



A Monthly e Magazine
ISSN:2583-2212
Nov, 2023 3(11),3064-3073

Popular Article

Effects Of Climate Change on Existence and Co-Existence of Humans and Wildlife

Munmun Sarma¹, Jahan Ahmed², K. B. Dev Choudhury³, Anil Deka⁴ and Nirmali Sarma⁵

¹Professor, ² Ph.D Scholar, ³ Assistant Professor, ⁴ Assistant Professor
Department of Anatomy & Histology

⁵ Ph.D Scholar, Department of Surgery and Radiology, College of Veterinary Science,
Assam Agricultural University, Khanapara, Guwahati 781 022

For better understanding of the cause of climate change one has to understand the terms “climate” and “weather”. Therefore, the term “weather” refers to the conditions in the air just above the earth such as the wind, the rain or temperature especially at a particular time over a particular area. *Climate* refers to the average weather of a place over several years. While the weather can change in just a few hours, climate takes hundreds, thousands, even millions of years to change.

Although, climate change and global warming are often used interchangeably but both have equally devastating effect on life forms in earth. Climate change and global warming is affecting both humans and wild animals. Both Climate change and global warming are due to human activity which is detrimental to its natural occurrence.

Global warming is a term used for the *observed century-scale rise in the average temperature of the Earth's climate system and its related effects*. Scientists are more than 95% certain that global warming is due to the increase in concentrations of greenhouse gases (GHGs) and emissions of gases due to human activity. The emitted greenhouse gases like water vapour, carbon dioxide, methane, nitrous oxide, and ozone accumulate and absorbed within the earth's atmosphere are emitted as heat radiation. Therefore, increase or decrease amount of greenhouse gases within the atmosphere act to either hold in or release more of the heat emitted from the sun.



Climate change is caused by the increase in the average global temperature of the Earth. Due to climate change and increase in global temperatures in some places, many regions of the earth may actually get colder while some parts may get warmer. Greenhouse gases cause atmospheric heating and agitation which also gauged the uncertainty of the weather and climate drastically increase the severity, scale, and frequency of storms, droughts, wildfires, and extreme temperatures.

Climate change can reach levels of irreversibility and is a threat to the survival of life on earth.

Causes of climate change: Alteration in emission levels of greenhouse gases leads to climate change. Human activities are changing the natural greenhouse. Over the last century the burning of fossil fuels like coal and oil has increased the concentration of atmospheric carbon dioxide (CO₂). This happens because the coal or oil burning process combines carbon with oxygen in the air to make CO₂. To a lesser extent, the clearing of land for agriculture, industry, and other human activities has increased concentrations of greenhouse gases. Climate change occurs due to the increase of the following gases in earth.

Water vapour: The most abundant greenhouse gas, but importantly, if there is an increase in water vapour in the atmosphere as the Earth's atmosphere warms, then along with clouds and precipitation, water vapour makes some of the most important feedback mechanisms to the greenhouse effect.

Carbon dioxide (CO₂): It is a minor but very important component of the atmosphere, carbon dioxide is released through natural processes such as respiration and volcanic eruptions and through anthropogenic activities such as deforestation, land use changes, and burning fossil fuels. Again, Human beings have increased atmospheric CO₂ concentration by more than a third since the Industrial Revolution began. This is the most important long-lived "forcing" of climate change.

Methane: A hydrocarbon gas produced by natural sources as well as human activities such as waste decomposition in landfills, agriculture, and especially paddy cultivation. Ruminant digestion and manure management are also linked with domestic livestock which contributes to methane production. On a molecule-for-molecule basis, methane is a far more active greenhouse gas than carbon dioxide, but also one which is much less abundant in the atmosphere.

Nitrous oxide: A powerful greenhouse gas produced by soil cultivation practices, especially the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning.

Chlorofluorocarbons (CFCs): CFCs are synthetic compounds entirely of industrial origin used in a number of applications, which is now largely regulated in production and release to the atmosphere by international agreement for their ability to contribute to destruction of the ozone



layer. Chlorofluorocarbons (CFCs) are anthropogenic compounds that have been released into the atmosphere since the 1930s in various applications such as in air-conditioning, refrigeration, blowing agents in foams, insulations and packing materials, propellants in aerosol cans, and as solvents. They are also potent greenhouse gases.

How long carbon dioxide remains in our atmosphere

The most important greenhouse gas related to global warming is carbon dioxide. Carbon dioxide is initially believed to remain in the atmosphere for more than 100 years but new research shows that 75% of that carbon will not disappear for thousands of years. The other 25% stays forever. We are creating a serious global warming crisis that will last far longer than we ever thought possible. Therefore, **Mason Inman** rightly quoted that *"The lifetime of fossil fuel CO₂ in the atmosphere is a few centuries, plus 25 percent that lasts essentially forever. Climatic impacts of releasing fossil fuel CO₂ to the atmosphere will last longer than Stonehenge, longer than time capsules, longer than nuclear waste, far longer than the age of human civilization so far."* — "Carbon is forever."

