nino conditions Saito et al. [14], Sheel et al. [15] Chhabra A et al. [16] and Joshi et al. [17]. The seasonal CO_2 concentrations in air exhibit high as one move from equator to high latitude, i.e latitude wise, Chakraborty et al. 2020 [18].

Energy generation/consumption contribute about 75% of total global GHG emissions India have fixed target in 2014 that with maximum 2^0 C global warming there shall be 175GW nonrenewable energy generation by 2022 and which shall be further augmented to 275GW by 2027, OECD/IEA :Int. Energy Association, 2015 [19]. The most lucrative and the least risky (both grid and financial) power generation is through solar cells as growing CO_2 which is nexus to health, and climate. Using non-cultivable lands to solar energy farm has been proposed by NREL to have optimal use of land resources. The degraded lands could be best utilized for agro-voltaic systems (unsuitable for crop growth) and range voltaic systems (grazing ground) to promote food production, optimal water saving along with solar power generation, Macknick et al. 2019 [20].

2.1 Organization and Methodologies

Considering the gravity of carbon increase in India, studies have been conducted to search for the rate of increase, health aspect, stratification in different zones, seasonal variation, the sources and the focusing points like cement, energy generation, agriculture and other sectors with the limits of exposure are considered. Considering the cataclysm of the nexus but important gas, the procedures for reduction by storing and utilization and its pro and cons has become a part of the research.

The modern society is also worried for the present process of 6^{th} mass extinction due to climatic anomalies. The UNFCC had made a pledge to reduce CO_2 conc. by imposing taxes to the participating nations where it was thought to reduce and effective use of this necessary gas but to be kept under limiting vales. With this novel aim UNFCC made conference at Paris during 2015 as Paris Pledge -2015 where India took leading role and in favour of imposing taxes over CO_2 emission and started in action. The rate and methodology of taxing and the useful results is discussed.

Meanwhile from March 2020 onwards there is outbreak of the pandemic COVID-19 has kept the people under lock downs, shut downs of developing sectors like industry, education, transportation and paralyzed the human movement. From the field dataof CO_2 conc in air, it is observed that within 6 months has been depleted above all the previous focused areas. So it is felt necessary to search for whether the high rate of taxes is to be relaxed during economic and GDP short fall phase. The high rise and burden of Carbon tax and decrease of CO_2 level due to pandemic jeopardy have been analyzed and results are discussed.

3. SEASONAL VARIATION OF CO_2

In northern hemisphere, CO_2 fluctuates seasonally depending upon the biosphere and atmospheric interactions fluxed by anthropogenic activities. The concentration of CO_2 level starts rising from approach of winter (due to balding) and reaches peak during early spring and goes on depleting slowly when the trees are filled with green leaves (Chhabra et al. [16] and Greg Shirah from NASA [21], Udetanshu et al. [22], Ballav S [23]. The carbon emissions/capita of developed countries when equated with developing India is biased at 3.26:1 which is disparaging (World Bank data) [24]

3.1 Co_2 Stratification India

OCO-2 (Orbiting Carbon Observ.-2) Launched by for monitoring the environment parameters divulge about few pockets of MP, UP and HP (Northern India) reports CO_2 level exhibits between 405 ppm and 410 ppm whereas the level in southern states hovers between .395 to 400ppm and central states between 400 and 405 ppm. When we are placed within carbon heap, it is highly essential to search for processes to come out of it Chhabra et al., 2017. Major contribution of CO_2 in India's major cities is from crowdie transport with fossil fuel based transport system. There was constant rise in emission trajectory from 1970 till 2018. But from 2019 there was fall in the trajectory observed due to imposition of federal governances after Paris agt-2015 and 2016 [25].

3.2 Agriculture and CO_2 Level

The ploughing that disrupts the frustum stratigraphy of earth in alluvial plains of India, causes manmade dust bowl in atmosphere inviting rain. Higher the cognitive dust bowl in USA and Canada during dirty thirties of 19^{th} century was in history that created drought and economic downfall. The loss of top soil by inexperienced farming methods and retention of sediment by hydraulic structures has caused fertile soil fractures resulting of sinking, shrinking in river deltas of India. Vegetation green cover loss to the fertile soil has increased CO_2 level in India augmented by domestication, Mishra S P 2020 26], and (https://www.nrel.gov/news/program/ 2019/ benefits-of-agrivoltaics-across-the-food-energy-water-nexus.html). Further cow dung or crop residue burning was 149.24 MT of CO_2 in the year 2008-09 from an agricultural waste 500MMT/year Jain N [27] and Bhubaneswari et al. [28].

3.3 CO_2 and Human Health

Oxygen is indispensable energy supplement for functions of cells. A living body lack of oxygen cannot breath. Breathing inspires release CO2 from body to atmosphere. The CO_2 at a range from 38 - 42 mm Hg controls the pH of blood, sparks breathing, and influences the affinity hemoglobin. Thus CO_2 has influence on human health by breathing the indoor/outdoor air, exhaust from vehicles, industries, fumes from waste incineration, or from cooking but exposure through contact of dry ice causing blisters. The NIOSH (The National Institute for Occupational Safety and Health), (NIOSH), CDC in 1976 have reported that oxides of carbon are considered workplace hazards and the safe limit is 0.037% or at low concentration www.cdc.gov › niosh. Potential health impact of concentration level of oxides of carbon and hazard routes are by inhalation, skin, eye, ingestions. Inhalation of different concentration of CO_2 has impact on human health as studied by EH40/2005 of COSHH (Control of Substances Hazardous to Health Regulations 2002). Workplace exposure limits can cause as in Table 1. Reasonable high conc. of CO_2 causes headache, dizziness, drowsiness, stinging of nose/ throat, induces rapid breathing and heart rate, vomiting, excess salivation, and unconsciousness. Over conc. maybe fatal but surrounding air up to 5K ppm is tolerable limit at the work place (OSHA).

