

Original Article

Impact of Environment Changes on Biodiversity

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Abstract - Environment change refers to the long-term, human-caused variations that may be from natural disasters or natural sources in weather and temperature; there exists biodiversity in the living organisms, ecology and ecological system. Living and non-living things are dependent on or interrelated with each other for the existence of living bodies. The most prevalent signs of degradation or variation in the environment are rising global average temperatures and harsh, unpredictable weather. The significance of a worldwide emergency that affects not just human well-being but also the sustainability of other life forms and these effects has grown to a high level due to an increase in different types of pollution or contaminants which are responsible for increasing the temperature of the environment and leads to bad impact on biodiversity.

Keywords - Environment, Biodiversity, Climate Change, Biological Species, Ecosystems.

1. Introduction

The fundamental needs for human survival and the preservation of the natural ecological balance in the world are biodiversity and the related Eco services it provides. Humanity's top concern today is biodiversity, its rapid loss, and the pressing need to conserve it. It is challenging to analyze the decline in biodiversity solely as a result of climate change because other human-caused environmental changes, such as habitat loss and degradation, overuse of bioresources, and the introduction of alien species, also impact ecosystems and biodiversity. The consequences of climate change on biodiversity are multifaceted (1,2).

A rise in temperature affects two facets of plant and animal growth and development. A change in phenological events is one, and a change in the distributional range of species is the other. Species of plants and animals have adapted to their natural environments. Animals have a tendency to migrate towards the poles and higher altitudes when the temperature in their natural habitat rises, seeking out more ideal temperatures and environmental factors. Numerous species might eventually become extinct because they are unable to adapt to the shifting weather patterns. Animals are essential to the seed distribution of the majority of flowering plants. Long-distance seed distribution has decreased because of defaunation brought on by environmental change and other stressors, estimating the dispersal function (3,4).

The primary causes of climate change have been an enormous increase in greenhouse gas carbon dioxide, methane, and nitrous oxide emissions in recent decades, mostly from the burning of coal and other fossil fuels, as well as deforestation. Climate change is primarily associated with a decline in crop productivity, a rise in sea

level, a noticeable increase in the frequency and intensity of natural disasters, and a loss of biodiversity (5,6).

The rich tapestry of life on earth, known as biodiversity, is closely linked to changes in the environment, particularly climate change. Changes or fluctuations in the environment bring about an impact on biodiversity, which is very much required for sustaining life on the earth (7).

The significance of this study is to address the research gap, which is very important because of the potential consequences of failing to understand the impact of environmental changes on biodiversity, such as loss of species, ecosystem collapse, and threats to human well-being.

Contextual Information: Biodiversity refers to the variety of life forms present in a particular habitat, ecosystem, or the entire planet. It encompasses a wide range of organisms, including plants, animals, fungi, and microorganisms, as well as the genetic diversity within each species and the diversity of ecosystems themselves. Biodiversity is crucial for maintaining ecosystem health and functioning due to several key reasons:

Biodiverse ecosystems tend to be more resilient to environmental changes and disturbances. The presence of a variety of species ensures that if one species is negatively affected by a change, others may be able to compensate, helping to maintain overall ecosystem stability.

Biodiversity supports a wide range of ecosystem services that are vital for human well-being. These services include pollination of crops by insects, regulation of water quality and quantity by wetlands and forests, nutrient



cycling, climate regulation, and provision of food and medicine.

Biodiversity provides a vast array of genetic resources that can be utilized for agriculture, medicine, industry, and scientific research. Genetic diversity within species allows them to adapt to changing environmental conditions, ensuring their long-term survival.

2. Methodology

Based on the environmental biodiversity mentioned in the introduction part of this paper, the impact or effect of environmental change (that is, change in the climatic condition and how does it leads to the existence and disappearance of biological species) on the biodiversity are explained in Result and Discussion part of this paper. The impact of environmental changes on biodiversity can be very satisfactorily explained by doing the field visit or survey of water bodies or water reservoirs and the area around it in Bhiwandi city, District Thane, State Maharashtra, located 50 Km from Mumbai city. A survey of water bodies was done during all climatic conditions like rainy season, winter season and summer season. A decrease in biodiversity is also due to an increase in pollution as the water bodies in Bhiwandi city are polluted or contaminated with heavy loads of pollutants or contaminants, which causes a decrease or disappearance of many biodiversity among living organisms.

