

Climate Change and Its Impact on India

Neha

ASSISTANT PROFESSOR, Dev Samaj College, Ambala City

Abstract: Now a days climate change is the biggest problem of the human being. It is already happening and represents one of the greatest environmental, social and economic threats facing the planet. The warming of the climate system is unequal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level. Climate change, also called global warming, refers to the rise in average surface temperatures on Earth. An overwhelming scientific consensus maintains that climate change is due primarily to the human use of fossil fuels, which releases carbon dioxide and other greenhouse gases into the air. The gases trap heat within the atmosphere, which can have a range of effects on ecosystems, including rising sea levels, severe weather events, and droughts that render landscapes more susceptible to wildfires. The main causes of climate change are Increase in CO₂ concentration, Ozone depletion, Deforestation, Methane and Nitrous oxide emissions from agriculture, Aerosols present in the Atmosphere, Sunspots, Burning of Fossil Fuels and Increase in population. India also affected by climate change. Droughts, extreme heat, changing rainfall patterns, glacier melting, rising sea level and health related issues are faced by India due to climate change. Indian government sets new climate change targets in 2015. The government has pledged to reduce its greenhouse gas emissions intensity — the ratio between a country's gross emissions to its gross domestic product at a particular point — by 33-35 per cent by 2030. For this, India has to ensure about 40 per cent of its electricity comes from non-fossil fuel sources. The government will launch new, more efficient and cleaner technologies in thermal power generation, reduction of emissions from the transportation sector, promotion of energy efficiency in industry, transportation, buildings and appliances, and reduction of emissions from waste.

Keywords: global warming, Climate change, transportation sector.

1. INTRODUCTION

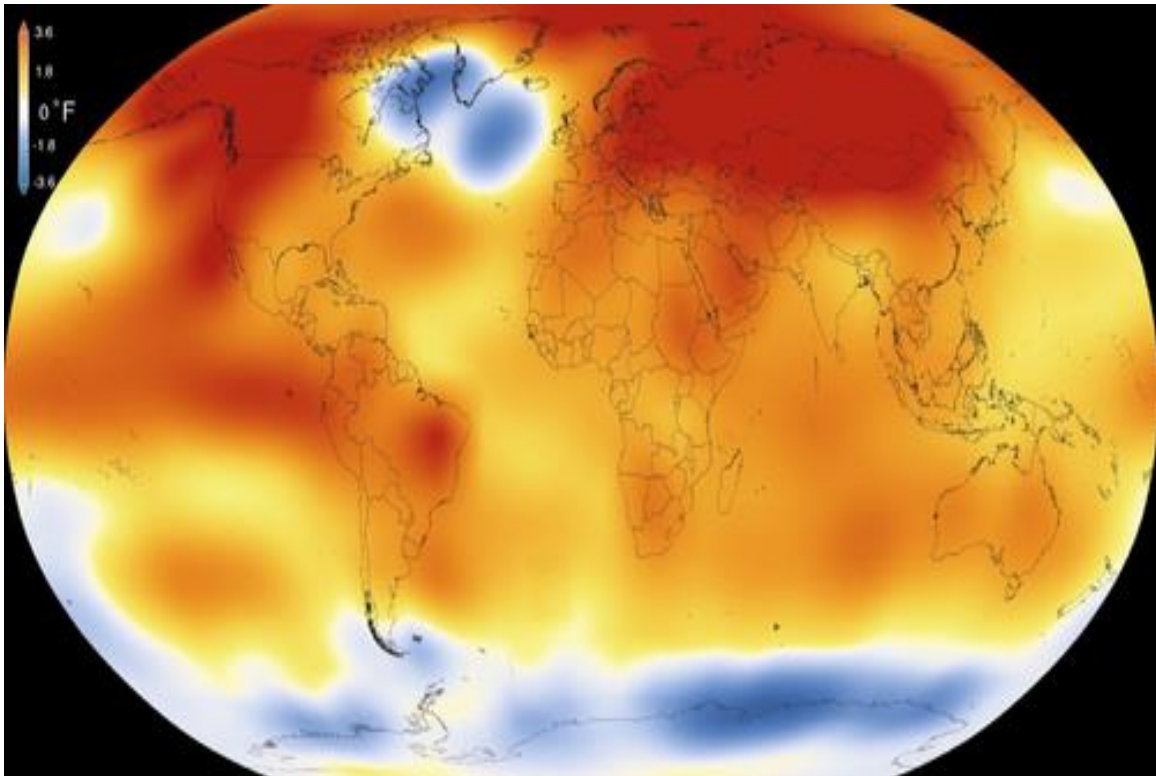
Now a days climate change is the biggest problem of the human being. It is already happening and represents one of the greatest environmental, social and economic threats facing the planet. The warming of the climate system is unequal, as is now evident from observations of increases in global average air and ocean temperatures, wide spread melting of snow and ice, and rising global mean sea level. The Earth's average surface temperature has risen by 0.76° C since 1850. Most of the warming that has occurred over the last 50 years is very likely to have been caused by human activities. The climate can affect every person and our health directly through increases in temperature. Such increases may lead to more extreme heat waves during the summer while producing less extreme cold spells during the winter. Particular segments of the population such as those with heart problems, asthma, the elderly, and the very young can be especially vulnerable to extreme heat. There can be extreme floods and droughts, hurricanes. In this paper we understand the meaning of climate change and factors that causes climate change. How climate change affects environment and human life. India also suffers from climate change and its adverse effect. Indian government sets new target to deal with this problem in future.