3.3.1 The exposure limits

CO_2 is a hazardous gas cited by OSHA (Occupational Safety and Health Administration), DOT (Department of Transportation), NIOSH-2004 and ACGIH-2002 (Association Advancing Occupational and Environmental Health). The exposure limits for CO_2 provided by different organizations are (https://www.nap.edu/read/11170/chapter/5#62). [I] OSHA: The PEL (permissible exposure limit) is safe for 5000ppm, for work place of 8hours. [II] NIOSH: The REL (recommended air borne exposure) is in average 5000ppm for 8hours in work place and 30000ppm for 15minutes exposure.[III] ACGIH: The TLV (threshold limiting value) is 5000ppm at 8hours in a work place and 30000ppm STEL (Short term exposure limit)

The Risk factors: The risk factors associated with CO_2 exposure can be temporal (Short term) or longterm, The limit of long-term is 8-hrs exposure at work place is < 5000 ppm and short-term (accidental) exposure time limit is ≤15mnts of 15000 ppm, https://www.hse.gov.uk/ carbon capture/ carbondioxide.htm. The short-term exposure for a higher level inhalation can cause

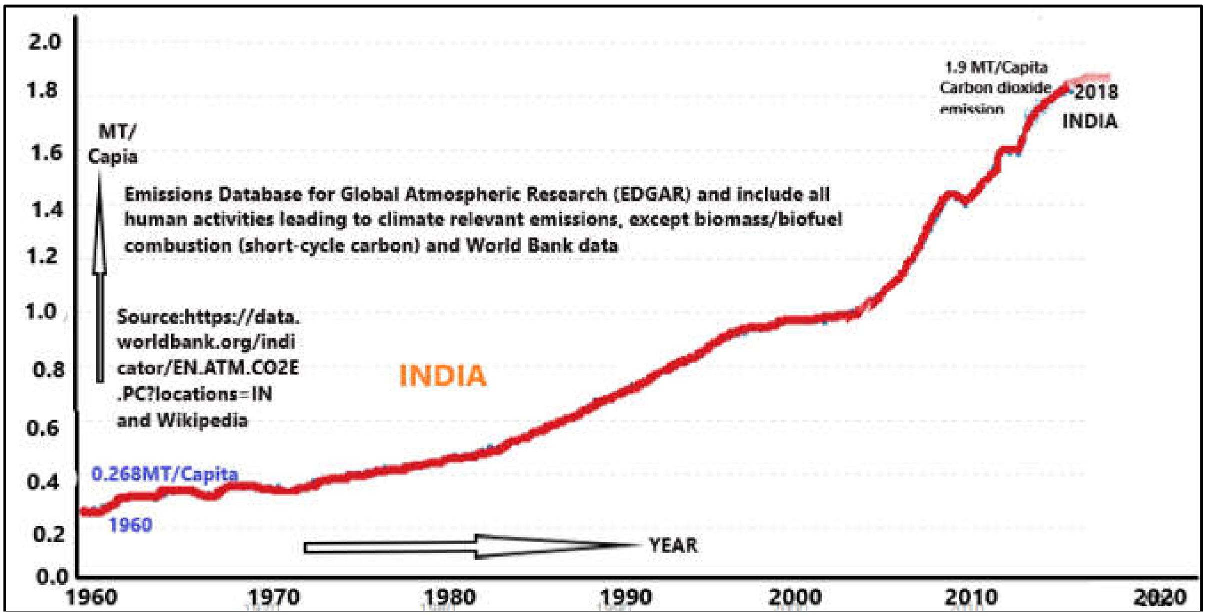

Fig. 4. The rise of emission of CO_2 in India from the year 1960-2018

Table 1. CO_2 concentration level and impact on human health at different level

Exposure hrs (max)	exposure levels	% rate /conc. inhaled	Physical conditions	Impact on human health	Source
	ppm	Hours			
Inhalation	≈500	short term	Increase heart rate, BP, fringe blood circulation	Impact on human health not noticed	Azuma et al., [29]
Inhalation <2.5hurs	<1000	1% conc. inhaled	Less/about no impact , breath rate slightly increase (children)	Weaken judgment, &thinking on short-term basis,.	NRC et al. [30]
Inhalation <2.5hurs	<2500	2% conc. inhaled	Fatigue, stuffy, tiredness loss of focus, head ach	Temporal marginally cognitive functional,	Azuma et al., [29]
Inhalation	2500to 5000;	20.9%O_2 3% conc. CO_2 ¡nhaled	Headache, fatigue, lethal mentally slow, emotional irritation, sleep disorder	Headache, drowsiness, tiredness.	Azuma et al., [29]
8-hour exposure	2500to 5000;	0.5% CO_2	Hearing & visual odds (work sites)	OSHA (PEL) and ACGIH (TLV)	OSHA website
8-hour exposure workplace	10,000	(1.0%)	Possible drowsiness, high breath rate,	Rise brain blood flow, increased minute ventilation	ACGIH, [31], Azuma et al. [29]
15 to 20mnts exposure	15,000	1.5 -2%	Head ach, increased BP, pulse rate, and respiratory stimulant	Breathing rate doubled, narcotic effect	Mac-Naughton et al., [32]
20mnts exposure workplace	30000	3%	Breath doubled, impaired hearing; headaches,	Break OSHA norms, slight boozing on the exposure time	Zhang et al., [33]
7-10mnts	40-50Th ppm	4-5%	Instant Dangerous to Health (IDLH); breath problem; intoxication	respiratory stimulus, dizziness, confusion, headache, choking	USDA data and EPA data
3-5mnts	80,000 ppm	06 - 08%	breathing problem, sweating, tremor,	un-conscious, vertigo,& possible death	https://www.epa.gov/sites/production/files/2015-06/documents/co$_2$appendixb.pdf ,
<3mnts	40Th-100Th ppm	9-10%	IDLH (Immediately dangerous to life or health), increased heart rate,	Headache, , rapid breath, dizziness, sweating; Unconsciousness	
<3mnts	>100000ppm	>10%	Loss of consciousness within minutes, coma, risk of death	muscle twitching; activity ceased and death	https://learn.kaiterra.com/

