# Refurbishment of Environmental Damage and Socio-Economic Consciousness relate to improvement of Climate Change

By
Dr. Hari Sadhan sarkar* and Oly Sarkar(Ghosh)**
*Calcutta Institute of Technology, Uluberia, Howrah, W. Bengal,India
**NRS Medcal College & Hospital, Sealdah, Kolkata, India

**ABSTRACT**

Demand for energy, water, food and shelter for raising the standard of lifestyle of country people is the driving force of democracy in modern days but that cause the environmental damages through Green House Gas, micro-particles emission from combustion of fossil fuels like coal, oil as well as fuel gases and incessant emissions of hydrocarbons from automobiles, oil fields, oil refineries besides industrial activities in the globe along with horizontal land encroachment decreasing greeneries in the planet earth with the decrease of oxygen/nitrogen ratio . The emissions are the main causes for increase of environmental pollution and responsible for climate change in contrast to the idea expressed by various researchers on the impact of climate change on environment although they are inter related. Mechanisms on interaction of solar/electro- magnetic radiation with suspended micro particulates and hydrocarbons in air and its impact on degradation of stratospheric ozone as well as accumulation of ozone in troposphere explains the emanation of higher wave length radiation for global warming. The land area is continuously decreasing due to spread of hutments for human shelters of increasing population in the planet causing shortage of land for greeneries to atmospheric carbon sequestration and oxygen enrichment which is to be augmented through construction of multistoried buildings for vertical accommodation of rural/ urban mass instead of horizontal spread of hutments encroaching landed area besides detoxification of obnoxious gases from atmosphere. The initiatives that are needed to promote the capacity of environment through green energy establishments in place of global fossil fuel energy starting from researchers, state administrative authorities to technical initiatives by citizens of individual countries to refurbish the health of environment for improvement of climate. The development of solar energy at cheaper capital cost is to reach the common people to reduce high carbon foot print as the immediate need of the globe. Socio-economic cultures are to be inculcated among people of developing and developed countries for use of green energy to nourish the environment for improvement of climatic conditions. Atmosphere GHG level optimization is necessary for better hygiene of biotic elements of environment.

Social works are to be intensified for improvement of environmental status. The flaws of environmental laws are to be tightened and socio-environmental economic culture is to be inculcated among citizens of states for environmental health improvement vis-a-vis control on climate change to save the planet from extinction of dominant human lives.

## 1. INTRODUCTION

The continuous improvement of human life style in the progressive world consumes more energy with increase in carbon foot-print at the present scenario of energy production resulting in pouring the environment with undesirable toxic fluids and non-fluid materials like gaseous volatile materials and micro- particles.

Environmental pollution due to the introduction of pollutants into the natural environment causes adverse effects on climate and human health. Climate change refers to a change in average weather conditions. It has been observed that climate change is related to some major forms of environment pollution (e.g., air pollution, water pollution, soil contamination, noise pollution, radioactive contamination, light pollution, thermal pollution, etc.). The issue of environment pollution and climate change has become a global concern because of:

1) Persistent and emerging pollutants to a certain extent cause climate change;
2) The variations in normal weather patterns have unfavourable effects on the physical and biological entities of the environment;
3) The role of humidity and temperature on movement of viruses (e.g. COVID-19) in its atmospheric spread was explained by the works of Chinese scientists[1]

The said work demonstrated that higher humidity and higher temperature disfavours longevity and transport of viruses but lower temperature and lower humidity favour them for longevity and movement. Further studies are needed to optimize the pollutants' (carriers') chemical characteristics, atmospheric temperature, radiation wave lengths passing through the atmosphere, etc. on survival/destroyal and movement of virus and disease germs. Study of Wei Su et. al[1]. did not indicate the role of other pollutants like SOx, NOx, and Ozone etc. in atmosphere on climate or on virus/disease germs. However, there is definite effect of SOx, NOx and PM2.5 carbon on life span and movement of virus/disease germs while spreading from source through wind movement from one continent to another as per spinning characteristics of mother earth round its axis. Since SOx, NOx are acidic in character their existence will harm the floating virus/ germs. Precipitation is another tool of mother earth with which the virus/germs are falling on the surface of the earth and the soil germs take care of them.

According to UN report, habitats/ cities consume 78 per cent of the world's energy and produce more than 60 per cent of greenhouse gas emissions. Yet, they account for less than 2 per cent of the Earth's surface. Reduction of greeneries makes worse the problem. According to the IPCC report, limiting global warming to 1.5 degrees Celsius would "require rapid and far-reaching transitions in uses of energy, land, urban and infrastructure (including transport and buildings), and industrial systems". The problem of GHGs will multiply when another 2.5 billion people will reside in urban areas by 2050- nearly 90 per cent of them in cities of Asia and Africa. The good news is that cities around the world have already started taking action to use alternative energy sources. Efforts by policy makers and administrators to address climate change, however, will need to accelerate to keep pace with population growth and the rapid change in environmental conditions.

The effects of climate change are worse among poor and low-income communities because many live on the margins of society, in unstable structures, and in areas more susceptible to flooding, landslides, earthquakes, cyclones/typhoons and face epidemics, inadequate purchase capacities, inadequate resources and reduced access to emergency response systems in many countries of the globe. This is even more pronounced in developing countries.

In the report of 26th October 2018, the World Health Organization (WHO) indicated that 93 per cent of the world's children breathe toxic air every day. According to the report, 1.8 billion children breathe air that is so polluted it puts their health and development at serious risk. WHO[2] estimates that in 2016, about 600,000 children died from acute lower respiratory infections caused by polluted air. The report highlights that "More than 40% of the world's population – which includes 1 billion children under age group of 15 - is exposed to high levels of household air pollution from mainly cooking with polluting technologies and fuels." In developing countries, women frequently rely on coal and biomass fuels for cooking and heating and obnoxious fumes generated from cooking media putting them and their children at higher risk to the effects of home pollutants. Many times this cause permanent allergies to those associated to cooking areas. This is being supported by studies of environment specialists[3] this persisting problems are acute in Asia-Pacific countries and the major role is played by higher concentration of polycyclic aromatic hydrocarbons, active micron level carbon  and metals in haze compared to non-haze aerosols. WHO recommends and supports the implementation of policies to reduce air pollution, including better waste management, the use of clean technologies and fuels for household cooking, heating and lighting to improve the quality of in-house air.

The reduction of greenhouse gases and air pollution is one of the goals of the UN Environment’s  Share the Road Programme, which encourages walking and cycling than hydrocarbon driven transport systems . The agency endorsed an award-winning bike-sharing scheme in Hangzhou, China, which started out to provide public transport, but ended up alleviating traffic congestion and drastically improving air quality. “Hangzhou is a great example of how cities can introduce initiatives like bike sharing to encourage people to get out of their cars and reduce air pollution,” said Rob de Jong, Head of UN Environment's Air Quality and Mobility Unit. Together with the WHO and the Climate and Clean Air Coalition, UN Environment is part of the global Breathe Life campaign, helping to mobilize cities and encourage individuals to protect the planet from effects of air pollution.

The researches undertaken by various authors on the cause of environmental damages are reproduced below and they tried to relate the environmental damages caused by climate change but concept of vice versa was not much addressed to improve the environmental status and its good effect on  climate change have not been much studied at various regions of the globe. Impact of climate change on environment have been reviewed by various researchers[1, 2]. The Graphical presentation of experimental data on Sarajevo valley[3] surrounded by high Olympic Mountains- Bjelasnica, Igman, Jahorina, etc. was explained but the said change in climate has been due to variation of environmental parameters. They have shown that one of the main parameters of climate characteristics of Sarajevo's field work is temperature inversion. It has
Influence on temperature gradient, on appearance and disappearance of fog due to air pollution which is evident from its effects on the temperature at the middle of the mounts, especially during winter period. Their experiment explained the cause of smog during war and no smog incidence after the war period –these

experiments explain the effect of pollutants on environment and consequently on climate after stoppage of war. The work of Bronstein, et al.may be reviewed where data from the meteorological station was used. They studied near Bjelave (630 meters), Butmir (518 meters), N.Sarajevo (535 meters) and Bjelasnica (2067 meters) over 1975-2005 to get practical data of pollutants in the atmosphere and may be compared on the following points of their observations:

1. Correlation between air pollution and temperature inversion
2. The results of experiment indicate the existence of high correlation between air pollution and temperature inversion (annual values - period April -March).
3. Decrease of air pollution was followed by appropriate decrease of number of days with inversion and number of days with fog.
4. Graph[4] shows annual arithmetic means of concentration of sulphur dioxide and black smoke during the period 1974/75 - 2005/06, measured on station Sarajevo – Bjelave.
5. Graph 2 shows annual number of days with temperature inversion in Sarajevo valley, during the period 1974/75 - 2005/06, measured on stations - Sarajevo - Bjelave and Sarajevo -Butmir.
6. Visual correlation between these two graphs obviously indicates Statistical correlation of these values as 0, 65, until year 2006.
7. Relatively high correlation exists when two different physical dimensions are compared. However, correlation of these values until year 2006 is lower, about 0.36.

It was reported by them that in last few years decrease of upper limit of inversion layer was noticed. Before the war, upper limit of inversion was about 900 meters, and after the war it is occasionally below 600 meters (above sea level).

The said workers admitted that because of the lack of adequate measurements on different spots, and especially aero sondage measurements, it was not adequate for analyses of the causes of this issue particularly climate change. With the help of their complex model of temperature inversion and air pollution, they had explained that structure and geometry of particles of pollution before and after the war were different. Before the war it was industrial emission, but in the present day after the war it was the traffic pollution that predominates. The Sarajevo valley experiments showed how level of inversion changes with load of pollutants in atmosphere. The said experimental data is in agreement with fluctuation of $SPM_{2.5m\mu}$ (black shoots ), VOCs and ozone concentrations with height of air column over sea level in and around the cities of developing and developed countries[5a, 18] . The continuous reduction of oxygen level in the global atmosphere for the last 1000 years is a challenge to the survival of red blood animals which is of global concern as appeared from the data published by various authors[6]. Continuous removal of oxygen molecules from air by various industrial activities is thinning the oxygen level in the atmosphere, increasing the likelihood that incoming sunlight will make it easy access to the earth's surface without getting scattered away.