How carbon dioxide in our atmosphere is tracked

Atmospheric carbon from fossil fuel burning is the main anthropogenic factor in the escalating global warming that we are experiencing now. The current level of carbon in our atmosphere is tracked using what is called the Keeling curve. The Keeling curve measures atmospheric carbon in parts per million (ppm).

Each year, many measurements are taken at Mauna Loa, Hawaii to determine the parts per million (ppm) of carbon in the atmosphere at that time. At the beginning of the Industrial Revolution around 1880, before we began fossil fuel burning, our atmospheric carbon ppm level was at about 270. Scientific evidence of climate change is unequivocal (IPCC), scientists are able to gather different information with the help of satellites which reveals the extent of climate change. Heat trapping nature of carbon dioxide and other gases was demonstrated in the mid 19th century. Increased levels of greenhouse gases cause the earth to warm. Ice cores drawn from green land, Antarctica and Tropical Mountain glaciers show that the earth's climate responds to changes in greenhouse gas levels. The level of current warming is way too faster than what it was before and what earth could sustain. All this is happening because of rise in global temperature, warming of oceans, shrinking of ice sheets, glacial retreat, decrease in snow cover, sea level rise, decline in arctic sea ice, ocean acidification and extreme conditions of rainfall, cloud burst and flood are an evidence of climate change (IPCC 5th assessment report). Even small increases in Earth's temperature caused by climate change can have severe effects. The earth's average temperature



has gone up 1.4° F over the past century and is expected to rise as much as 11.5° F over the next. That might not seem like a lot, but the average temperature during the last Ice Age was about 4° F lower than it is today. Rising sea levels due to the melting of the polar ice caps (again, caused by climate change) contribute to greater storm damage; warming ocean temperatures are associated with stronger and more frequent storms; additional rainfall, particularly during severe weather events, leads to flooding and other damage; an increase in the incidence and severity of wildfires threatens habitats, homes, and lives; and heat waves contribute to human deaths and other consequences.

Effects of climate change on existence and co-existence of life:

As the climate warms, it changes the nature of global rainfall, evaporation, snow, stream flow and other factors that affect water supply and its quality. Major effects include rise in water temperatures beyond normal, which affects the water quality and accelerates water pollution. Some human activities that cause damage (either directly or indirectly) to the environment on a global scale include human over-population, overconsumption, over exploitation, pollution, and deforestation, to name a few.

Environment is one that surrounds us everywhere; it can be living (biotic) or non-living (abiotic) things. It includes physical, chemical and other natural forces. Living things constantly interact with environment and adapt themselves to conditions in their environment.

Prevention and control of degradation of land, water, vegetation and air is required to preserve our environment. Conserve and enhance natural and man-made heritage sites, including biological diversity of unique ecosystems. Raise awareness and understanding of the link between environment and development.

The ozone layer is mainly found in the stratosphere, from approximately 15 to 35 km above Earth, although its thickness varies according to season and geographic locations. This Ozone layer is depleting rapidly due to the Chlorofluorocarbons (CFCs) and other halogenated ozone depleting substances. The total amount of effective halogens (chlorine and bromine) in the stratosphere can be calculated and are known as the equivalent effective stratospheric chlorine (EESC). Again, Black carbon which causes human mortality and morbidity consists of pure carbon in several linked forms. It is formed through the incomplete combustion of fossil fuels, bio fuel, and biomass, and is emitted in both anthropogenic and naturally occurring soot.

It can be summarized that global warming, together with resultant changes in food and water supplies, can indirectly cause increases in a range of adverse health outcomes, including



malnutrition, diarrhoea, cardiovascular and respiratory diseases, and water-borne and insect-transmitted diseases.

Effects of climate change on human health:

Climate change is causing a wide range of risks to population health – risks that will increase many folds in future, often to critical levels. The three main categories of health risks include:

- (i) Direct effects (e.g. physical weather disasters, effects due to heat waves, and amplified air pollution)
- (ii) Effects mediated through changes related to global and climate change in ecological systems and relationships (e.g., crop yields, mosquito ecology, marine productivity)
- (iii) Indirect effects relating to impoverishment, displacement, resource conflicts (e.g., water), and post-disaster mental health problems.

Climate change is a major factor to slow down the international progress made towards minimising child labour and malnutrition, deaths from diarrheal diseases and the spread of other contagious and infectious diseases. Climate change also acts predominantly by exacerbating the existing, often enormous, health problems, especially in the weaker parts of the world. The variations in weather conditions already have many adverse effects on the health of poor people in developing nations, and these too are likely to be 'multiplied' by the added stresses of climate change.