Source: https://www.epa.gov/sites/production/files/2015-06/documents/co$_2$appendixb.pdf; https: // ethanolrfa.org/wp-content/ uploads/2016/02/Module-2-Handout-CO_2-Adverse-Health-Effects-Fact-Sheet.pdf;http://www.nuco$_2$.com/pdf/CO_2_Compressed_Gas.pdf;https://learn .kaiterra.com /en/air-academy/is-carbon-dioxide-harmful-to-people;https://www.fsis.usda.gov/wps/wcm/ conn ect/bf97edac-77be-4442-aea4-9d2615f376e0/Carbon-Dioxide.pdf?; https://www.osha. gov/ dts/ chemicalsampling/data/CH_225400.html;

suffocation, unconscious, head ach, double vision, ringing sound heard and convulsions, thought disturbances, loss of consciousness, and/or other symptoms (Seizure) and for very high level of exposure may cause death. The long term exposure to high level of CO_2 may change the body metabolism or disorder in bone calcium. Dry ice is irritant to eye and skin. However CO_2 has no report of immune-toxicity, Genotoxicity and Carcinogenicity potentiality.

3.3.2 CO_2 poisoning

CO_2 cause asphyxiation by hypoxia and also a toxicant. Read deaths in some idle wells as it contains CO_2 at high conc. level which causes unconsciousness and arrest respiration in about one minute. The solid CO_2 is called dry ice undergoes sublimation and generate huge CO_2 on warming. Many suicidal cases is reported from dry ice and high geothermal CO_2 emissions have been reported as cause of intoxications Rupp et al. [34], Gill et al. [35], Permentier et al. [36]

3.4 The Carbon Footprints India

Plastic waste disposal by discarding, incinerating, reuse, recycle and composting emit GHG gases and estimated that 1.8 billion MT of CO_2 was released during in 2015.

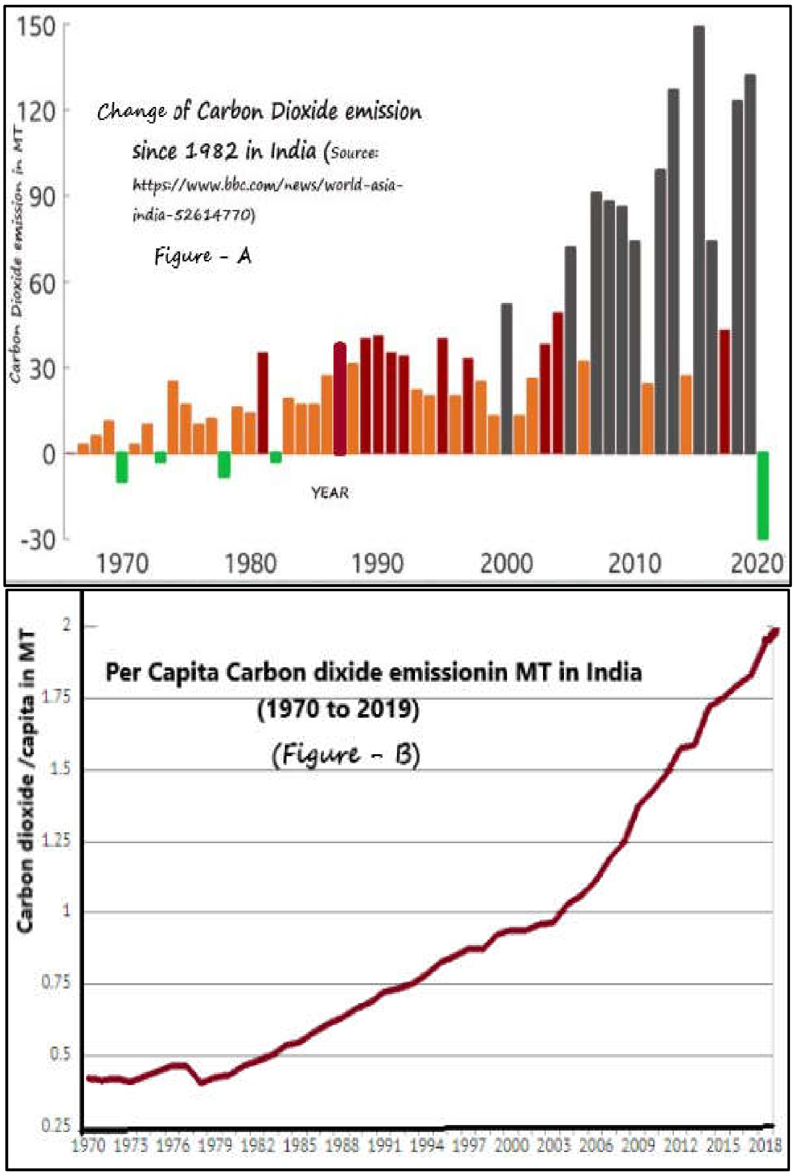

Fig. 5 (a) & (b). Total and per-capita CO_2 emission in India during Anthropocene; Carbon Brief

CO_2 /capita can be the CO_2 emissions that stem from the TPP's, consumption of fossil fuels and the making of cement. CO_2 emissions/person for India was 1.94 MT in 2018, which was 0.92MT/person in 1999 reached from a maximum rise of 10.16% in 2009 and later fall to 6.02% in 2018 Fig. 5(a) and (b).