More sunlight means more evaporation from the earth's surface, more ozone concentration in lower tropospheric region of earth which leads to higher exposure of biotics to UV radiation and increase in humidity. As humidity levels rise, temperatures also increase because water vapor is a potent heat-trapping greenhouse gas. Adding oxygen molecules has the opposite effect: a thicker layer in the atmosphere, with more scattering of incoming sunlight, reduced surface evaporation, and less heat trapped by water vapor. In their Science paper, Poulsen and two colleagues quantified the effect of changing oxygen levels on climate using an atmospheric global climate model to account for changes in atmospheric density, mass and molecular weights.

It was focused on the mid-Cretaceous, a period characterized by high atmospheric carbon dioxide levels and the warmest conditions of the last 100 million years. Specifically, they focused on Cenomanian Age, from 100.5 million years ago to 93.9 million years ago.

A series of simulations were developed in which oxygen levels varied from a low of 5 percent to a high of 35 percent. It was found that decreased oxygen levels led to substantial increases in global precipitation rates and temperature. Changing oxygen concentrations could help explain features of the paleo-climate record not accounted for by variations in carbon dioxide levels, such as warm polar temperatures and unexpectedly high precipitation rates in some periods.

Though previously unappreciated for its influence on climate, changing atmospheric oxygen levels have long been recognized for shaping the course of life on Earth. Billions of years ago, for example, photosynthesizing Cyanobacteria in the oceans released massive amounts of oxygen that eventually made it possible for animals to colonize the land.

Thus continuous depletion of oxygen level in the atmosphere, the oxygen concentration in each breathing cycle of animals is not enough for proper oxidation of food materials taken by them and the replenishment of oxygen level for ferrous hemoglobin – to ferric hemoglobin cycle in artery-vein system being /to be maintained by heart causing indigestion of food materials, decreasing potency to attack by disease germs are the root cause of present generation of the globe with the result of decreasing heights of red-blood animals, lower potency to fight against disease germs, failure to prevent the various types of virus attacks. This is the scenario of mass scale attack by COVID-19 besides other causes that requires immediate studies to save mankind in the planet. Each biotic environmental element is now facing direct threat by environmental pollutants causing climate change which further damages the environmental protection given by mother earth so long.

### 1.1. Effect of Environmental pollution on climate in US Air

The impression of the author is that the pollution results from the combination of high emissions from various sources and unfavorable weather conditions during the studies. The regulatory authorities are supposed to be active to protect public health through emission control regulations. But still there is substantial air pollution as evidenced from experimental data published by various authors. The resulting improvements in air quality may be evidenced by changes in weather statistics, i.e., changes in climate. It is a fact that the countries are entering an era of rapid change in life style with implication of electromagnetic wave clusters endangering vegetation and other components of environment (noticed large damage to coconut, brittle nuts, etc. in developing and developed countries ) causing environmental change, the implications of air quality need to be better understood, both for the purpose of air quality management, as well as biosphere as a whole besides one of the societal consequences on climate change.

It was established by researchers[7] that besides others the two air pollutants of most concern for public health are surface ozone and particulate matter. Ozone is produced in the troposphere by photochemical oxidation of CO, methane and higher hydrocarbons, and non-methane volatile organic (HOx) radicals and increase of any of these constituents will definitely cause environment to danger in respect of climate change which was being established[7] in the observations of of researchers [8] at Sarajevo valley.

Daniel J. Jacob et al[9] had shown that during summer, ozone pollution mostly occurs due to photochemical interaction of (HOx) and (NOx), but is limited by non-methane volatile organic compounds (NMVOC) under highly polluted conditions of atmosphere even during non-summer season. The ionospheric ozone is depleted by photolysis in the presence of water vapor of the atmosphere. Uptake and transport on hemispheric scales in the free troposphere add atmospheric lifetime of ozone ranging from a few days in the boundary layer to weeks in the troposphere. Anthropogenic ozone and methane ventilated from the source continents by vegetation in the dry boundary layer is an important sink in the continental boundary layer ( 2 km).

Although NMVOCs, CO, SOx and NOx have large sources from combustion, municipal wastes and vegetation, methane has a number of biogenic and anthropogenic sources. OH originates mainly from atmospheric oxidation of water vapor and hydrologic cycles in the atmosphere with other hydrogen oxide.

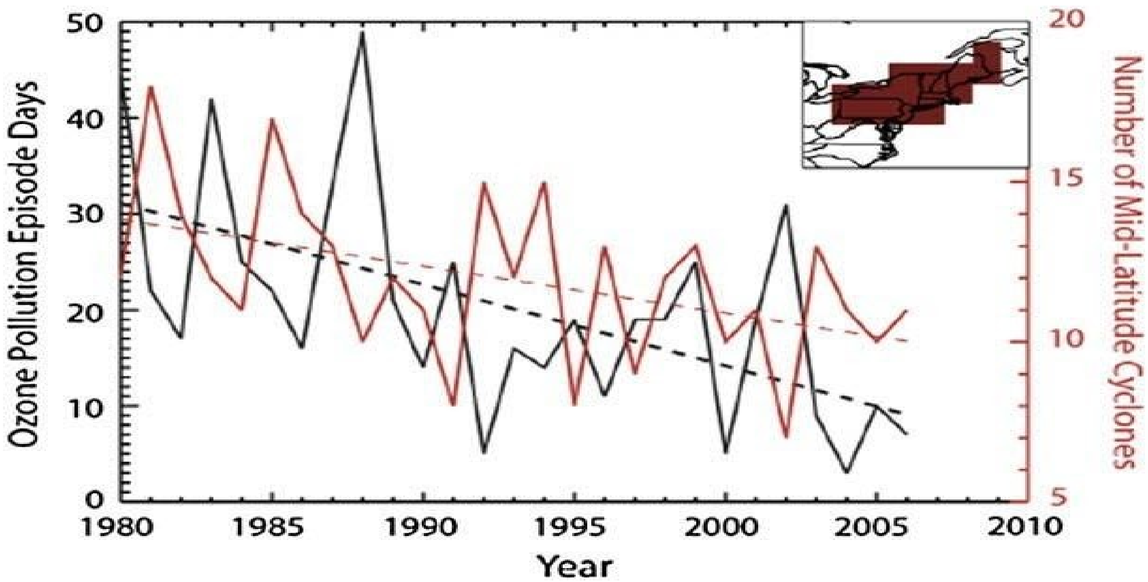



Fig.1. 1980–2006 trend in the number of ozone pollution episodes (black) and the number of mid-Latitude cyclones (red) in the northeastern U.S. in summer (Jun- Aug) for 1980-2006 has been shown by Leibensperger et al. [12]

Surface ozone which is of increasing concern for its concentration being higher than air quality standards as per studies[10] [Holloway, T., Fiore, A., Galanter Hastings, M.,2003] presented above.

As per the studies of Leung,et al[11] [Leung, L.R., Gustafson, W.I., 2005 ], the Solid Particulate Matter (SPM) includes as principal components - sulfate, nitrate, organic carbon, elemental carbon, soil dust, sea salt etc., the average concentration
of ozone exceeds 85ppb during summer in Asia, US and Arab region which is manifested in the form of cyclones in the cyclone tracks of each year. As per observation of Leung, L.R. et al the first four components are mostly present as fine particles less than 2.5 mμ diameter (PM2.5), and these are of most concern for human health. Sulfate, nitrate and organic carbon are produced within the atmosphere by oxidation of SOx, NOx, and NMVOCs. Carbon particles emitted directly by combustion and auto exhausts adsorbs Nitrate and organic compounds (VOCs) exchange between the particle and gas phases, depending on back-ground temperature.

Particulate matter (PM) pollution, such as PM2.5, is of concern due to health and climate change impact. High volume air samplers with two -stage filter pack have been used to collect weekly ambient air samples, i.e. coarse particles (PM >2.5) and fine particles (PM2.5) from regions of utmost importance. From the published report of TERI, India, the highest monthly levels of PM2.5 and PM>2.5 were in December 2016 and November 2015 of 75 ± 5 and 55.2 ± 8 μg/m3, respectively.
The findings of this study suggest that strict controls of $PM_{2.5}$ concentrations in South and South East Asia (SSEA) are urgently required.

The studies of Yusheng Shi et al[12a] had shown that fine particulate matter ($PM_{2.5}$) poses a potential threat to human health, including premature mortality under long-term exposure based on a long-term series of high-resolution (0.01° × 0.01°) satellite-retrieved $PM_{2.5}$ concentrations, this study estimated the premature mortality attributable to $PM_{2.5}$ in SSEA from 1999 to 2014. Then, the long-term trends and spatial characteristics of $PM_{2.5}$-induced premature deaths (1999–2014) were analyzed using trend analyses and standard deviations. Results showed the estimated number of $PM_{2.5}$-induced average annual premature deaths in SSEA was 1,447,000. The numbers increased from 1,179,400 in 1999 to 1,724,900 in 2014, with a growth rate of 38% and net increase of 545,500. Stroke and ischemic heart disease were the two principal contributors, accounting for 39% and 35% of the total, respectively. High values were concentrated in North India, Bangladesh, East Pakistan, and some metropolitan areas of Southeast Asia. An estimated 991,600 deaths in India was quantified (i.e., ~69% of the total premature deaths in SSEA). The long-term trends (1999–2014) of $PM_{2.5}$-related premature mortality exhibited consistent incremental tendencies in all countries except Sri Lanka. The findings of this study suggest that strict controls of $PM_{2.5}$ concentrations in SSEA are urgently required.

Seasonal variation of PM is location-dependent; in general, PM needs to be viewed as an air quality problem throughout the year. PM is efficiently scavenged by precipitation which functions as its main atmospheric sink, resulting in atmospheric lifetimes of more days in the boundary layer and a few weeks in the free troposphere (similar to ozone). Forest fires, agricultural wastes fires in the open air etc. are the main sources of air pollution which even can be transported on intercontinental spaces as is happening in the growing mechanized crop cutting facilities in South East Asian (SEA) countries.