Climate Change:

Climate change is a change in the statistical distribution of weather patterns when that change lasts for an extended period of time (i.e., decades to millions of years). Climate change may refer to a change in average weather conditions, or in the

time variation of weather around longer-term average conditions (i.e., more or fewer extreme weather events). Climate change is caused by factors such as biotic processes, variations in solar radiation received by Earth, plate tectonics, and volcanic eruptions. Scientists actively work to understand past and future climate by using observations and theoretical models. A climate record—extending deep into the Earth's past—has been assembled, and continues to be built up, based on geological evidence from borehole temperature profiles, cores removed from deep accumulations of ice, floral and faunal records, glacial and periglacial processes, stable-isotope and other analyses of sediment layers, and records of past sea levels.

Physical Evidence:



Evidence for climatic change is taken from a variety of sources that can be used to reconstruct past climates. Reasonably complete global records of surface temperature are available beginning from the mid-late 19th century. For earlier periods, most of the evidence is indirect—climatic changes are inferred from changes in proxies, indicators that reflect climate, such as vegetation, ice cores, dendrochronology, sea level change, and glacial geology.

Causes of Climate Change:

Increase in CO₂ concentration:

The CO₂ concentration in the atmosphere by about thirty percent, due to Human beings have increased, the increase is proportional to increases in fossil fuel combustion, for electricity generation, transportation, and heating, and also the manufacture of cement (human caused) emissions. It is predicted that we'll soon reach carbon dioxide concentrations that haven't been seen on Earth in the last 50 million years, which is eventually leading to changes in the Earth's average surface temperature, which is really proving fatal to human lives.

2. OZONE DEPLETION

Increase in ozone levels in the stratosphere over Antarctica, are the result of complex chemical processes. The return of the Sun at the end of winter triggers photochemical reactions that lead to the destruction of ozone in the stratosphere. As reported Over the Arctic the gradual development of an annual decline during the 1990s, has been observed. The Protection of the Ozone Layer amendments has been issued to eliminate certain CFCs from industrial production, the substantial destruction of ozone in the stratosphere over Antarctica, has not seen any improvement till date.

Deforestation:

The use of forests for fuel (both wood, for charcoal and other necessary lifestyle products) is one cause of deforestation. In order to satiate ourselves, for wood and other products, mainly habitat and to build farms we are chopping forests which is not a good sign and has also led to a decrease in rainfalls. Forests are very human friendly, they clean the air as they act as natural filters that remove and store carbon dioxide from the atmosphere, and this deforestation releases large amounts of carbon, as well as reducing the amount of carbon gas capture on the earth.

Methane and Nitrous oxide emissions from agriculture, Arctic sea beds and factories:

Methane is one of the greenhouse gases, which causes global warming. When organic matter is broken down by bacteria under oxygen-starved conditions as in agricultural fields, methane is produced. The process also takes place in the intestines of herbivorous animals, and with the increase in the amount of concentrated livestock production, the levels of methane released into the atmosphere are increasing. Another source of methane is methane clathrate, a compound in large amounts of methane trapped in the crystal structure of ice. As methane escapes from the Arctic seabed, the rate of global warming increases, accordingly.

Aerosols present in the Atmosphere:

Atmospheric aerosols are able to alter the climate in two important ways.

- They scatter and absorb solar and infra-red radiation
- They may change the micro-physical and chemical properties of clouds and possibly their lifetime and extent.