3.5 Co_2 Capture & Hoarding

A Carbon Capture and storage from CO_2 from TPP sources, refineries, Industrial units (> 0.1 $MtCO_2$/year) and conveying and injecting the compressed CO_2 into deep (>800m) below ground level and isolated from atmosphere and then safely used for human use,. The capture risk is associated with life cycle toxicity of some noxious solvents, operational safety, transportation through large pipelines and geological storage site selection risk, ipcc_wg3_ar5_chapter7.pdf-2018 (pp- 7.5.5 - 532)

3.5.1 Problem with capture, storage and transmission of CO_2

The technology of capture and storage under high pressure by compression of the gas need to be developed make the process riskless. For utilization of the gas for human use need transportation through pipelines to the stake holder's place for use. Sites like cold drink manufacturing units can store ≈ 1000 MT liquid CO_2 (liquid state), in about 350MT capacity tanks at pressures (20 barg) and temp -17^oC. However the problems associated are fixing hazard range for release from storage beyond a distance of 50 to 400 m for instantaneous release whereas for continuous release the distance to be minimum 100m or there is potentiality of major accident with cold and liquid CO_2 storage units https://www.hse.gov.uk/carboncapture/assets/docs/major-hazard-potential-carbon-dioxide.pdf

3.6 Paris Climate Change Protocol (COP-21); 2015

The taxing carbon is one among the fiscal tool, most cost-effective, and easy way to curb the GHG emission and gear the innovation in clean technology, promote sustainable development achievements during Anthropocene. Hammered by the burden of GHG, the UNFCCC (United Nations Framework Convention on Climate Change) in their 21st Conference (COP21) at Paris approved a strategic action plan on 12th Dec. 2015, called the Paris Agreement. The agreement was authenticated by 195 nations (at present 197 countries) to come to a consensus on global climate action plan to combat ensuing climatic anomalies like global warming, MSLR and surge in GHG gas concentration.

3.6.1 Measures to reduce CO_2

The ambient air standard can be maintained by strengthening public transport, goods transport by electric vehicles or trains only, reducing emission from TPP's and cement production units, stubble burning, along with stringent federal regulations for reducing GHG production.

3.6.2 Carbon Tax

Carbon tax is a tax against pollution both indoor and outdoor. Taxing can be imposed in two ways i.e. (i) ETS (Emission trading system), (ii) CTC (Carbon Tax Charge). The ETS method adopts fixation of ceiling on total GHG emission that permits low emission industrial units to trade their spare allowances as Carbon credits to those large emitting units. The CTC method adopts predefined federal taxing at a common rate on carbon content of the fossil fuel used, https://www.nbcnews.com/business/economy/small-farmers-left-behind-trump-administration-s-covid-19-relief-n1236158

3.6.3 Merits of Carbon tax

It is the concept of taxing polluting gasses on use of fossil fuel and coal used for energy generation and producing industrial productions and making alternate cost competitive alternate sources of drives from renewable sources. The tax emphasizes on benefits on social and economic façades promoting climate change prospective. It can also cutout the consumption of fossil fuels, search for alternative energy fonts and revenue generation by negotiating sustainable ambient air quality. It also have merits of achieving emission targets and a prime source for clean energy investment.

3.6.4 Issues related to Carbon Tax

Impact of surge in CO_2 level increases global warming which common issue for tropics, subtropics and polar countries in both the spheres. IPCC 5th AR 2013 reports there is 0.85°C rise in global temp as per 2006 level which is less important in tropical countries like India (Fig. 6). India enjoys the tropic's warm climate, so are less affected with the pre-existing rise in temp due to rise in CO_2 level. The southern hemisphere is contributing less to rise in carbon dioxide than northern hemisphere, but suffering much. So the burden of taxing for carbon emission should be based on the collective mutual perseverance as all countries are not emitting CO_2 at same rate.

The lowering of 1.5°C target anomaly agreed upon in the Paris agreement in 2015 has reduced CDR, in atmosphere is crucial. The IAMS model assigns abridging CO_2 level from 190 to 1190 of cumulative removal is essential towards fag end of 21st century. The economical unsecured classes contribute least to the climate change in India but on imposition of the new carbon tax shall make them worst sufferer burdened. Further no accepted methodology is found for the assessment of the amount of CO_2 lags by industrial, residential and agricultural units. The tax structure shall be tentative and less meticulous and irrational in India (Fig. 6).

4. MODELS FOR SHAPING CARBON TAX

In addition to the IAMS models different models developed to reduce emission of CDR along with taxing methodologies are:

4.1 JET Model

Models are developed for sharing carbon tax like Jet Energy transition model (JET), The model mechanism is based on global level of income and emission the tax is to be fixed. The payment methodology is shown in Fig. 7. The model is based on helping the resource wise poor but developing nations for the energy transition but not considering their finances statuesque. By this global green sharing of carbon tax; the rich and developed countries shall pay their own tax share and in addition support the poor developing countries in transition.