**1.2. Effect of air quality on climate change**

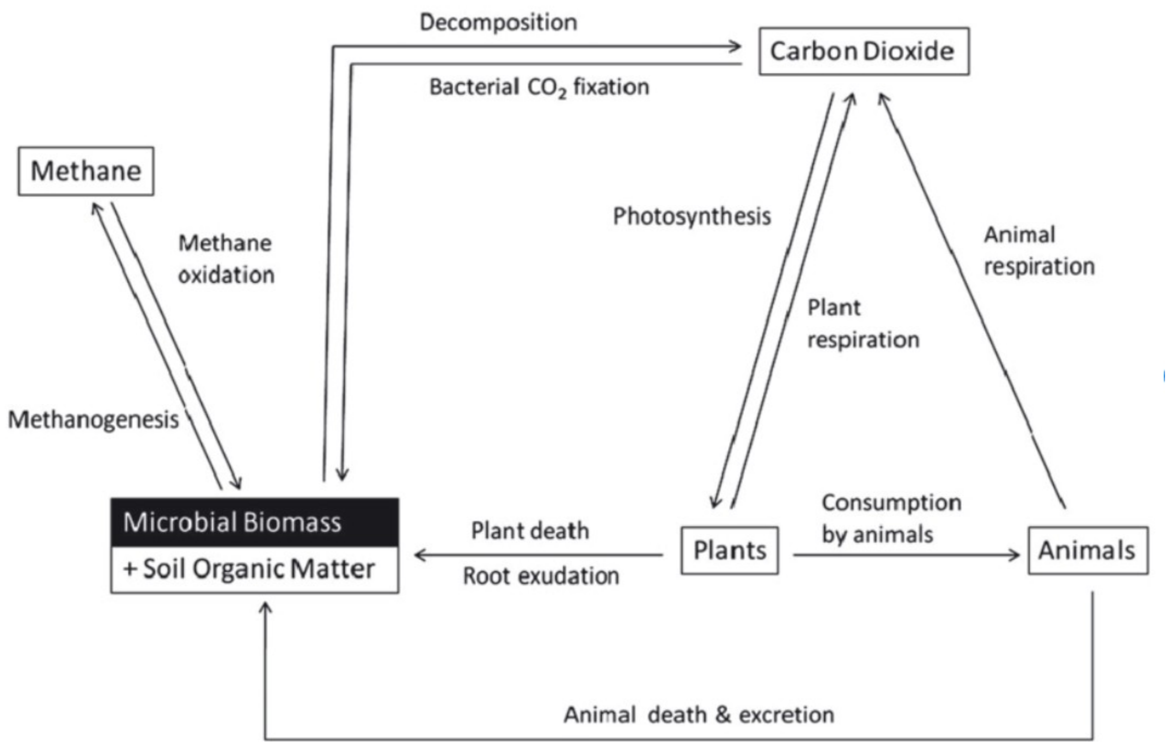
It was noticed by the researchers that changes in climate affect air quality by perturbing ventilation rates (wind speed, mixing depth, convection, frontal passages), precipitation scavenging, dry deposition, chemical production and loss rates, natural emissions, and background concentrations. The main player of variability in air quality is 2.5mµ solid particulates along with VOCs in the upper troposphere (at cloud forming zone) where water vapor cannot form cloud. The VOC along with Micro level particulates (mostly free carbon) accumulation in upper atmosphere of troposphere sometimes repulses water vapour from cloud formation. The cloud formation is favoured when these pollutants are swept away from equatorial region towards polar region due to high temperature difference between these two regions and high wind velocity during spinning of earth with increasing concentrations of SPM2.5 mµ( global cyclonic separation of SPM2.5 mµ at lower tropospheric region helping for shelter to viruses and VOCs resulting in lower precipitation rates, higher heat accumulation in the lower tropospheric region.

The relation of increase in ozone concentration in the tropospheric region with increase in surface temperature of earth is very much co-related from the observation of researchers[6] and that a record high number of exceedances of ozone was experienced during summer of 1988 the hottest on record in the

Northeast due to the eruption of Mt. Pinatubo where as low number of exceedances of ozone was reported by researchers in the coolest summer of 1992 during the period of 1980-2006. The difference in the number of episodes between 1988 and 1992 was a factor of 10[13]. The above condition is gradually being reached due to continuous pouring of GHG gases into the atmosphere for increased fossil fuel fire and other human activities at industries and non-point traffic sources of air pollution besides addition of those gases from anthropogenic sources as per chemistry – climate systems. Change is forced by a perturbation to anthropogenic emissions resulting from socio-economic factors external to the Chemistry-climate systems.

It was established that Ozone and PM interact with solar and terrestrial radiation and as such are recognized as important climate forcing agents[14]. Because of this dual role, the effect on climate change by surface air quality is often framed in the broader context of chemistry-climate interactions[13, 13a, 13b], as shown diagrammatically in Fig.2 proving the fact of perturbation to surface air quality.

As per present author’s observation, the study by above authors did not consider the effect of hydrocarbons concentration in atmosphere from various sources-industrial (Refineries, fertilizer, etc.), traffic, anthropogenic, etc. Change in climate is effected by anthropogenic emissions from biosphere, dust, forest fires, lightning, etc. affecting air quality.




Microbial communities and carbon cycle.

Fig. 2. Carbon cycle showing GHG contribution from nature to atmosphere.

The findings of foregoing authors made to understand that it is the environmental quality whose variation influences the climate. This review thus reveals that increased air pollutants have direct impact upon health and climate and vice-versa. The findings of Neal Fann et al[16]explained impact of Ozone on Health. Albertine, J. M.et al[17] explained the impact of increased $CO_2$ and Ozone load in atmospheric air on the public health and climate change - sometimes cause natural disaster by tycoon, cyclone, etc.

The increased load of pollutants like Ozone, GHG, VOCs, micron level particles etc. in the atmosphere, results in climate change which will make it harder for any given regulatory approach to reduce ground-level ozone pollution in the future as meteorological conditions become increasingly conducive to forming ozone over most of the part of earth unless drastic measures be taken by the country authorities for immediate emission reductions to reduce the super cyclonic conditions at various regions of the globe to maintain equilibrium condition of the nature. Environmental pollution of heavy metals like mercury from particulates emissions from large and micro-level industrial sources (fly ash from fossil fuel fire systems of industrial activities- power plant, steam generators, etc.) cause continuous loading of micron level particulates on environment with harmful impact on vegetation and animals who have freedom to nourish in nature's mass and energy.

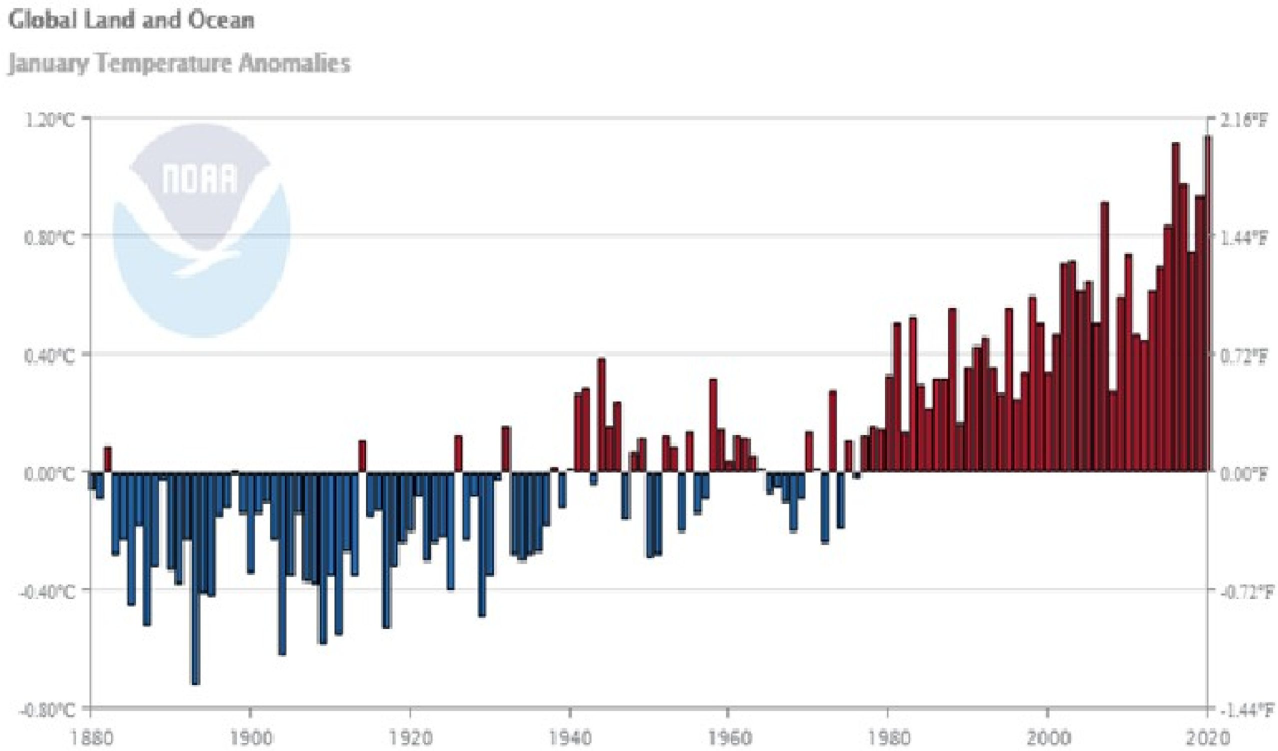
**2.1. Before the Industrial Revolution:**

It was experimentally established that abrupt increments of most of the green house gas (GHGs) in atmosphere has occurred since nineteenth century. It was reported by various researchers that 40 per cent more $CO_2$ increase in the atmosphere as compared to 200 years ago might be from carbon emissions from industries and transport systems. 1998 was being the hottest year in the warmest decade of the warmest century for one thousand years due to unabated carbon emission whose impact caused heat wave in Europe in 2003 killing over 30,000 people with the appearance of severe drought in the Amazon region in 2005 turning the Amazonian Rainforest of carbon sink - into a source of carbon emissions endangering flora and fauna., Arctic ice had melted by significant amounts (2007); 2009 was the fifth warmest year since 1850; and 2010 has broken all records for extreme weather events.