This can be explained as, scattering of solar radiation acts to cool the planet, while the absorption of solar radiation by aerosols warms the air directly instead of absorption of sunlight from the surface of the Earth.

The human contribution to the amount of aerosols in the atmosphere takes many forms, such as:

- Biomass burning produces a combination of organic droplets.
- Exhaust emissions from transport generate pollutants that are either aerosols from the outset, or are converted by chemical reactions in the atmosphere to form aerosols.

Sunspots:

Sunspots are dark patches on the sun's surface that block hot solar plasma. Increase in solar activities changes the Earth's solar radiation levels, thereby causing short-term warming cycles. Surrounding sunspots are bright patches known as faculae. These patches give off greater than normal radiation, and they are more powerful than the darker, cooler patches. This means that the total average energy over a 30-day solar rotation increases, which gives way to many other after effects

Burning of Fossil Fuels:

Each time a fossil fuel burns, carbon dioxide levels in the atmosphere increase. As we know carbon dioxide absorbs infra-red energy emitted from the earth's surface, preventing it from returning to space. Automobiles, carbon emissions from the burning of gasoline to power cars, trucks, and other methods of transportation. Electricity generation requires, coal is the largest producer of carbon dioxide emissions, therefore countries across the world want to switch to nuclear power plants.

Mining activities:

Mining oil, coal and other mineral products underlying in deep beds allow methane, a greenhouse gas, to escape from the earth. Disturbing the soil, stored gases make their way into the environment.

Population Increase:

As the population on Earth increases, food and housing demands along with other basic necessities also increase. Manure from cattle, contributes to methane gas levels. The cutting down of forests to make space for housing and other buildings accounts for close to 11-12 % of carbon emissions.

Impact of Climate Change:

There are so many impacts of climate change, scientists have broadly categorized them into three areas:

1. Erratic climate and weather extremes
2. Altered ecosystems and habitats
3. Risks to human health and society

The primary impact: Earth's water systems thrown off balance:

Emissions of heat-trapping gases from human activity—especially the burning of fossil fuels for energy—cause our atmosphere to heat up.

This atmospheric heating unleashes a torrent of rapid changes to the way water systems typically function on our planet.

For example:

- **The cryosphere—the frozen water on Earth—is melting.** A warmer atmosphere causes the planet's snow pack, glaciers and sea and freshwater ice to melt at an accelerated pace. Melting glaciers and polar ice sheets contribute to sea level rise. As the ice melts, it also exposes more dark ocean waters, which absorbs more sunlight than ice, and thus heats the ocean more, triggering a cycle of melting and heating.
- **Weather of all kinds is getting more extreme:** The increased evaporation of water is like fuel for storms, exacerbating extreme weather events, such as hurricanes. Rising sea levels make coastal flooding events worse. In more naturally arid areas, droughts and wildfires intensify.
- **The oceans are getting hotter, expanding, and becoming more acidic:** The oceans are getting hotter, because they soak up 90% of the extra heat in the atmosphere. This causes the oceans to expand, and this also contributes to higher sea levels. Meanwhile, the increased concentration of carbon dioxide in the ocean triggers a chemistry change that makes the water more acidic. The ocean is almost 40% more acidic than it used to be.

This shift in water patterns then alters natural habitats

As climatic patterns rapidly shift, habitats on land and in the sea are changing, making them inhospitable for some species, while letting others move in and take over. In some cases, entire ecosystems are at risk of collapsing.

The changes to the natural world are vast, but here are three notable and well-documented examples.

- **Coral and shellfish are suffering:** Coral reefs are highly sensitive to small changes in ocean temperatures. The heat stresses the algae that nourish the corals and provide their vibrant colors. The algae then leave, and the corals eventually starve, an event known as bleaching. Also, a more acidic ocean affects the normal calcium balance, meaning creatures with calcified shells, such as shellfish and coral, may not have enough calcium to grow.
- **Forests are more prone to deadly infestations:**
- Milder winters and longer summers allow tree-killing insects to thrive. Meanwhile, trees weakened by prolonged drought have lower defense mechanisms. This cycle of warmer weather, weak trees and thriving insects is likely the culprit behind the massive die-off of 70,000 square miles of Rocky Mountain conifers.
- **Our Arctic creatures need ice, but it's vanishing:** As sea ice disappears, ice-dependent mammals like walrus and polar bears struggle to survive. In 2008, the polar bear became the first animal to be added to the Endangered Species Act list of threatened species because of global warming.