A changing climate thus affects the prerequisites of population health: clean air and water, sufficient food, natural constraints on infectious disease agents, and the adequacy and security of shelter. A warmer and more variable climate leads to higher levels of some air pollutants. It increases the rates and ranges of transmission of infectious diseases through unclean water and contaminated food, and by affecting vector organisms (such as mosquitoes) and intermediate or reservoir host species that harbour the infectious agent (such as cattle, bats and rodents). Changes in temperature, rainfall and seasonality compromise agricultural production in many regions, including some of the least developed countries, thus, jeopardising child health and growth and the overall health and functional capacity of adults. Due to the increase in temperature, the frequency and severity of weather-related disasters will increase in different parts of the world. Therefore, in summary, global warming along with the changes in diets and water supplies can indirectly cause increase in a range of adverse health outcome like diarrhoea,



malnutrition, injuries, respiratory and cardiovascular diseases, water-borne disease and diseases transmitted through invertebrate hosts and insects.

Climate change and health index have a major impact on health and quality of life, and are interlinked in various ways. The report of the WHO Commission on Social Determinants of Health points out that disadvantaged communities are likely to shoulder a disproportionate share of the burden of climate change because of their increased exposure and vulnerability to health threats. Malaria and diarrhoea are cause of 90% deaths in children aged 5 years or younger, mostly in developing countries. Other severely affected population groups include women, the elderly and people living in developing states and other coastal regions, mega-cities or mountainous areas.

- Direct – effect of climate change directly on human population.
- Indirect – Threats that are associated with the effects of climate change that have an impact on emotional and future life.

Extreme climate/weather events

More variations and fluctuations in the climatic conditions are observed now-a-days than what was observed years back. Climate change is more important in terms of its impact on human health, than that of a gradual and long-term trend towards higher average temperature. Infectious disease often accompanies extreme weather events, such as floods, earthquakes and drought. Due to loss of infrastructure in such natural disasters, basic service to the people affected cannot be provided leading to rapid spread of the diseases and infections.

Effects of global warming on infectious diseases

Climate change may lead to dramatic increases in prevalence of a variety of infectious diseases. Beginning in the mid-70s, there has been an "emergence, resurgence and redistribution of infectious diseases". Reasons for this are likely multi-causal, dependent on a variety of social, environmental and climatic factors, however, many argue that the "volatility of infectious disease may be one of the earliest biological expressions of climate instability". Though many infectious diseases are affected by changes in climate, vector-borne diseases, such as malaria, dengue fever and Leishmaniasis present the strongest causal relationship. One major reason is that change in climatic conditions increases the prevalence of vector borne disease as the temperature and rainfall plays a major role in the distribution, magnitude, and viral capacity of mosquitoes, which are primary vectors for many vector-borne diseases. Observation and research detect a shift of pests and pathogens in the distribution away from the equator and towards Earth's poles. A tool that has been used to predict this distribution trend is the Dynamic Mosquito Simulation Process (DyMSiM) which uses epidemiological and entomological data and practices to model future



mosquito distributions based upon climate conditions and geographical conditions. This modelling technique helps identify the distribution of specific species of mosquito, some of which are more susceptible to viral infection than others.

Beyond distribution, rising temperatures can decrease viral incubation time *in vivo* in vectors which increases the transmission capability leading to an increased rate of infection.

Effects of global warming on Wildlife

There is a humongous effect of climate change on wildlife. Most species of animals, birds, reptiles in almost all parts of the world are being badly affected by climate change. It has been observed that climate change is having an effect on most of the endangered and rare species of wildlife, many different species of wildlife had become extinct and many species are under threat of extinction.

1. In birds it has been observed that laying behaviour, migration, nesting and feeding behaviour are changing due to climate change and its effects.
2. Distribution of animals is also affected, population of some animals are decreasing rapidly while some species are increasing leading to an imbalance. Due to natural calamities and habitat destruction, wild animals are not able to move about freely in their traditional migratory routes and sometimes death occurs.
3. The marine animals are adversely affected due to climate change and its effects. Population of some marine species have rapidly decreased and some have become extinct. Due to rise in sea level, some beaches have disappeared which were the nesting sites of many species of turtles and other species of marine wildlife
4. There are reports of occurrence of emerging and reemerging diseases in wildlife from many different parts of the world.
5. Due to the factors contributing to climate change, there is a direct competition for food and space among Humans, livestock and wild animals due to which incidences of man-animal conflict is on the rise.
6. There are also incidences where people affected by the natural calamities due to climate change and other related causes have taken to poaching and trading of wild animals and their parts.
7. There are increasing incidences of forest fires in different parts of the world due to which many forests have vanished and animals have been killed.