## 2.2. Studies of global atmospheric parameters

The published data on global atmospheric parameters are presented below to show how global pandemics/epidemics are initiated due to their abnormal variations. The following global parameters are encrypted below on Temperature and Precipitation Map from National Centre for Environmental Information [18]

The global land and ocean surface temperature for January 2020 was the highest in the 141-year record, with a temperature departure from average of 1.14°C (2.05°F) above the20th century average. This value was only 0.02°C (0.04°F) higher than the now second highest January temperature departure from average set in 2016. The four warmest Januaries on record have occurred since 2016, while the 10 warmest Januaries have occurred since 2002. The only Januaries with a global land and ocean surface temperature departure from average above 1.0°C (1.8°F) occurred in 2016 and 2020.

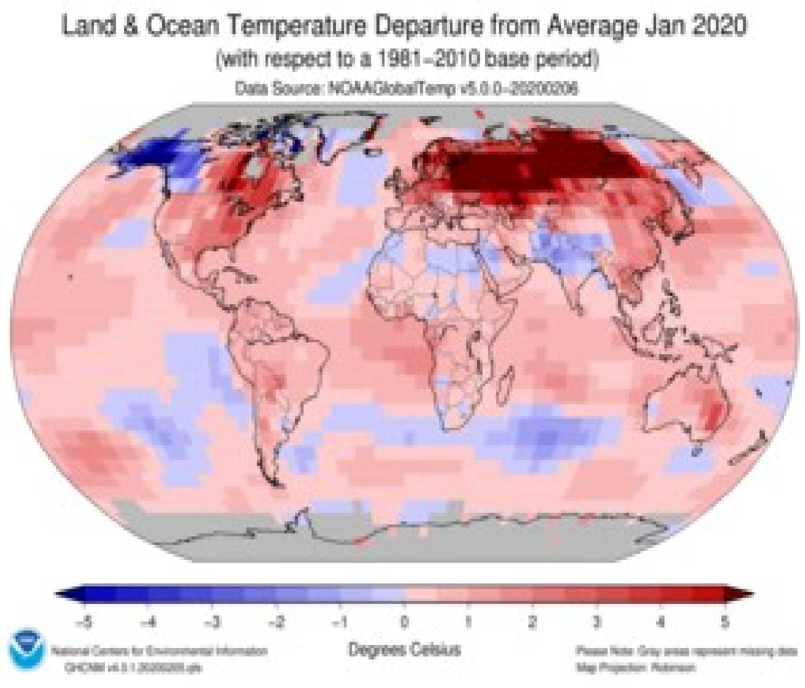



The January global land and surface temperature departure was also the fourth highest monthly temperature departure in the 1681-month record. Only March 2016, February 2016, and December 2015 had a greater temperature departure; all months that had a strong warm phase El Niño / Southern Oscillation (ENSO) present in the tropical Pacific Ocean. ENSO, which is a periodic fluctuation in sea surface temperature and air pressure of the overlying atmosphere across the tropical Pacific Ocean, can influence global temperatures. A warm phase ENSO, also known as El Niño, tends to have a warming influence on global temperatures, while the cold phase (La Niña) tends to have a cooling influence.

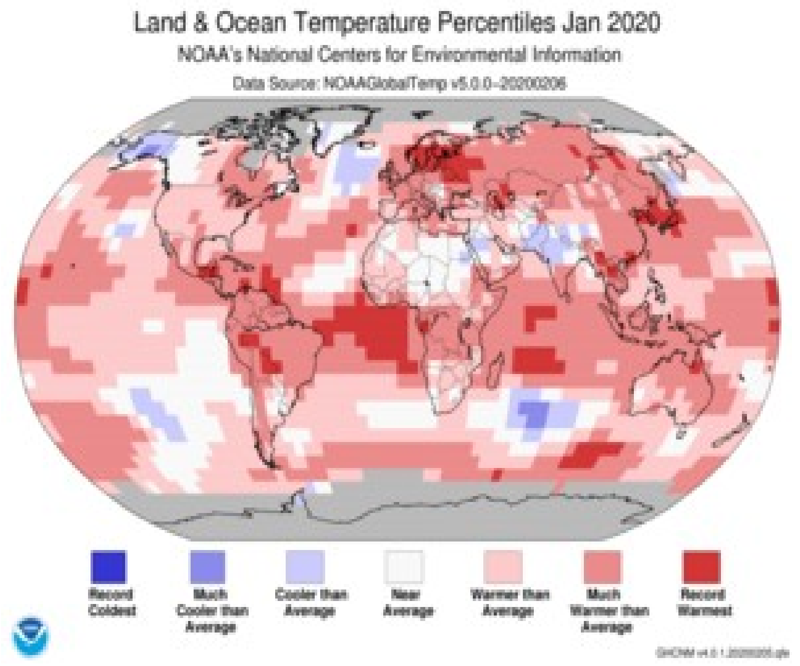
However, the January 2020 global land and ocean surface temperature departure from average was the highest for any month during ENSO neutral conditions, meaning El Niño or La Niña was not present in the tropical Pacific Ocean. March 2017 (+1.08°C / +1.94°F), December 2019 (+1.05°C / +1.89°F), and February 2017 (+1.02°C / +1.84°F) were the other months where the global land and ocean surface temperature departure from average was above 1.0°C (1.8°F) during ENSO neutral conditions in the tropical Pacific Ocean.

The global land-only surface temperature departure of +2.12°C (+3.82°F) was the highest on record for January, besting the previous record set in 2007 by 0.15°C (0.27°F). This was also the third highest global land surface temperature for any month in the 1,681-montlhy record. The months of March 2016 (+2.53°C / +4.55°F) and February 2016 (+2.43°C / +4.37°F) were warmer. The January 2020 global ocean surface temperature was the second highest for January on record with a temperature departure from average of +0.78°C (+1.40°F). Only January 2016 was warmer at +0.91°C (+1.64°F).

The Northern Hemisphere land and ocean surface temperature departure from average was also highest on record at 1.50°C (2.70°F) above average. This value exceeded the previous record of 1.38°C (2.48°F) set in January 2016 by 0.12°C (0.22°F). The Southern Hemisphere had its second warmest January on record, with a land and ocean surface temperature departure from average of 0.78°C (1.40°F) above average. Only January 2016 was warmer.




January 2020 Blended Land and Sea Surface Temperature Anomalies in degrees Celsius




January 2020 Blended Land and Sea Surface Temperature Percentiles

The first month of the year was characterized by warmer-than-average temperatures across much of the world's land and ocean surface. The most notable warm temperatures were observed across much of Russia and parts of Scandinavia and eastern Canada, where temperatures were at least 5.0°C (9.0°F) above average. Other notable warm temperatures were observed across parts of the eastern contiguous U.S., central Europe, and eastern Australia, where temperatures were more than 2.0°C (3.6°F) above average. Meanwhile, the most notable cool temperature departures from average were observed across much of Alaska and parts of western Canada, where temperatures were at least 4.0°C (7.2°F) below average. Record warm January surface temperatures present across parts of Scandinavia, Asia, the Indian Ocean, the central and western Pacific Ocean, the Atlantic Ocean, and Central and South America. However, no land or ocean areas had record-cold January temperatures.

Select national information is highlighted below. It may be noted that different countries report anomalies with respect to different base periods. The information provided here is based directly upon these data:

- North America had its 16th warmest January in the 111-year record.

- The contiguous U.S. had its fifth warmest January in its 126-year record with a temperature 3.0°C (5.4°F) above the 20th century average.

The Hawaiian region had its second warmest January on record, while Alaska had its coldest January since 2012 and tied with 1970 as the 13th coldest January on record.

The Caribbean region had its second warmest January on record, with a temperature 1.01°C (1.82°F) above average. Only January 2016 was warmer.

- January 2020 was South America's second warmest January on record at +1.37°C (+2.47°F). Only January 2016 was warmer.
- Europe also had its second warmest January on record with a temperature departure from average of +3.16°C (+5.69°F), trailing behind the record warm January of 2007 (+3.32°C / +5.98°F). This was also Europe's seventh highest monthly temperature departure from average in the 1,321 monthly records. February 1990 had the highest monthly temperature departure from average at +4.11°C (+7.40°F).
- The United Kingdom had its sixth warmest January since national records began in 1884 with a national average temperature of 5.6°C (42.1°F), which is 2.0°C (3.6°F) above the 1981–2010 average. Of note, England and Scotland had their fifth warmest January on record.
- Norway had its second warmest January since national records began in 1900. The national January 2020 temperature of 6.1°C (43.0°F) was only 0.1°C (0.2°F) cooler than the record warm January of 1989. Several stations across eastern Norway had their warmest January on record.
- Finland had its second warmest January on record, falling behind January 1925. According to the Finnish Meteorological Institute, up to 60% of Finland had its warmest January on record with many locations observing temperatures that were 7°–8°C (12.6°–14.4°F) above the 1981–2010 average.