4.2 ETS Model

The Emission Trading system model aim at cap and trade methodology on GHG emission by fixing a ceiling and have options for trading (sell and buy) emission units fixed under different caps by harmonizing the demand of total emission/ supply of available ETS units.

4.3 Emission Reduction Funds Model

They are the tax clients financed schemes of Australia at present where government purchases the credits generated by emission reduction projects.

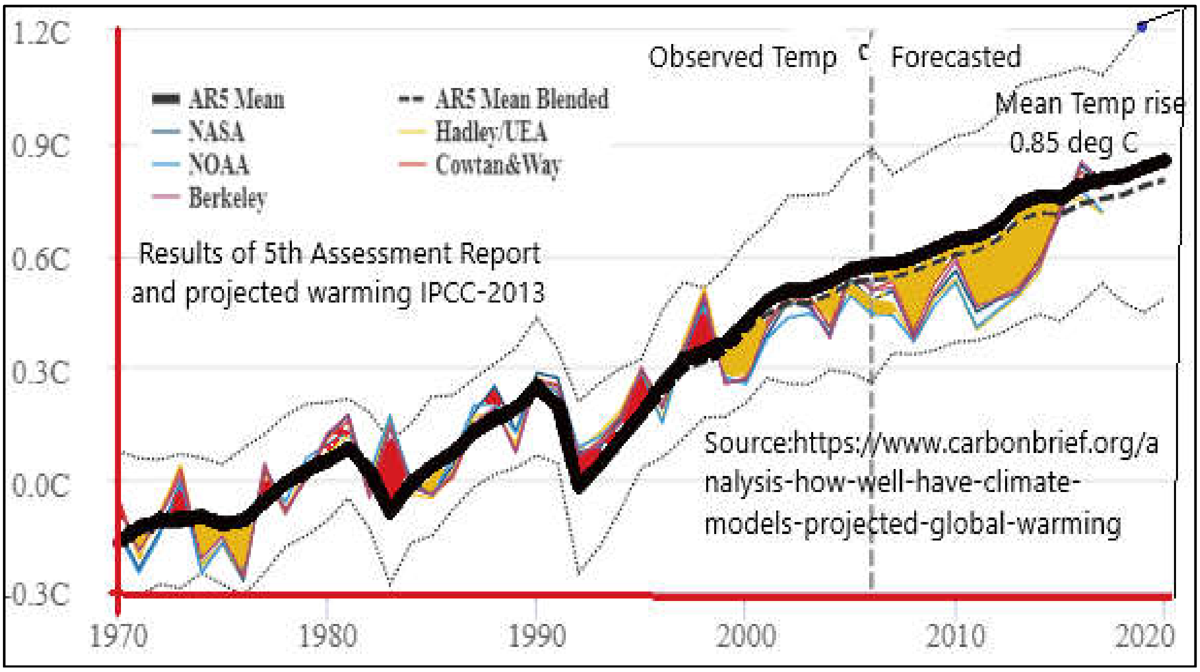

Fig. 6. Global warming prediction and deviation from mean (global agencies; AR-5 IPCC)

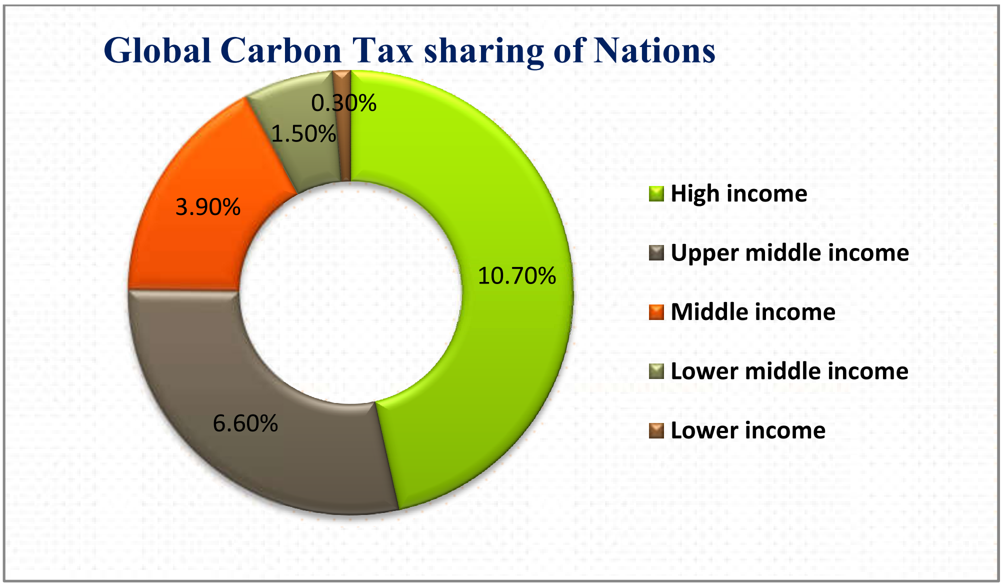

Fig. 7. The share contributed by nations based on level of Income and Emission (JET model)

4.4 Carbon Taxing Fossil Fuel use

In this method carbon tax is levied over the entire economy which lags carbon incentive generations and do not assure guarantee on sustaining minimum level of GHG generation in the nation.

