

Climate Change and Biodiversity

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Abstract- We all witness to the deleterious effects of climate change. The response of biodiversity to climate change has become an extremely active field of research. Predictions play an important role in alerting scientists and decision makers to potential future risks, provide a means to bolster attribution of biological changes to climate change and can support the development of proactive strategies to reduce climate change impacts on biodiversity. The whole world is now anxious to control the damage and loss of biodiversity with the passage of time. Maintaining and restoring healthy ecosystems plays a key role in adapting to and mitigating climate change through biodiversity conservation, sustainable use and sustainable land management and yields multiple environmental, economic and social benefits.

Indexed Terms- Climate change, greenhouse gases, biodiversity.

I. INTRODUCTION

The word 'climate' refers to the long-term weather patterns within a defined region including temperature, humidity, rainfalls and wind amount. Weather refers to daily or weekly changes in the atmosphere, while climate is generally discussed, in terms of years, decades, centuries, and millennia. Today, the commonly used term 'climate change' represents any change in climate over time, whether due to natural causes and/or as a result of human activities. Climate change refers to significant and long-term changes to a region's climate. These changes can occur over a few decades, or millions of years. Climate change alters entire ecosystems along with the living organism that live there. As climate has changed throughout Earth's history, all living creatures have had to adapt, move, or die out. When these changes happen gradually, ecosystems and species are able to evolve together. A gradual change also gives species the opportunity to adapt to new

conditions and when these changes happen very quickly, than the species try to adapt quickly in a suitable location. Climate change will provide new ways for invasive species to encroach on new territory. Naturally occurring Green House Gases are responsible for slow increase in earth's temperature, which is necessary for balancing the environment. But now, anthropogenic activities continuously increase the levels of greenhouse gases in the atmosphere. More greenhouse gases trapped more heat with the result atmospheric temperature increased (Global warming). The industries, burning of fossil fuels and transportation generate and release greenhouse gas like carbon dioxide (CO₂) and methane (CH₄). Large amounts of greenhouse gases are also released every day by volcanic eruptions and forest fires. Greenhouse gases from all sources mix in the atmosphere and affect the entire Earth. In 1896, the Nobel Laureate Svante Arrhenius predicted that increases of atmospheric CO₂ from burning fossil fuels would lead to global warming. He suggested that doubling of CO₂ concentrations in the atmosphere would raise the temperatures of the Earth by about 2 to 6 °C.

As Earth warms and temperatures rise, regional climates are affected in various ways such as heavier monsoons in some area and droughts in other areas, rising sea levels and crop failures. Reduced snowpack and shrinking glaciers in the mountains mean less melting snow flowing into rivers, reservoirs, and lakes for fish and wildlife, and less water available for drinking and irrigation. Warmer temperatures also produce increased evaporation, which leads to heavier rainfall and snowfall. Warmer air temperatures also lead to higher ocean temperatures, and warmer oceans affect global ocean currents and associated weather patterns.

Biodiversity describes the range of living organisms in a given area considering the variety of life forms, the genes they contain, and the ecosystems they form. Life forms within an ecosystem vary in their size and shape

from the simplest unicellular prokaryote to the more complex multicellular eukaryotic organisms. Each organism plays an important role and contributes to ecosystem stability (Singh and Singh, 2019). The climate change has a huge impact on biodiversity (Prakash and Srivastava, 2019). The biodiversity conservation is required for sustainable development (Verma, 2019) and survival of plants and animals because biodiversity is the foundation of human life (Verma and Prakash, 2020).

The importance of biodiversity can be ascertained from the Convention on Biological Diversity (CBD), signed in 1992 at Rio de Janeiro, Brazil. The convention main objectives have been the conservation of biological diversity, the sustainable use of its components; and the fair and equitable sharing of benefits arising from genetic resources. The importance of biodiversity and its role in sustainable development is stressed by most of the researchers (Griggs, 2013). Thus biodiversity is a measure of the health of ecosystems and is the foundation of ecosystem services to which human wellbeing is intimately linked (Prakash and Verma, 2019).

II. IMPACT ON BIODIVERSITY

Biodiversity is continually transferred by a changing climate. Conditions change across the face of the planet, sometimes slowly, sometimes in larger increments leading to rearrangements of biological associations. There is a need of biodiversity conservation (Verma, 2015) because the biodiversity has different levels (Verma, 2016) and its loss has irreparable effects (Kumar and Verma, 2017). The ecological balance is necessary for widespread biodiversity (Verma 2017), human survival and all are interrelated with agriculture (Verma 2018a, 2018b).