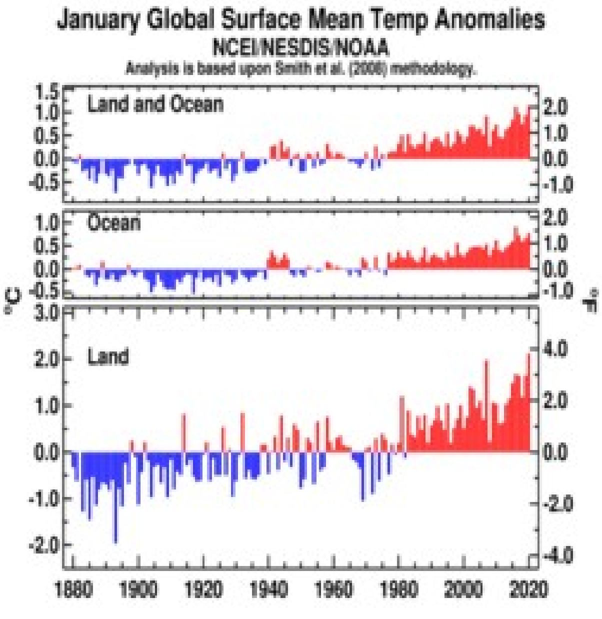
- Denmark had its warmest January since national records began in 1874, with a national average temperature of 5.5°C (41.9°F) and 3.9°C (7.02°F) above the 1991–2020 average. The previous record of 5.0°C (41.0°F) was set in 2007.
- France had its 10th warmest January since national records began in 1900. The January 2020 national average temperature of 7.1°C (44.8°F) was 2.2°C (4.0°F) above average.
- The January 2020 temperature for Asia was 3.46°C (6.23°F) above average and the second highest for January on record. This is 0.11°C (0.20°F) less than the record warm January of 2007. This was also the sixth highest monthly temperature departure from average for Asia in the 1,321 monthly records. Asia's March 2008 temperature departure of +4.27°C (7.69°F) was the highest on record.
- Hong Kong had its highest maximum and mean temperatures on record at 2.6°C (4.7°F) and 2.3°C (4.1°F) above average, respectively. Hong Kong's minimum temperature for January 2020 was also 2.3°C (4.1°F) above average and the second highest on record.
- Oceania had its third warmest January on record at +1.61°C (+2.90°F), trailing behind 2019 (+2.51°C / +4.52°F) and 2013 (+1.79°C / +3.22°F).
- Australia's mean temperature during January 2020 was 1.45°C (2.61°F) above the 1961–1990 average, resulting in the third warmest January in the 111-year record. The national minimum and maximum temperatures were also 1.45°C (2.61°F) above average and were the third and ninth highest, respectively, on record. Regionally, Queensland had its second highest mean temperature on record at 2.38°C (4.28°F) above average. New South Wales mean temperature was the fifth highest for January on record.

| JANUARY | ANOMALY | | RANK (OUT OF 141 YEARS) | RECORDS | | |
|---|---|---|---|---|---|---|
| | °C | °F | | YEAR(S) | °C | °F |

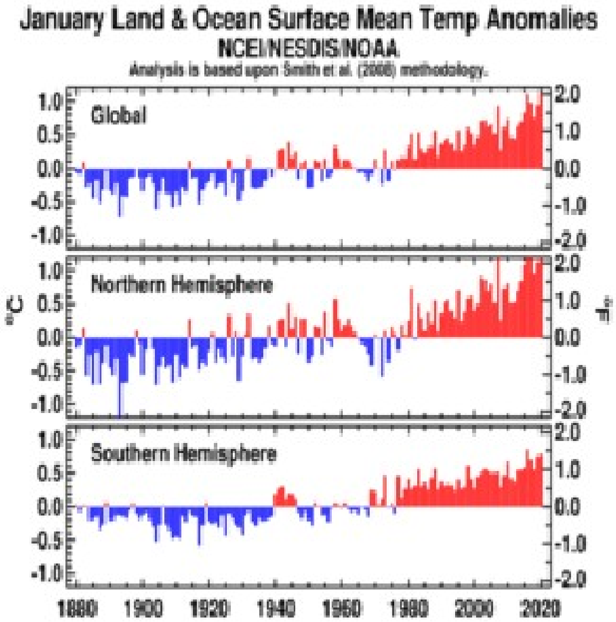
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Global** | | | | | | | |
| Land | +2.12 ± 0.21 | +3.82 ± 0.38 | Warmest | 1st | 2020 | +2.12 | +3.82 |
| | | | Coolest | 141st | 1893 | -1.97 | -3.55 |
| Ocean | +0.78 ± 0.15 | +1.40 ± 0.27 | Warmest | 2nd | 2016 | +0.91 | +1.64 |
| | | | Coolest | 140th | 1917 | -0.53 | -0.95 |
| Land and Ocean | +1.14 ± 0.17 | +2.05 ± 0.31 | Warmest | 1st | 2020 | +1.14 | +2.05 |
| | | | Coolest | 141st | 1893 | -0.72 | -1.30 |
| **Northern Hemisphere** | | | | | | | |
| Land | +2.44 ± 0.29 | +4.39 ± 0.52 | Warmest | 1st | 2007, 2020 | +2.44 | +4.39 |
| | | | Coolest | 141st | 1893 | -2.51 | -4.52 |
| | Ties: 2007 | | | | | | |
| Ocean | +0.91 ± 0.14 | +1.64 ± 0.25 | Warmest | 2nd | 2016 | +1.10 | +1.98 |
| | | | Coolest | 140th | 1904 | -0.53 | -0.95 |
| Land and Ocean | +1.50 ± 0.20 | +2.70 ± 0.36 | Warmest | 1st | 2020 | +1.50 | +2.70 |
| | | | Coolest | 141st | 1893 | -1.32 | -2.38 |
| **Southern Hemisphere** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Land | +1.29 ± 0.14 | +2.32 ± 0.25 | Warmest | 2nd | 2019 | +1.44 | +2.59 |
| | | | Coolest | 140th | 1918 | -0.91 | -1.64 |
| Ocean | +0.69 ± 0.15 | +1.24 ± 0.27 | Warmest | 2nd | 2016 | +0.78 | +1.40 |
| | | | Coolest | 140th | 1917 | -0.58 | -1.04 |
| Land and Ocean | +0.78 ± 0.15 | +1.40 ± 0.27 | Warmest | 2nd | 2016 | +0.86 | +1.55 |
| | | | Coolest | 140th | 1917 | -0.59 | -1.06 |

The most current data can be accessed via the Global Surface Temperature Anomalies page



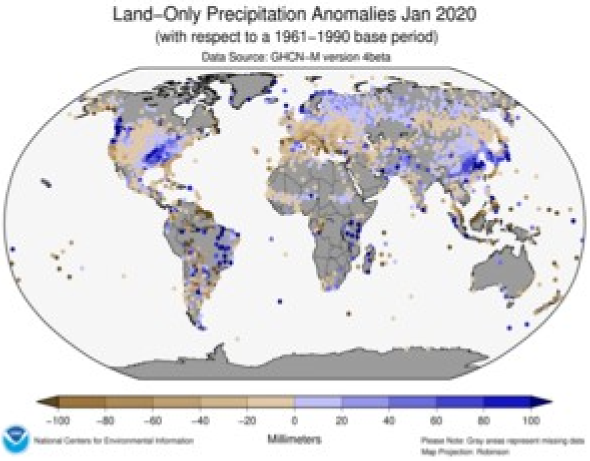

January Global Land and Ocean Plot



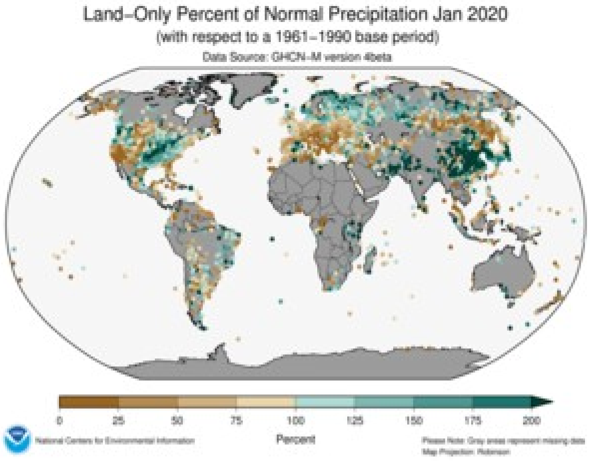

January Global Hemisphere Plot

# Precipitation

## January Precipitation




January 2020 Land-Only Precipitation Anomalies




January 2020 Land-Only Precipitation Percent of Normal

The maps shown above represent precipitation percent of normal (left, using a base period of 1961–1990) and precipitation percentiles (right, using the period of record) based on the GHCN dataset of land surface stations. As is typical, precipitation anomalies during January 2020 varied significantly around the world.

January precipitation was generally drier than normal across parts of Alaska, the southwestern contiguous U.S., central and western Europe, New Zealand, and parts of eastern Asia. Wetter-than-normal conditions were notable across the northwestern and eastern half of the contiguous U.S., eastern Brazil, northern Europe, western and central Russia, and parts of southern and eastern Asia.

Select national information is highlighted below. (Please note that different countries report anomalies with respect to different base periods. The information provided here is based directly upon these data):

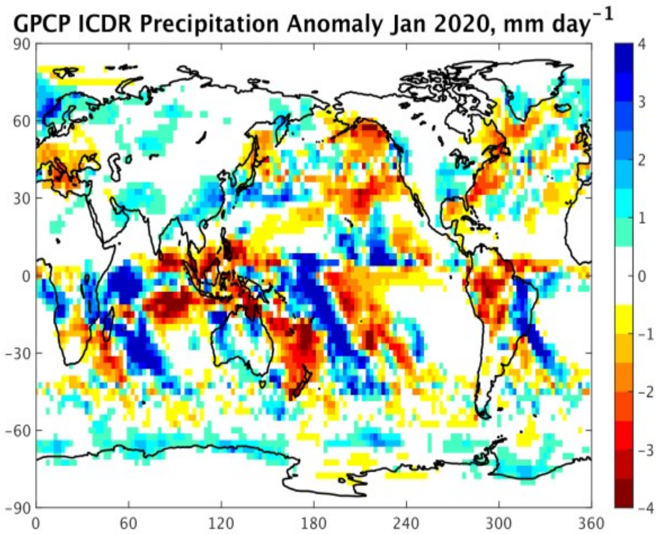
- Alaska had its driest January since 2006 and the 14th driest on record.
- While much of the western half of Spain had below-average precipitation, much of the east had above-average conditions.

Overall, Spain's January 2020 was near average at 11% above average precipitation for January. Several locations set new high January precipitation records. Of note, the Barcelona airport had a total of 174 mm of precipitation for the month, the highest on record for January.