4.5 Hybrid Modeling

It is an amalgamated method of ETS and carbon taxing where a limit is to be fixed by the nation to levee prerogative ETS on either maximum or minimum price/ allowance, or introduce a carbon tax scheme which enforces a definite size of emission reduction units to relax tax liability.

4.6 The Tax Payers of Afro-Asian Countries

BY the FY 2019, 29 countries including India are among the carbon tax payers. This tax is levied upon producers, suppliers and at different stages of consumption. The producers include coal mines, and oil well heads. The suppliers and distributors are oil refineries; coal and crude oil transport vendors, whereas the distributors are the terminal points of utilities and oil marketing companies. The electricity users at times are to pay carbon tax directly in their bills (Fig. 8).

4.7 Carbon Tax and Climate Change

Imposition of direct or indirect taxes on different form of energy generation, transportation and use upsurges the cost of Fuel which has negative impact on their consumption, increases energy efficiency, forces research for alternate renewable energy and make energy sector more competitive. Consequently the emission of GHG gases is reduced abruptly. Finally the carbon tax has positive impact over climatic changes and maintains sustainable ambient air around us.

4.8 Carbon Tax – India

As a leading nation during Paris pledge 2015, India had augmented the carbon tax form 100INR/ $MTCO_2$ e to 200 INR/ $MTCO_2$e. in the Budget 2015–16. But in the year 2010 the carbon tax was 100INR/ $MTCO_2$ e based on clean energy CESS during 2010 on coal. Later it was relaxed to 50INR/ $MTCO_2$ e (vide exemption CESS Notification No.3/2010-Clean energy on 22.06.2010). In 2014-15 budgets it was again increased to 100INR/ $MTCO_2$e. At present the carbon tax has been surged to 400INR/ $MTCO_2$e which is 4times that of the tax of 2014. It is made to scale up the renewable sources of electricity generation and keeping India at par with global level and to deplete the intensity of emission by @ 22%.

4.9 Structuring of Carbon Tax

Basically two approaches implemented in structuring the carbon tax where the 1st one is ‘revenue neutrality’, where the tax amount collected is settled back to the payers and 2nd one is to spend the collected revenue to supplement the government prerogatives and public utilities. https://energy. economictimes, indiatimes. com/news /coal/india-must-focus-on-carbon-taxing-to-achieve-its-climate-goals-study/71722045 After change in political scenario in India during 2014, the Carbo tax was doubled to 100 INR/MT. After Paris agreement on climate change, 2015, the carbon tax rate was hiked to @200INR/MT and after implementation a goods and service tax in India from 1st July the 2017 the rate of carbon tax is included in GST and the carbon tax was raised @400INR/MT of coal. The present structure of the carbon tax is given in Table 2.

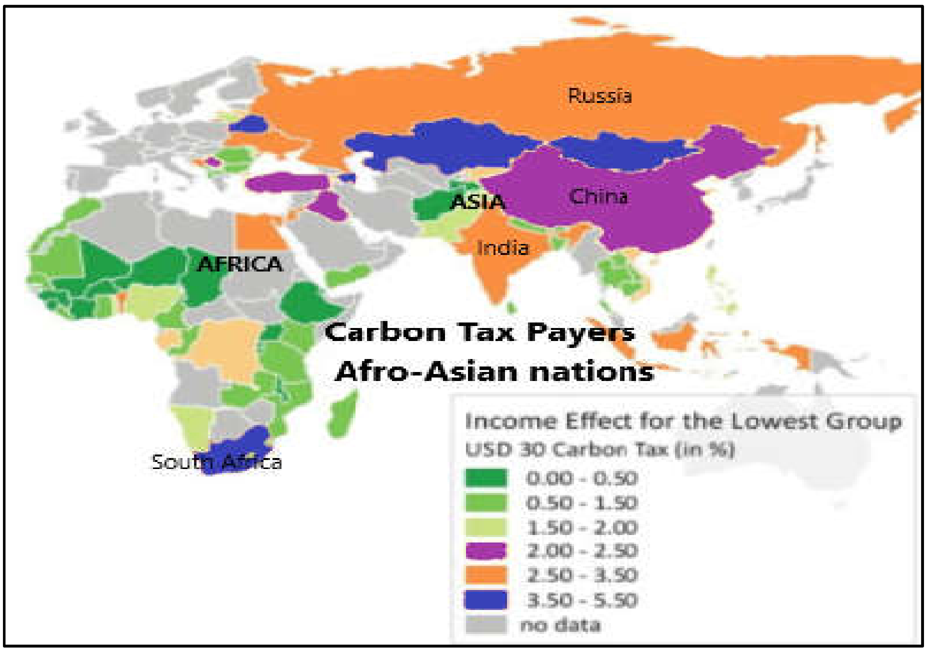

Fig. 8. Carbon tax payers of afro-Asia lower income nations (2018) as per parish protocol

Table 2. The % rate of taxes imposed on coal and fossil fuel in India upon GST and NoGST Items

Type of fuel	GST deduction India	Emission factor India	Carbon tax (INR/MT) India	Total intake 2016	Total Emission
Included in GST	**@ in (%)**	**Kg CO_2/ MBtu**	**@35 $/MT of CO_2**	**Th MT**	**%**
LPG	5% domestic 18% commercial	64.01	6791	19623	2.94%
Kerosene	5% Agricultural 18% commercial	72.30	7311	6286	3.17%
Naphtha	18%	72.80	7260	13271	3.14%
Asphalt/Bitumen	18%	75.61	7311	5938	316.54%
Coal	5%(+GST as cess or @ Rs. 400/MT)	95.35	4116	678.5MMT	1.78%
Petroleum coke	5%	102.10	7803	-	1.78%
Not included in GST					
Natural gas	0.25%	53.07	6486	45540	2808.6%
Petrol	113%	71.30	7173	21847	3.11%
HS diesel/Diesel	78%	73.16	7415 (High speed)	75014	3.21%
Aviation fuel; ATF	14.62%	70.90	7348	6262	3.18%