Global warming is responsible for increasing the storms and floods, reduced snow pack and more frequent droughts, and rising sea levels: How will all of these climate changes affect the biodiversity. Species have evolved to survive within certain temperature ranges and are able to tolerate variations in weather. The effects of climate change may push some species to the edge of extinction, while other species may flourish. Global warming disturb the biological clock of various reptiles and birds and other

animal. Warmer spring temperatures may cause birds to begin their seasonal migrations or nesting and cause bears to emerge from hibernation earlier than usual. Mortality rate of young elephants are more due to increasing the temperature. Elephants, like humans, reproduce later in life, so if calves die before they can mate, then the species will be unable to survive. Animals that require cooler temperatures are shifting their ranges to higher elevations or towards the poles as the temperatures in their home ranges rise. The American pika, a small mammal related to rabbits and hares, is adapted to life in the alpine environment. They are extremely sensitive to temperature and can die when temperatures reach only 78°F to 85°F (25.6°C to 29.5°C) (IFAW, 2012).

Temperatures in the Himalayan ecosystem are increasing at a rate of 0.9 °C annually, which is considerably higher than the global average of 0.7 °C per decade. Change in the temperature increases the mosquito, flies and other insects population in Himalayan region. The presence of these insects suggests the possible spread of vectorborne diseases, such as malaria and dengue fever, to areas where cooler temperatures previously protected people from these threats (FAO, 2012).

Ecological communities of plant and animal species called “biomes” are shifting as the planet warms. Some species are able to adapt and move while others cannot, and these will disappear with their disappearing habitat. In the Mandakini Valley of northern India, scientists report that the oak forests have been invaded by pine trees (between 1 000 and 1 600 m), particularly on south-facing slopes. This phenomenon can also be observed in many other valleys of the region. Many sources of water, such as springs, have dried up because of the disappearing oak trees and invading pines (FAO, 2012).

Climate change and invasive species are two major threats to biodiversity. Put them together and the repercussions are projected to be widespread. Climate change will provide new ways for invasive species to encroach on new territory. Natural disasters like storm surges and high winds, which increase in number and severity as the earth warms, spread non-native plants and insects to new territories. For example, the winds of the 2005 hurricane season likely introduced cactus

moths to Mexico, where their presence threatens endemic cactus species. Virtually all ecosystems worldwide have suffered invasion by the main taxonomic groups including India. The major invasive alien plant species include *Lantana camara*, *Eupatorium odoratum*, *Eupatorium adenophorum*, *Parthenium hysterophorus*, *Ageratum conyzoides*, *Mikania micrantha*, *Prosopis juliflora* and *Cytisus scoparius*.

In terms of agriculture, there is a need for climate resilient farming systems. Climate literacy should be spread and a cadre of Community Climate Risk Managers should be formed in villages. The calamity of climate change should be converted into an opportunity for developing and spreading climate resilient farming techniques and systems (Swaminathan and Keshvan, 2012).

CONCLUSION

The changes in climatic factors have a huge impact on the biodiversity of a region. Factors such as increasing temperatures and rising sea levels have impacted the marine and terrestrial ecosystems hugely leading to extinction of various species and many species have been categorized as vulnerable or are at point of being declared extinct. Factors such as deforestation, large scale development and construction like dams and other big developmental projects, clearing of forest land for agriculture and other non- agricultural uses have significantly impacted the biodiversity. The protection of biodiversity becomes crucial in present time. It is therefore important to understand the impacts of climate change on the biodiversity and mitigation strategies should be undertaken to reduce the damage caused by adverse effects of climatic change on biodiversity. Other affects due to climatic change would be:

- Global average sea level will rise.
- Higher ocean levels will contaminated underground water sources particularly in smaller island states including Indian oceans is the Caribbean Sea and some of the most productive deltas.
- Arid and semiarid regions are becoming drier which will result prolonged droughts.

- On the other hand atmosphere water content is increasing globally and mid to high altitudes are becoming wetter.
- Possibilities of extreme weather events such as heat waves, wild fire, storms, and flash, flood etc.

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