3. Result and Discussion

During the survey in different climatic conditions or during different weather, it was found that most of the biological organisms or species and plants (that is, flora and fauna) are available in plenty during the rainy season, and then there is a decrease in biodiversity as climate goes from winter to summer seasons, different diversities in the birds are also seen during the rainy season, but this variety goes on decreasing due to change in the weather pattern from cool to hot or from low temperature to high temperature, few animals and their existence are explained in the given table as per the climatic condition.

The reasons for change or loss or destruction of biodiversity due to changes in weather, climate or environmental changes are mentioned.

Table 1. Existence of biological species

Weather	Biological Species		
	Winter	No number of frogs appears	A large number of earthworms
Summer	Species of frogs disappear	Less number of earthworms	A very low number of snakelet
Rainy	Large number of Frogs	Innumerable number of earthworms	A large number of snakelet

Rising Temperatures: Several ways rising global temperatures affect biodiversity. For example, modifying what can grow and thrive in ecosystems over extended periods of time might be caused by rising temperatures. Globally, decreased growth rates and browning have already been caused by less water vapour in the atmosphere in vegetated areas.

Extreme Weather Events: As a result of climate change, there are more intense fires, storms, and droughts.

Ocean Changes: Marine life is impacted by warming seas and acidity. Particularly at risk are corals, which are essential to marine ecosystems. In acidic seas, corals and shellfish have difficulty forming skeletons and shells.

Changed Habitats: The distribution and abundance of species are impacted by the disruption of natural habitats caused by climate change. The Amazon rainforest and mangroves, both abundant in biodiversity, are essential for controlling climate and sequestering carbon.

The first extinctions caused by climate change have occurred as a result of climate change. Disease rates rise, local species disappear, and huge death events take place. The loss of biodiversity is linked to long-lasting ecological changes. Natural disasters that wipe out entire biological communities and eradicate local populations, such as wildfires, floods, and volcanic eruptions, change ecosystems (8,9,10,11).

3.1. Preserving Biodiversity

Reducing Global Warming: Preserving organic carbon sinks (like mangroves and the Amazon) is essential for reducing global warming.

Healthy ecosystems have the potential to mitigate the effects of climate change. Acknowledging that biodiversity can be both a cause and an effect of climate change is important.

Maintaining biodiversity is critical to both our own health and the resilience of our world.

A decline in biodiversity has an impact on the functioning of an ecosystem, rendering species less adaptive to environmental changes and more susceptible to natural disasters. Ecosystems and biodiversity around the world are increasingly at risk from climate change. Species are adapting to the changing climate by changing their shape and behaviour, changing their phenology, and shifting their geographic range. These adaptations are mediated by plastic and evolutionary responses. The direct consequences of climate change on ecosystems (including more extreme events), along with species and population responses, are causing broad changes in emergent features such as productivity, species interactions, and vulnerability to biological invaders. When taken as a whole, these effects change the services and advantages that natural ecosystems can offer to civilization. However, not every influence is both positive and bad changes may necessitate expensive

societal adaptations. To reduce expenses over time, natural resource managers require proactive, adaptable adaptation plans that take past trends and future projections into account (12,13).

The term climate change describes anthropogenic variations in local, regional, or global temperature and weather. The weather and living forms have coexisted in a delicate equilibrium for millions of years, allowing for the existence of all life on earth. This balance is progressively shifting following the Industrial Revolution, and this shift has been noticeable since the mid-1900s. The sustainability of biodiversity and human well-being are now seriously threatened by it. The most frequent signs of climate change are rising global average temperatures and abrupt, extreme weather. The factors causing climate change, how it affects biodiversity, and the global mitigation efforts being implemented. Strategies, widespread or systematic adoption are still lacking in the country (14).

Rising atmospheric temperatures severely impact biodiversity and ecosystems. The most significant evidence of climate change comes from long-term records of CO₂ concentrations, global temperatures, and weather patterns (15).