Source:https://shaktifoundation.in/wp-content/uploads/2018/07/Discussion-Paper-on-Carbon-Tax-Structure-for-India-Full-Report.pdf
(Source Shakti foundations .in)

5. DISCUSSION

Implementation of carbon tax of a country to fight climate anomalies is to start with a high rate, (initializing fast de-carbonization) moderate increase for about a decade and allow it to fall slowly are the proposition of some environmentalists. Some carbon players demands the application vice versa i.e. start with a low rate of carbon tax and increase gradually. Whatsoever may be the implementation process the country has to pay for reduction of CO_2 level of global atmosphere which is going to become apocalyptic to human and de-carbonization is the first priority of the 21st century.

Reinstituting by bringing back CO_2 level to pre Industrial period by de-carbonization of India's energy generation methods are the concurrent pressing demand of environmental challenges by restricting climate changes with our complex sustainability issues. Modern India's concept of food security, combating water scarcity, optimizing land-use and land cover, equality to all, biodiversity and restricting harsh climates change need to be challenged. An integrated line of attack is indispensable for maximizing co-benefits, minimizing trade-offs and successfully building a better future through reduction of GHG emission.

5.1 Hindrances over National Growth

From mid of March and April- 2020; there faced sharp decline in global carbon emissions by 17% and India by 26% compared to that of 2019 as impact of the pandemic COVID-19 and SARS CoV-2 virus and simultaneously a fault line over India's development trajectory. The social, economy, and livelihood have lost amidst the lock downs, containments, confinement social distancing has paralyzed the day-today activities and reached the World War II carbon level (source: PTI; The Economic Times, May 20, 2020, 10:52 AM IST. https://economictimes. India times. com/news/international/business/17-decline-in-global-carbon-emissions-due-to-covid-19-lock down-study/articleshow/75840410.cms?utm_source.The national developmental activities to combat climate changes through NAPCC-2008 in India by adaptation of the National Mission for Enhanced Energy Efficiency, National Solar Mission, the National Mission for a Green India, the National Mission on Strategic Knowledge for Climate Change and four more have been jeopardized Helme D, 2020 [37].

Prior to 2019, the CO_2 concentration level was upsurging@1% and it was constant during 2019 but after the outbreak of COVID-19; the India's CO_2 level declined at a faster rate making the upper air atmosphere clean and a comparative study is shown in Fig. 9. It is estimated that the global mean daily conc. of CO_2 has been dwindled to -17% (–11 to –25%) as per 2019level (Quéré C. Le, 2020[38] Evans S., Mar-2020 [39]).

The government has planned for reducing SPM pollution levels of 102 cities by 20-30% by 2024 under NCAP. USA has already allotted budgetary tax relief on 14MMtCO_2 e as post-pandemic measures. Apr-Carbon brief-2020 Evans S et al, 2020[40] and Hausfather Zeke 2020 has also reported 2020 shall be the warmest year from CarbonBrief 2020 [41].

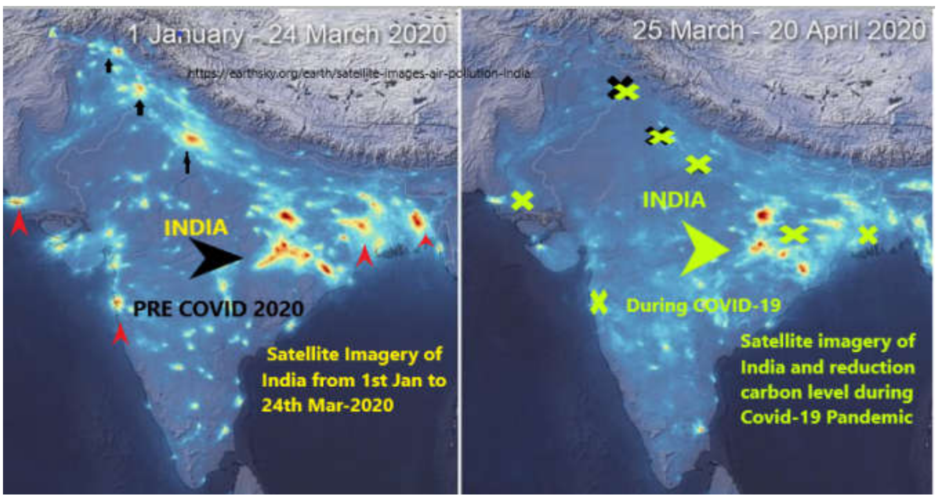

Fig. 9. Reduction of CO_2 level in atmosphere during Pre-Covid and during Pandemic-2020

The SARS-CoV-2 virus spread has triggered lowering trend of the declined of CO_2 emission (started from 2019 by implementation of carbon tax) through lockdown, containments, and confinements which has steered a steep plummet in global CO_2 emissions by 17% during initial dates of April -2020 as matched to 2019 level whereas India's CO_2 emissions had sank by 26%.The average $PM_{2.5}$ and PM_{10} level was much higher in the year 2019 but the shut downs and confinement has reduced as observed till 4th phage shutdown (25th march and 8th June) in four cities like Kolkata, Delhi, Mumbai and Bengaluru of India (Fig. 10).