It also places many added burdens on people and society

Human life is thrown out of balance, too. One of the biggest impacts? Where, how and when we grow food, which is vitally connected to our climate's normal patterns.

More extreme weather also means we face increased pressure on our health, infrastructure, and economy.

- **Climate change is a major threat to agriculture:** The toll that climate change takes on agriculture is nearly incalculable, and as a result, our food security is at risk. All over the world, farmers are struggling to keep up with shifting weather and increasingly unpredictable water supplies. Farmers also must contend with unexpected attacks from weeds, diseases and pests, which affect yield.
- **Warmer, polluted air affects our health:** A warmer atmosphere increases chemical reactions that form ground-level ozone, also known as smog. Smog is a well-known lung irritant and a major trigger of asthma attacks. Smoke from

wildfires further degrade the air. Extreme summer heat will mean more deaths during heat waves, and warmer freshwater makes it easier for pathogens to grow and contaminate drinking water.

- **Infrastructure and transportation are at risk, too:** Hot weather, flooding and other extreme weather events damage infrastructure, put heavy burdens on electrical supplies, and disrupt how we travel and commute.

Climate Change And India:

Climate change also effect india adversely. Climate change could kill half a million people globally, and more than a hundred thousand in India over the next 35 years. climate change will adversely impact food production. "The model projects that by 2050, climate change will lead to per-person reductions of 3.2% in global food availability, 4% in fruit and vegetable consumption. This change in dietary habits will cause an increase in lifestyle diseases. Already lifestyle diseases are among the biggest health risks in India. For instance, about 60% of the total deaths in India are due to non-communicable diseases like heart infections, diabetes, cancer, and respiratory diseases. huge coastal erosion due to a rise in sea levels of about 40 cm resulting from faster melting of glaciers in the Himalayan and Hindukush ranges. It can affect half-a-million people in India because of excessive flooding in coastal areas and also can increase the salinity of ground water in the Sunderbans and surface water in coastal areas. The major impact of climate change in india are :

Extreme Heat:

India is already experiencing a warming climate. Unusual and unprecedented spells of hot weather are expected to occur far more frequently and cover much larger areas. Under 4°C warming, the west coast and southern India are projected to shift to new, high-temperature climatic regimes with significant impacts on agriculture.

Changing Rainfall Pattern:

A decline in monsoon rainfall since the 1950s has already been observed. The frequency of heavy rainfall events has also increased. A 2°C rise in the world's average temperatures will make India's summer monsoon highly unpredictable. At 4°C warming, an extremely wet monsoon that currently has a chance of occurring only once in 100 years is projected to occur every 10 years by the end of the century. An abrupt change in the monsoon could precipitate a major crisis, triggering more frequent droughts as well as greater flooding in large parts of India. India's northwest coast to the south eastern coastal region could see higher than average rainfall.

Droughts:

Evidence indicates that parts of South Asia have become drier since the 1970s with an increase in the number of droughts. Droughts have major consequences. In 1987 and 2002-2003, droughts affected more than half of India's crop area and led to a huge fall in crop production. Droughts are expected to be more frequent in some areas, especially in north-western India, Jharkhand, Orissa and Chhattisgarh.

Crop yields are expected to fall significantly because of extreme heat by the 2040s

3. GROUNDWATER

More than 60% of India's agriculture is rain-fed, making the country highly dependent on groundwater. Even without climate change, 15% of India's groundwater resources are overexploited. Although it is difficult to predict future ground water levels, falling water tables can be expected to reduce further on account of increasing demand for water from a growing population, more affluent life styles, as well as from the services sector and industry.

Glacier Melt:

Glaciers in the northwestern Himalayas and in the Karakoram range - where westerly winter winds are the major source of moisture - have remained stable or even advanced. On the other hand, most Himalayan glaciers - where a substantial part of the moisture is supplied by the summer monsoon - have been retreating over the past century. At 2.5°C warming, melting glaciers and the loss of snow cover over the Himalayas are expected to threaten the stability and reliability of northern India's primarily glacier-fed rivers, particularly the Indus and the Brahmaputra. The Ganges will be less dependent on melt water due to high annual rainfall downstream during the monsoon season. The Indus and Brahmaputra are expected to see increased flows in spring when the snows melt, with flows reducing subsequently in late spring and summer.