8. Due to the change in pattern of rainfall there is a problem for the grazing animals. Strong cyclones and hurricanes are occurring more in coastal parts of different countries affecting both human and animals.
9. Droughts and downpours exacerbated by climate change allowed two diseases to converge and wipe out
10. large numbers of African lions in 1994 and 2001.

Mitigation measures

- Full transformation of economies in line with sustainable goals for development without damaging the environment and eco system.
- Balance among nation in dealing with climate change.
- Helping people and nature adapt to a changing climate
- Combat deforestation and take up afforestation measures.
- Engage with different stake holders to reduce carbon emission.
- More use of renewable energy like solar energy and wind power.
- Lesser use of fossil fuel.
- Provide help to the developing countries to adopt clean energy resources like wind and solar power.

Conclusion

It can be concluded that the climate is changing at a faster rate than it should which is having a negative impact on the human health as well as wildlife. If urgent measures are not taken to control climate change than there is a danger of total mass extinction. Our future generations will suffer for our misdeeds and inaction.

Climate variability and change affects birdlife and animals in a number of ways;

- a) Birds lay eggs earlier in the year than usual,
- b) Plants bloom earlier and mammals come out of hibernation sooner.
- c) Distribution of animals is also affected; with many species moving closer to the poles as a response to the
- d) rise in global temperatures.
- e) Birds are migrating and arriving at their nesting grounds earlier, and the nesting grounds that they are moving to are not as far away as they used to be and in some countries the birds don't even leave anymore, as the climate is suitable all year round.



- f) A sea level rise of only 50cm could cause sea turtles to lose their nesting beaches – over 30% of Caribbean beaches are used by turtles during the nesting season and would be affected.
- g) The already endangered Mediterranean Monk Seals need beaches upon which to raise their pups and a rise in sea level could there could damage shallow coastal areas used annually by whales and dolphins which need shallow, gentle waters in order to rear their small calves.
- h) There is also a vast decreasing population of antelope and all Africans big cat species

Climate variability and change affects birdlife and animals in a number of ways;

- a) Birds lay eggs earlier in the year than usual,
- b) Plants bloom earlier and mammals come out of hibernation sooner.
- c) Distribution of animals is also affected; with many species moving closer to the poles as a response to the rise in global temperatures.
- d) Birds are migrating and arriving at their nesting grounds earlier, and the nesting grounds that they are moving to are not as far away as they used to be and in some countries the birds don't even leave anymore, as the climate is suitable all year round.
- e) A sea level rise of only 50cm could cause sea turtles to lose their nesting beaches – over 30% of Caribbean beaches are used by turtles during the nesting season and would be affected.
- f) The already endangered Mediterranean Monk Seals need beaches upon which to raise their pups and a rise in sea level could there could damage shallow coastal areas used annually by whales and dolphins which need shallow, gentle waters in order to rear their small calves.
- g) There is also a vast decreasing population of antelope and all Africans big cat species

Climate variability and change affects birdlife and animals in a number of ways;

- a. Birds lay eggs earlier in the year than usual,
- b. Plants bloom earlier and mammals come out of hibernation sooner.
- c. Distribution of animals is also affected; with many species moving closer to the poles as a response to the rise in global temperatures.
- d. Birds are migrating and arriving at their nesting grounds earlier, and the nesting grounds that they are moving to are not as far away as they used to be and in some countries the birds don't even leave anymore, as the climate is suitable all year round.



- e. A sea level rise of only 50cm could cause sea turtles to lose their nesting beaches – over 30% of Caribbean beaches are used by turtles during the nesting season and would be affected.
- f. The already endangered Mediterranean Monk Seals need beaches upon which to raise their pups and a rise in sea level could there could damage shallow coastal areas used annually by whales and dolphins which need shallow, gentle waters in order to rear their small calves.
- g. There is also a vast decreasing population of antelope and all Africans big cat species

References

The Intergovernmental Panel on Climate Change (IPCC)

WWF website

International Union for Conservation of Nature

Nicola Lacetera (2018) Impact of climate change on animal health and welfare

Animal Frontiers, Volume 9, Issue 1, January 2019, Pages 26–31

Cook N.B. and K. V. Nordlund (2009) The influence of the environment on dairy cow behavior, claw health and herd lameness dynamics *Vet. J.* 179 360-369.

Forastiere F(2010). Climate change and health: a challenge for epidemiology and public health. *Int. J. Public Health*, 55-83- 84

Climate Change and Its Effects On Wildlife Resources. Taddeo Rusoke. Nkumba University, Entebbe Uganda.