The global decline was predicted to 4.4-8.0% during 1st quarter of 2020 contributed by road transport accounted 43%, power sector by 19% and by industry 25% and aviation segment by 10% respectively against India's retrospective declination was 1%, CREA-2020, Quere C. L., 2020[37], and https://www.ndtv.com/india-news/26-decline-in-indias-carbon-emissions-due-to-covid-19-lockdown-study-2231872.

5.2 Changes in Governance Dynamics

The longstanding concerns of the COVID-19 have transmuted the workstation, research arena, education, Transportation, construction, and energy sectors shall be under grim. The massive supply chain breakdown will continue till last day of the pandemic. 213 countries either developed or developing from rural to cosmopolitan have been affected including India. The post-crunch economic impetus could head towards bolstering the country's renewable energy programme as energy sector is worst affected. The GDP growth of India was 5% in the first quarter from Jan-Mar whereas the pandemic dynamic governance have resulted in declining by -09%, Keelery S., 2020 [42].

India has planned for 40% of generation of power by replacing conventional to renewable by 2030. The dynamic governance has designed to install atomic, solar, wind, geothermal, solar floating to achieve the goal. But mid of March has made rat hole on the process of growth due to the rapid spate of the pandemic COVID-19 diverting the attention of the governance to health care, hospital formulation and management, medicines and gadget procurement, and inventing vaccines in virology laboratories. The apocalyptic pandemic made the industrial workers to migrate to their native places by deserting their work places in India. The industries, educational religious institutions and daily activities were paralyzed and containment was forced to people for their lives forgetting livelihood. The administrative frame work was completely diverted for the last 7months to rehabilitate the migrants, to maintain law and orders for lock

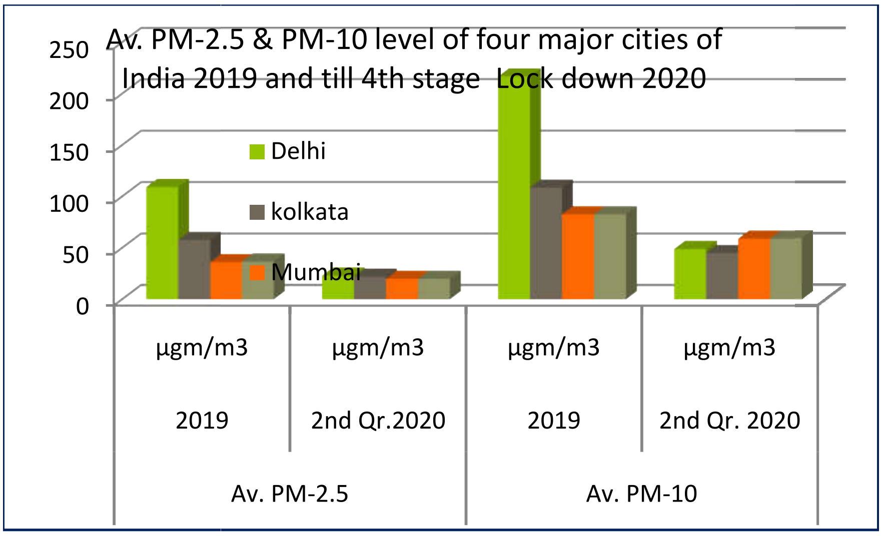

Fig. 10. The down surge in average SPM level (PM 2.5 and PM-10) in India's sky during 2019 and 25th March to 8th June 2020 (4th stage of lockdown) due to COVID-19

(Source: Roy, Esha 2020 and taken from PK Khup Hangzo article; https://www.vifindia.org/article/2020/august/21/covid-19-pandemic-and-lessons-for-climate-change-responses

downs, containments, maintaining social distances and COVID-19 isolation wards and hospitals through 5 phases of Janata Curfew from March 15th, 2020 in five phases.

By reducing the carbon level India has to change the mode of conventional energy generation to renewable energy, modernize agriculture and food system. This will maintain the ethical health standard of all living and generate higher government revenue.

In spite of war footed actions against the outbreak, World meter has reported, 30.34million confirmed cases including 950.4Th mortalities vis-à-vis India has 5.21million confirmed cases including 84.4th deaths from the outbreak of the fast mutated SARS-CoV-2 virus till 18th Sept. 2020 at 0500UST where WHO has reported less numbers but in all the cases the statistics is behind the actual as noticed in India as a part of Government management dynamics for not to keep the people in Panic. The energy generation is the major carbon producing sector along with cement production and agriculture. The high carbon tax shall be a burden to the middle and lower middle class people in India at this idle social distancing, closures, lock down and confinements.

6. CONCLUSION

All nations are not to pay carbon tax equally as they are not emitting GHG at equal rates and climatologically identical, possess equal biomass, and CO_2 emission mitigation. Optimization of storing and removal of CO_2 from atmosphere at low cost is the India's goal. COVID-19 has spiked unemployment, poverty and socio-economic instability making all the Indians to strive for life and livelihood that depleted India's GDP by 23.9% less than in April-June 2019. The tax has been surged from 50INR/MMT$CO_{2\,e}$ to 400INR/ MMTCO_2 e is very high rate of jump and creating burden to all. The government initiatives should be focused on green and clean projects like renewable energy generation, energy storage structures, green building constructions, electric and solar vehicle transport, manufacturing of low-carbon technology gadgets and carbon efficient industrial processes through carbon sinks rather emphasizing on collection of high carbon taxes as post pandemic mitigating measures.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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