Sea level rise:

Mumbai has the world's largest population exposed to coastal flooding, with large parts of the city built on reclaimed land, below the high-tide mark. Rapid and unplanned urbanization further increases the risks of sea water intrusion. With India close to the equator, the sub-continent would see much higher rises in sea levels than higher latitudes. Sea-level rise and storm surges would lead to saltwater intrusion in the coastal areas, impacting agriculture, degrading groundwater quality, contaminating drinking water, and possibly causing a rise in diarrhea cases and cholera outbreaks, as the cholera bacterium survives longer in saline water. Kolkata and Mumbai, both densely populated cities, are particularly vulnerable to the impacts of sea-level rise, tropical cyclones, and riverine flooding.

Agriculture and food security:

Seasonal water scarcity, rising temperatures, and intrusion of sea water would threaten crop yields, jeopardizing the country's food security. Should current trends persist, substantial yield reductions in both rice and wheat can be expected in the near and medium term. Under 2°C warming by the 2050s, the country may need to import more than twice the amount of food-grain than would be required without climate change.

Water Security:

Many parts of India are already experiencing water stress. Even without climate change, satisfying future demand for water will be a major challenge. Urbanization, population growth, economic development, and increasing demand for water from agriculture and industry are likely to aggravate the situation further. An increase in variability of monsoon rainfall is expected to increase water shortages in some areas. Studies have found that the threat to water security is very high over central India, along the mountain ranges of the Western Ghats, and in India's northeastern states.

Health:

Climate change is expected to have major health impacts in India- increasing malnutrition and related health disorders such as child stunting - with the poor likely to be affected most severely. Child stunting is projected to increase by 35% by 2050 compared to a scenario without climate change. Malaria and other vector-borne diseases, along with diarrheal infections which are a major cause of child mortality, are likely to spread into areas where colder temperatures had previously limited transmission. Heat waves are likely to result in a very substantial rise in mortality and death, and injuries from extreme weather events are likely to increase.

India's Climate and Energy Policy:

The government has pledged to reduce its greenhouse gas emissions intensity — the ratio between a country's gross emissions to its gross domestic product at a particular point — by 33-35 per cent by 2030, compared to 2005 levels. For this, India has to ensure about 40 per cent of its electricity comes from non-fossil fuel sources. India will also increase its forest cover to create an additional carbon sink of 2.5-3 billion tonnes of carbon dioxide equivalent. These targets (called the intended nationally determined contribution, or INDC) were presented to the United Nations Framework Convention on Climate Change for the global Paris summit. The government has said till 2030, these emission intensity-reduction targets and adaptation to climate change will require about \$2.5 trillion, as well as an array of technologies. India, in its submission, said, The successful implementation of INDC is contingent upon an ambitious global agreement, including additional means of implementation to be provided by developed countries, technology transfer and capacity building. India's goal is to reduce overall emission intensity and improve the energy efficiency of its economy over time and, at the same time, protect the vulnerable sectors of the economy and our society. In 2010, India had committed that by 2020, it would reduce the emissions intensity of its economy 20-25 per cent compared to 2005 levels. India will undertake the emission intensity reduction and the changing of energy mix by 2030. India has already undertaken to reduce emissions and adapt to climate change, including the ambitious target of setting up 175 Gw of solar and wind power capacity by 2022 and an enhanced energy-efficiency mission across industrial sectors. It also promises to increase the share of renewable energy in the energy mix, though it doesn't explicitly mention 300-350 Gw of solar and wind power capacity will be required to achieve non-fossil fuel power capacity of 40per cent. the government will launch, including introduction of new, more efficient and cleaner technologies in thermal power generation, reduction of emissions from the transportation sector, promotion of energy efficiency in industry, transportation, buildings and appliances, and reduction of emissions from waste.

4. CONCLUSION

As we all know climate is an important element for the survival of human and other species. Now climate change is a global problem. Today we are moving rapidly to a swift and appalling deterioration of our environmental assets. There is still world enough and time, but the decades immediately ahead are crucial. During these next crucial decades we must be open to large changes in our own lives and be prepared to make sacrifices because of our commitments to Earth, future generations, and to justice. Developed and developing countries come together to tackle this problem.

REFERENCES

- [1] <https://climatechangesandpoverty.wordpress.com>
- [2] <https://en.wikipedia.org>
- [3] <http://www.c2es.org>
- [4] <http://www.business-standard.com>
- [5] <http://listovative.com>
- [6] <http://www.worldbank.org>
- [7] <http://www.greenpeace.org>
- [8] <https://www.edf.org>