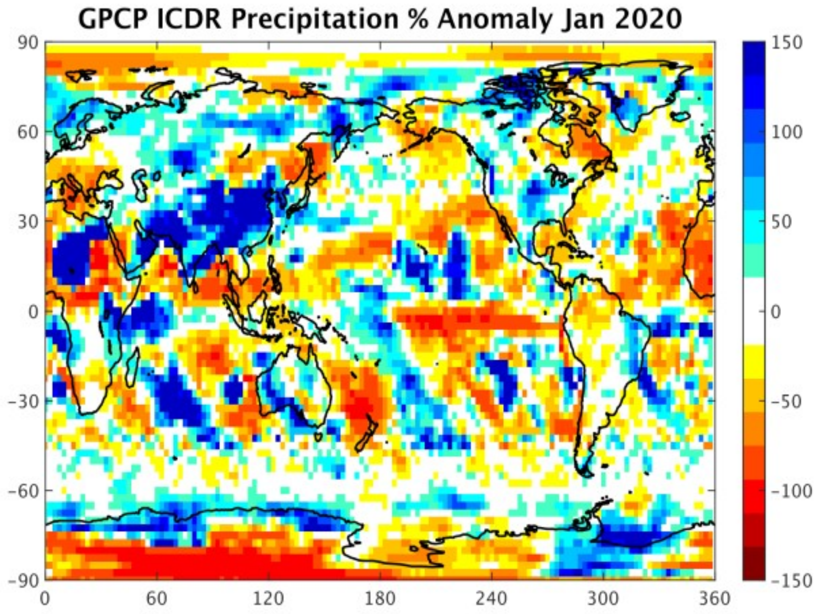
Australia, as a whole, had 12% above average January precipitation. The region with the highest precipitation was Western Australia, receiving 59% above average precipitation for January. However, New South Wales and South Australia had 36% and 25% below average precipitation, respectively.

## Global Precipitation Climatology Project (GPCP)

The following analysis is based upon the Global Precipitation Climatology Project (GPCP) Interim Climate Data Record. It is provided courtesy of the GPCP Principal Investigator team at the University of Maryland.




January 2020 GPCP precipitation anomalies




January 2020 GPCP precipitation percent anomalies

- Australia receives some rainfall to help fight wildfires and even experiences floods in the north
- West Indian Ocean area and into Madagascar and eastern Africa still have positive rainfall anomalies and flooding over the land areas
- South America rainfall anomaly pattern reverses from December
- Northern Hemisphere mid-latitude storm tracks over both ocean and land related to variations in precipitation

As the sun reaches its furthest south position the major rain features across continents have followed and have peaks south of the Equator (see Africa and South America) as seen in the GPCP global monthly analysis for January 2020. Over tropical oceans, this is also the case in the Indian and Atlantic Oceans, while across the Pacific the ITCZ hovers near the Equator, with a strong extension to the southeast into the Southern Hemisphere as part of the SPCZ. The Asian monsoon produced rainfall across the Maritime Continent and into parts of Australia, giving some relief to the wildfire-ravaged continent.

Positive rainfall anomalies are still prevalent in the western Indian Ocean, as they have been over the last few months, again associated with positive SST anomalies, even though the IOD index has gone neutral due to warming in the eastern portion of that ocean. These rainfall excesses over the ocean extend inland into eastern Africa and are tending to continue the flooding evident over the last few months. A

positive SST anomaly off the southwest coast of Africa is also associated with excess rainfall over that ocean area and extending onto the coastal countries.
Australia, which has suffered an extended drought and one of the worst wildfire seasons in their history had gotten some relief in January as the monsoon has arrived. The anomaly field even shows some significant positive features in the north that were associated with floods, mostly in areas of low population density. In the southeast portion of the country, where wildfires were concentrated, the limited rainfall was helpful, but insufficient to end the fires. To the north over the Maritime Continent the monsoon is active, but still shows below normal rainfall for the month. Further to the southeast, New Zealand continues their drought accompanied by a negative precipitation anomaly over the islands and surrounding waters.

Over South America a rainfall maximum is evident in eastern Brazil, with a rainfall deficit over the western part of the continent. This alignment is a flip-flop from last month. The rainfall feature in the east was accompanied by floods and landslides in that area.

In the Northern Hemisphere the typical mid-winter rainfall maxima extend to the northeast from the Asian and North American continents, with the anomaly field showing variations from the mean pattern. For the Pacific feature positive precipitation above the mean is evident at the western edge of the feature in China, extending to the east over the water through southern Japan. Further to the east this mid-latitude storm track has mostly negative anomalies. Over North America the U.S. Pacific northwest had a positive precipitation (snow) anomaly, with excess precipitation also in the Midwest and part of the Gulf coast. The Gulf of Mexico itself had a rain deficit.

In the North Atlantic there is a rainfall deficit just east of the U.S., but further to the northeast the anomaly pattern indicates a northward shift to the Atlantic storm track and related precipitation feature with a peak at the coast of Norway. Southwest Europe has a precipitation deficit this month, while to the northeast, over Scandinavia and east over northern Europe there is a moderate precipitation excess.

Recent chemistry-climate modeling studies have attempted to account for geographical differences in patterns of air pollution emissions and to consider the way these pollutants interact in the atmosphere. These models which explored the effects of a variety in projected future changes in short-lived air pollutants suggest that these species are likely to contribute to further warming by 2050. For example, studies considering pollution by aerosol particles and air pollution abatement strategies in the energy and transport sectors suggest that, even with maximum abatement strategies, changes in air pollution patterns are likely to contribute to an increase in temperatures.

Through a series of observations by the researchers it was observed that increasing in relative humidity increases the PM water content and hence the uptake of semi-volatile components, mainly nitrate and little of organics. Dawson et al.[19] (2007b) focused their model of perturbation studies with large sensitivity of nitrate and sulphate PM to humidity having little sensitivity to other PM components. A likely explanation is that aqueous-phase $SO_2$ oxidation by $H_2O_2$ in cloud takes place on a time scale of minutes. This processing frequency or simulation of aqueous-phase sulfate formation in clouds is difficult to explain in either meso-scale or global models[20] (Koch et al., 2003). From chemistry-climate modeling it is easy to explain the interation of $SO_2$ –$SO_3$ oxidation enhancement over solid surface of particulates specifically carbon centers adsorbed on particulates or shoots floating in atmosphere.

### 3.1. Climate Change, Air Quality, and Human Health

Air pollutants influence[21] meteorological variables such as temperature, humidity, wind speed and direction, and mixing height which in turn inducts weather and climate of the adjoining areas-locally or regionally. There is growing recognition that development of optimal control strategies for key pollutants like ozone and fine particles now requires assessment of potential future climate conditions and their influence on the attainment of air quality objectives. In addition, other air contaminants of relevance to human health, including smoke from wildfires and airborne pollens and molds, may be influenced by climate change but guided by meteorological variables. The chemical characteristics of pollutants governs the humidity of adjoining space e.g.,the hygroscopic pollutants cause temporary increase in local humidity causing acid rain but VOC(Hydrocarbons) accumulation cause repulsion water molecules in space causing decrease in humidity thus controlling the meteorological parameters and thus control weather/ climate. Further works are in progress to get generalized concept of pollutants influence on weather/climate.

The above findings have a definite bearing on the major attack of COVID-19 on USA as compared to Asian countries might be due to highest temperature in January 2020, low humidity, low temperature( in the range of 15-21°C) and some other environmental parameters that to be searched out.

## 3.2. Effect of environment on climate change

[$NO_2$ is an irritant to our lungs and gives smog its brown colour. Its main significance however is that it helps make ozone and air-borne particles, two of the most harmful air pollutants. Ozone damages our lungs and crops. Fine particles – tiny particulate matter of 2.5 microns (PM2.5) or less in size – end up deep in our lungs and can enter our bloodstream. Satellite observations help us to track pollutants like nitrogen dioxide ($NO_2$) that indicate areas of unhealthy air, as well as levels of greenhouse gases carbon dioxide ($CO_2$) and methane ($CH_4$) that are driving global

warming –

### 3.3.COVID-19 DROP IN POLLUTION TO BE SHORT-LIVED

COVID-19's hit to the global economy is cutting air pollution, but the eventual recovery could leave our environment worse off and further behind in reducing emissions[22]

By weighted-average statistics of GCM results it projected a likely 2000–2050 increase of $\sim$ 0.1 μg m−3 in annual mean PM2.5 in the eastern US arising from less frequent frontal ventilation, and a likely decrease albeit with greater inter-GCM variability in the Pacific Northwest due to more frequent maritime inflows. Potentially larger regional effects of 2000–2050 climate change on PM2.5 may arise from changes in temperature, biogenic emissions, wildfires, and vegetation, but are still unlikely to affect annual PM2.5 by more than 0.5 μg m−3 .

To reduce cost and complexity, the researchers[23] [Liang et al., 2006] suggested regional components to be omitted and diagnose change in air quality from the global CTM simulation (with spatial resolution of a few hundred km) but authors suggest that RCM /GCM simulation on pollution parameters relating the climate change would be more illustrative on regional impact vis-à-vis global influence on regional climate.

## 4.1.Impact of tropospheric ozone on climate change :

The researchers[24a, 24b] established that the most important climate variables affecting tropospheric ozone on a global scale are stratosphere-troposphere exchange, lightning NOx, and water vapor associated with VOCs.

The stratosphere-troposphere exchange and lightning NOx cause an increase in ozone and the water vapour in troposphere. The above models agree that climate change will decrease the ozone background in the lower troposphere where the water vapor effect is dominant but cannot explain the decrease of ozone in the northern hemisphere[25] as per presentation of Dentener et al. (2006) in the analysis of 10 global GCM-CTMs where a decrease of annual mean surface ozone in the northern hemisphere has been highlighted due to flow of pollutants from equatorial region and stratosphere–troposphere exchange causing climate change holding anthropogenic emissions of ozone precursors constant. The contradictory views can be cleared if one considers that it is the pollutants' flow from equatorial region to polar region due to temperature gradient and atmospheric air flow in the opposite direction causing climate change.

From the various models it may be generalized that the ozone increase is largest in urban areas where present-day ozone is already high[26a,b,c] which is due to increase of air pollution parameters.

Major studies as described were based on US and Canada areas but a few studies were published in the application of above models in European and other sub-continents. Differences in air pollution meteorology between GCMs/RCMs are a major cause of the above discrepancies[27] (Kunkel et al., 2007)[64]. In the opinion of authors, the differences between CTMs in the parameterizations of natural emissions, chemistry, and deposition also play a role. Wu et al. (2008a)[28] pointed out that model differences in isoprene oxidation mechanisms have significant implications for sensitivity to climate change in regions where NOx is relatively low and isoprene is high, such as the southeastern U.S. Oxidation of isoprene by OH produces organic peroxy radicals $RO_2$, which react with NO by two branches:

i. produce ozone by $NO_2$ photolysis
ii. produces isoprene nitrates and can be a major sink for NOx

But the fate of these nitrates (in particular whether they recycle NOx or represent terminal sinks) remains largely unknown as claimed[29].

There may also be substantial production of isoprene nitrates from oxidation of isoprene by the nitrate radical but this is even less supported by experimental data[30a, 30b] found that their assumed isoprene nitrate yield of 12%, with no NOx recycling, is responsible for their lack of sensitivity of ozone to climate change in the southeastern U.S. While Racherla and Adams (2006) [31] did not include isoprene nitrate formation in their model and found by contrast a large ozone sensitivity to climate change in that region. Other major factor of uncertainty is the sensitivity of isoprene emission to climate change.

Minimum GHG level in troposphere is needed to maintain ambient temperature at a level of comfort of human beings, Zero GHGs in atmosphere has also serious impact on climate. Continued and improved networks of measurements that provide long-term data are essential to gain a more robust understanding about past and present changes in concentrations of air pollutants and GHGs.
Such networks include surface, aircraft and satellite monitoring. Aircraft experiments combined with analysis using numerical models have proved to be particularly useful in advancing our knowledge about key chemical and physical processes in the atmosphere. There is also a clear need for improved emission inventories that track changing sources of air pollutants and GHGs over a wide range of locations and from year to year.

## 4.2. Effect of mercury pollution on climate change

Through e series of experiments of fly ash/bottom ash analysis in authors' laboratory, it was observed that mercury contents range from 0.1-0.3 Mg per Kg of ash in thermal power stations in Asian countries. It was also noticed that the mercury content in fly/bottom ash increases with increase in depth of mines- from which the coal is extracted.

The effect of mercury pollution through ash disposal from various sources like coal fired thermal power stations of different continents victimizes the local mass for ingress of mercury through food chain or air breathing. Increased volatilization of soil mercury could potentially be of considerable importance, as the amount of mercury stocked in soil (1.2-106 Mg) and that in the atmosphere (6- 103 Mg) and in the ocean (4 -104 Mg)[32]. Soil mercury is mainly bound to organic matter[33] which may be, besides above, due to contamination with fly ash emission from thermal power plants and industrial emissions. Future warming at mid latitudes could

release large amounts of soil organic matter to the atmosphere as CO2, both through increased respiration[34] and increased fires. The mercury pollution from fly ash of thermal power station is getting settled ultimately on soil and water body of earth surface and sometimes is getting access in the food chain of animals including human systems causing varieties of diseases.

The effect of PM although is uncertain but potentially significant on climate control as indicated in earlier studies. If the business runs as-usual, future scenarios without significant emission reductions beyond current regulations, the models as explained above find that the combined effects of emissions will result in increased ozone pollution. Assuming emission reductions far beyond the full implementation of current regulations of various countries, the reduction of emission will partly offset the benefit of the emissions reductions[35a, 35b, 35c]. It is suggested that including the imposition of 'climate penalty' as the need of the present day for stronger emission controls to achieve the given air quality standard but concern are to be highlighted in the social and other media. The actions being taken in air quality upgradation can attain a 10% NOx emission reduction but unless all other devices are used it will not be possible for a 50% NOx reduction in the 2050 climate. The climate penalty can decrease anthropogenic NOx emissions, thus providing additional return on NOx emission controls. By using the observed inter-annual correlation between cyclone frequency and exceedances of the ozone in air quality

standard, it can be concluded that air quality standard for the ozone should be more stringent to reduce trends in cyclone frequency as indicated by the NCEP/NCAR reanalysis. Still the important issue is whether climate change is dependent on ozone which is being influenced by NOx and NMVOC emissions in a way that would compromise the effectiveness of current emission control strategies in the global scenarios.

Cardelino and Chameides (1990)[36] for the Atlanta urban plume showed in their model simulation that ozone sensitivity increased to NOx as temperature increases, due to increasing isoprene emission and supply of HOx radicals. The studies of Milan and Atlanta plumes likely reflect regional differences in biogenic NMVOC emissions, and from both studies it was shown that sensitivities of ozone to NOx and NMVOC emissions might have affected the climate change. Higher temperatures increase the demand for air conditioning in summer when ozone,

chloro-fluoro compounds and PM concentrations are highest in the region. Anthropogenic NMVOCs also increase in the atmosphere due to Evaporative emissions, although the effect determined for mobile sources is relatively weak, in the range 1.3-5% $K^{-1}$[(36), (37)]. Since ozone has direct impact on air quality, the ozone background is likely to become an increasingly important issue for air quality standards as the same will become more stringent. This background is likely to increase in the future because of global increase in methane and NOx emissions[38a, 38b] (Fiore et al., 2002). Wu et al. (2008b) find that the U.S. policy-relevant background (PRB), defined by the U.S.

Environmental Protection Agency (EPA) as the surface ozone concentration in the absence of North American anthropogenic emissions will decrease by up to 2 ppb in summer as a result of 2000-2050 climate change. Wu et al. (2008b)[38b] projected that climate change will fully offset the effect of rising global anthropogenic emissions on the PRB in the eastern U.S. in summer, though there will still be a 2-5 ppb increase in the PRB in the west. Seasons outside summer will experience less benefit from climate change in terms of decreasing the ozone background and intercontinental transport of pollutants[38a] (Fiore et al., 2002)[73].

## 5.1. Global energy policy

Global energy policy offers an opportunity to dramatically improve air quality through transition to nonpolluting energy sources. A switch from mineral fossil fuel energy to Solar/Ocean energy would benefit air quality and could possibly be helpful in reducing the carbon emission. The battery run bus/truck /TOTO/bikes etc. are already started plying the developing countries helping in the removal of environment related problems and started reducing GHG emissions..

## 5.2. Role of Social workers in limiting the pollution and pandemic/ epidemic control

Social workers can play an important role in using their mediation skills to mobilize communities, facilitate technology sharing, reducing disputes in ideologies of technocrats, bureaucrats, politicians and state administrators on emission reduction. Industrialists, agriculturists and economists so far treated the atmosphere as a carbon sink by pouring gaseous, liquids and solid pollutants source straight into it. Population explosion, their unrealistic lifestyles associated with industrialization, centralization in cities and growth of communities associated with urbanization have added pressure on the earth's finite fossil fuel resources on one

hand and lack of proper waste management practices multiplied the pressure on the environment on the other. Global demand for energy is predicted to increase by 60 per cent by 2030[39] while the atmosphere is rapidly approaching its limits in absorbing emissions; Scientists on the IPCC calculated that to keep temperature rises within $2^0$C, a total of 1,400 billion tons of carbon emissions are to be absorbed by the atmosphere between 2000 and 2050. The repercussion of increasing pollutants load in the atmosphere is expected to manifest in the weather/climate as well as direct attack on living kingdom through various diseases besides chronic health issues with increase in medical bills in almost all families. Thus medical bill may be considered to be an economic index of global pollution impact and pandemic/epidemic spread of viruses may be related to global temperature fluctuation from allowable limit. It may be mentioned in this connection that the virus germs under hibernation under ice coverage get alive as soon as they get favourable condition (through increase of temperature may be due to GHG effect or some other reason which is to be corroborated with the fact that January 2020 had seen higher temperature in corresponding periods of previous years and mass attack by Corona virus thus spread since January 2020. This may be compared with the recovery of fossils and varied types of bacteria/viruses hibernated under ice cover around Iakutia at the northern part of ice desert - Siberia near china border of north Asia.

The lock-down, on maintaining social distance to defeat COVID-19 attack, is an unique social work which helped in the check of corona virus when all the pollutants emission centers are completely under shut down. After 7 days lock down of all transport, hotel restaurants, industries, etc. were kept shut down except thermal power plants, the level of PM2.5 had come down to almost 40% and similar reduction of other pollutants by same ratio, no much deposits of dusts on house hold materials in Kolkata houses. The water of the hoogly river(India) appears to be more transparent (before and after 2 hours of tides), green leaves shining without dust coverage.

## 5.3. Shifting patterns of energy consumption

Binary authentication of 'Polluters'(West) and 'Non-Polluters' (Global South) position the West as the perpetrator of catastrophic events and the others as victims bearing a disproportionate share of the effects of climate change. The West is blamed for unfairly consuming fossil fuels, extensively polluting land, air and water and producing climate change. These constitute a historical legacy and moral

obligation to reduce its own emissions and pay for industrializing nations to 'catch-hold' in their development by funding for clean air technologies[40]. Unfortunately, the blame game has produced an intractable impasse in negotiations about who caused the damage, who will pay for undoing it and who is suffering and resulted in an impasse in negotiations around the Kyoto Protocol (TWN, 2010).The West's dominance as polluter is changing as emissions from industrialising countries in the Global South rises. For example, South Korea's emissions nearly doubled from 298 million tons in 1990 to 594 tons in 2005. Emissions in China rival those of Germany at 6.4 tons of HCU per capita GDP. China's use of energy is less efficient because3.5 times more energy than the global average is consumed to generate each unit of GDP [39]. The largest consumers of energy in 2005 included industrialized and rapidly industrialising countries (percentage in brackets): USA (20.5%); China (15.0%); Russia (5.7%); Indonesia (4.7%); Japan(3.0%);Germany (2.4%); France (2.4%); Canada (2.4%); the UK (2.0%); South Korea (1.9%).

China emits 6.1 billion tons of CO2 yearly, while 250 million people live in poverty. Its emissions are set to rise to 10 billion by 2020[39]. China overtook the USA as the single largest polluter in 2006 and is likely to retain that position for the foreseeable future. Together, they produce 40 per cent of global carbon emissions to be absorbed by the same atmosphere and biosphere inhabited by all living things [39]. China's emissions will continue to rise because it is opening a coal-fired power station every few days to feed its industrialization drive. Coal, the dirtiest fossil fuel, could be substituted by renewable energies if the green technologies associated with them were better shared and emissions recycled more effectively. More global technological cooperation would enable the Chinese government to expand its existing renewable energy programme and accelerate the search for alternative solutions, a development its policymakers are keen to progress. Rapid population growth, highest in the Global South, will intensify pressures on resources available to meet ever growing needs (UNDP, 2009). The changing picture in energy use requires a more equitable sharing of resources and clean energy technologies than is occurring. Social workers can advocate for this to happen. Individual contributions to climate change are differentiated according to class and geographic region.

Rich individuals contribute most in GHG emissions, if lifestyle activities are counted. These include private jets, consumerism and, if Sir Richard Branson succeeds, day

trips to outer space for US$200,000 per passenger[41]. These decisions are made privately. Individuals can disregard carbon footprints and their impact upon the earth's entire population. In contrast, a homeless person in a rich country would have a small personal carbon footprint. Wars and terrorist bombs contribute carbon emissions that are usually discounted. The people enjoy in groups, for example, fireworks to celebrate New Year, or Guy Fawkes Day, add to the total carbon emissions that planet earth has to absorb. Some alternatives are available or can be created to reduce man made GHG emission. The impact on climate change will be variable as weather events become more extreme. Some countries will sink. Small island nations in the Pacific like Tuvalu might disappear altogether. Others might rise. Climate migrants will pose another issue to be addressed (UNDP, 2008). The 1951 Geneva Convention on Refugees perhaps does not apply to climate migrants[42]. New protocols are necessary to cover their needs (UNDP, 2008).

Humanitarian aid currently cannot meet demands for food, shelter and medicines by climate refugees in drought stricken Somalia, Kenya and Ethiopia. Social workers can advocate for increases in aid and help develop appropriate services and policies. These complex realities are compelling the West to rethink its strategy towards climate change, reject the Polluter-Non-Polluter barriers but everyone should think to take action in reducing emissions.

Public should play a minimal role on control of environmental pollution as Mother Nature causes climate change. The emphasis on earth’s more surface coverage with greeneries should made for people’s contributions and call for reductions in greenhouse gas emissions to limit temperature rises to $2^0$C, stabilize the world's climate and reduce damage caused by humans. A substantial amount of other evidence supports the view that people induced climate change is real and having deleterious effects on the livelihoods and well-being of countless people[43]. One-half of British voters are sceptical about the relevance of climate change to their lives[44]. Their numbers encompass distinguished persons, including Nigel Lawson, former Chancellor in the UK, who deems policies to reduce carbon emissions extremely damaging and harmful.

A DEFRA study in the UK made the classification in a survey that clustered people's responses around

- Positive greens: They comprise 18 per cent of respondents and will do as much as possible to limit their impact on the environment

- Waste-watchers: Covering 12 per cent of respondents, this group considers thrift part of their lifestyle and recycles extensively;
- Concerned consumers: Forming 14 per cent of those replying, they felt they were already doing a lot and unlikely to do more;
- Sideline supporters: Making up 14 per cent of those surveyed, they acknowledged climate change as a problem, but refused to alter current lifestyles;
- Stalled starters: This group has little information about climate change, wanted an affluent lifestyle, but could not afford it;
- Honestly disengaged: These respondents lacked interest in the issue, seeing it as irrelevant to them.

## 5.4. Contribution of social work on Pollution control and climate change :

Air pollution control side by side Climate change has become imminent for one of the most important challenges being faced by contemporary societies. It encompasses the idea that the world's climate is changing as a result of greenhouse gas or carbon emissions caused by human activities. Greenhouse gases include water vapor, carbon dioxide (CO2), methane, nitrous oxide and chlorofluorocarbons. The deforestation and industrial processes contribute to changes in air temperature, precipitation patterns, ocean acidity, melting glaciers and sea level rise. The Inter-governmental Panel on Climate Change (IPCC) suggests that natural processes account for only 5 per cent of climate change (IPCC, 2007). Measured in parts per million (ppm), carbon emissions have risen from 280 ppm before the industrial revolution to 430 ppm by 2005 and around 480ppm by 2014 and still are growing. Climate change is expected to have a differentiated impact on countries as extreme weather events increase in frequency, produce climate change refugees and increased risk to poorest communities if emissions remain unabated.

Poor air quality is also caused by emissions of nitrogen oxides, methane and other volatile organic compounds (VOC) that combine in the lower atmosphere to produce ozone. Ground-level ozone is a serious pollutant, which at high levels, damages human health and vegetation, including crop yields. In addition, ozone is a short lived air pollutant and improved networks of measurements that provide long-term data are essential to gain a more robust understanding about past and

present changes in concentrations of air pollutants and GHGs. Continued and improved networks of measurements that provide long-term data are essential to gain a more robust understanding about past and present changes in concentrations of air pollutants and GHGs.

Such networks include surface, aircraft and satellite monitoring. Aircraft experiments combined with analysis using numerical models have proved to be particularly useful in advancing our knowledge about key chemical and physical processes in the atmosphere. There is also a clear need for improved emission inventories that track changing sources of air pollutants and GHGs over a wide range of locations and from year to year.

This initiative which was launched in 2008 can be thought of as one which is low carbon, resource efficient and socially applauded. UNEP initiative involves 3 sets of activities:

1. Producing a Green Economy Report,
2. Providing Advisory Services and
3. Research[45]

It may be mentioned in this connection that social workers must engage effectively in these by learning about the science behind climate change; speaking about policies; developing resilience amongst individuals and communities; mitigating losses caused by climate change; helping to resolve conflicts over scarce resources; and responding to devastation caused by extreme weather events including floods and droughts. Social workers can counsel effectively to overcome the complex arguments and realities around climate change by the people suffering loss and grief in these circumstances and help build their resilience in preventing and/or adapting to its consequences. The roles of social work educators and practitioners range from advocacy to community mobilization. In this connection two case studies are shown below:

i. one from the Global South and
ii. the other from the Global North

To examine these because climate change affects everyone, everywhere in the planet it was noticed to increase the pollutants level to increase as compared to equatorial region.

In the Rio summit 1992 for stress on clean development mechanism and then Kyoto Protocol, signed by 184 countries in Kyoto, Japan in 1997 the stress was given for limiting rises in the earth's temperature to less than $2^0$C through action on revival of environmental health for which countries could participate in the Clean Development Mechanism (CDM) Projects to reduce emissions. These were to be funded through an Adaption Fund that levied a 2 per cent charge on CDM Projects.

At the COP16 meeting in Mexico in 2010[46a, 46b] the carbon credit scheme for encouragement of pollution control by polluters but compliance mechanisms proved problematic as this cause price tag to increase and non-polluters stated earning with some plea or other. In actual practice the polluters should pay. The scheme of subsidizing firms using clean, green technologies by paying an amount per ton of carbon reduced may be operated to reduce GHG emission. Social workers' roles in climate change endeavors to have a commonly accepted formula effectively for reduction of total pollution on the earth acceptable to all has become necessary at the present juncture to save the earth from destruction like "Extreme events of heat waves, heavy rainfall, and winter extremes are more likely with a changing climate or climate change is understood to be a public health issue because it affects the quality of our water, air, food supplies, and living spaces or extreme weather events-hurricanes that are unprecedented in size and strength,
for example-are very much in line with what climate scientists have been warning we should expect as a result of global warming.

The nonconventional energy efficient technology implements and continuous growth of natural resources like greeneries and minerals, land and implements may safe guard the environment and simultaneous action on social consciousness to the citizen of the country to contribute least emission of green house gases on the one hand and conservation of environment on the other to give continuous impetus to the climate improvement. Some countries, like Republic of China, started shifting hutments of villages to multistoried apartments for vertical accommodation of families instead of horizontal spread of residences/commercial complexes to increase the greeneries instead of reducing the natural greeneries as is being the trend among developing and developed countries. The increase of greeneries must be the immediate step to be adopted by each and individual of countries in this planet.

Since the pouring in pollutants to atmosphere is increasing, its effect on mixing depth is uncertain and possibly increase[47a, 47b, 47c] and climate change will be more in coming years at the rate of increasing pollutants load.

The latest impact of climate change due to change in pollutants' load in India has been noticed recently causing tremendous damage by strong cyclones like Phony, Bul-bul, etc. 2019 in India of South East Asia.

This review further observed correlations of air quality with meteorological variables and statistical correlation of pollutant concentrations with meteorological variables in US which has been an active area of study by various researchers for over three decades, and this focuses three principal purposes for highlighting in the present review:

(1) to remove the effect of meteorological variability in analyses of long-term trends of air quality,
(2) to construct empirical models for air quality forecasts,
(3) to gain insight into the processes affecting pollutant concentrations.
(4) Pandemic eruption of COVID-19 taking lives of lakhs of people through out the globe is now a challenge to find out the solution in the long run.

The beneficial effect of climate change on the ozone background may partly offset the expected global increase in the ozone local nonconventional energy will offset the background of rising methane and NOx emissions over the coming decades. Let the people of the planet have peaceful life with less epidemic/pandemic attacks globally.

**6.0.Conclusion**

It is a proven practice of nature that precipitation frequency, which is largely determined by PM, VOCs, NOx, Sox, Ozone loss, etc. in the atmosphere, is expected to increase with reduction of pollution load in environment as a whole so as to reach the environmental pollution level of thousand years back with the result of minimizing the frequency of natural disaster like "PHONY" of last May or “Bulbul” of last October 2019 in India from Bay of Bengal of Indian Ocean or COVID-19

taking lakhs of lives erupted from China which caused a serious impact on social economy ultimately besides life and material loss.

While considering the scientific causes of climate changes, the following are suggested for all out action as follows:

1. The global power requirement can be met by solar power and other non-conventional sources and its growth should be given utmost priority with all out global help so that global carbon foot print is drastically reduced.
2. Polluters should be penalized through socio-economic means to restrict the Pandemic/epidemic due to climate change.
3. Technological revolutions on cheaper durable long term storage of power for long time uses are the need to run the transports or machineries.
4. Fossil fuel burning is the heart burning of the present day and that should be immediately stopped globally.
5. Greeneries to be spread over the entire globe making land availability through stoppage of land enclosure by erratic hutments; vertical industrial and residential expansion instead of horizontal spread with stricter pollution control rules side by side implementation of social obligation on the part of polluters.
6. Green energy producers should be rewarded with cash and kind to face the challenges of reduction of global carbon foot print.

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