The pressures placed on forests in the last few decades by mining, cattle ranching, and the cultivation of plantation crops, including oil palm, coffee, tea, and rubber, have significantly decreased the amount of forest cover. In the 377 million hectares of forest that the World Wildlife Fund (WWF) monitors worldwide, more than 43 million hectares of forest were lost between 2004 and 2017. The world's largest tropical rainforest, spanning more than 5 million km², is the Amazon Rain Forest. It has been degrading for a long time and has hit its peak recently. About 17% of the Amazon rainforest has been destroyed during the previous 50 years, and the percentage has been rising recently, according to National Geographic (16).

The primary cause of greenhouse gas emissions is the combustion of fossil fuels, such as coal, oil, and natural gas, by vehicles and other businesses. Both the extraction and consumption of these fuels release carbon dioxide into the atmosphere. Prior to the industrial revolution, the atmosphere had about 280 parts per million of carbon dioxide; as of 2019, that number has risen to 412 parts per million. An increase in atmospheric temperature causes the ocean's temperature to rise as well. Approximately 25 percent of the carbon dioxide released by human activity is removed by the seas, which is a significant contribution to the global carbon cycle. Additionally, some carbon dioxide dissolves in ocean water, releasing carbonic acid, which makes seawater more acidic (1,5,8,16).

Microbes feeding on nitrogen-based organic matter from wastewater and uncultivated soil are the primary natural source of nitrous oxide released into the atmosphere, accounting for 60% of the total amount. Human activity, especially agriculture, is the source of the remaining nitrous

oxide. In order to boost output, farmers regularly apply nitrogenous fertilizers to crop plants, yet many have a tendency to apply more than is necessary. However, it causes the nitrification and denitrification processes by bacteria to release nitrous oxide into the soil. The quantity of nitrogen that is available in the soil to microbial action, which results in the emission of nitrous oxide, is increased by both synthetic and organic fertilizers (2,4,7,14).

An increase in the frequency and intensity of natural disasters, coupled with extreme and unpredictable weather, results in alterations to the weather pattern. Farmers could arrange their crop sowing seasons in accordance with the prevailing meteorological conditions in previous decades when it was feasible to reasonably foresee the yearly weather pattern, including the start and finish of the monsoon rains. Farmers are currently incurring enormous losses as a result of the weather pattern shifting virtually annually. It is clearly evident that the frequency and severity of natural disasters, including hurricanes, typhoons, cyclones, floods, and droughts, as well as wildfires, have increased (17,18,19,20,21).

The two methods that global warming is raising mean sea level are as follows. In addition to adding water to the ocean, the melting of glaciers, the polar ice cap, and the Atlantic ice shelf also causes the ocean's volume to increase as the water gets warmer. Tiny carbon particles are released during incomplete combustion of biomass, biofuels, and fossil fuels. Global warming is caused by carbon particles trapped in the air, which absorb solar radiation thousands of times more efficiently than CO₂. Sea levels rise because of the enhanced melting of snow, glaciers, and ice caps caused by the deposition of black particles on top of them (16,17,18,19,20,21).

Changes in the environment are causing growing losses in crop productivity. Global yield losses for rice, wheat, and maize show an increase of 10 to 25% with each degree Celsius of warming. Over the past 50 years, heat waves and droughts have approximately tripled agricultural losses. Abiotic pressures caused by climate change have resulted in an overall increase in crop output loss, which poses a serious danger to the world's food security. The increase in CO₂ levels in the atmosphere during global warming indicated a loss in crop productivity output. Food grains' nutritional content deteriorates as a result of environmental changes. Protein, mineral, and vitamin content in rice and other cereal crops decreases with an increase in atmospheric CO₂ concentration. Climate change would make insect, pests more prevalent, thus lowering crop production. Floods and droughts that occur frequently have a significant effect on food production as well. Global warming affects pollinators, and this affects crop productivity as well. Bees spend less time foraging in both high and low temperatures, which further decreases the ability of crop species to properly pollinate. Warming waters and increased acidity have an effect on marine ecosystems. Habitat loss has an impact on freshwater and marine fish productivity and dispersion patterns (18,19).

4. Conclusion

The entire world faces a widespread and increasing threat to its biodiversity, ecosystems, and ecosystem services from climate change. The effects of climate change have been and will continue to be seen at the individual, population, and species levels through morphology, behaviour, and range shifts; at the ecosystem level, these effects can be seen in changes to primary production, species interactions, emergent properties, and extreme events. Changes in ecosystems and biodiversity have an impact on human well-being since they affect the provision,

regulation, support, and cultural aspects of services that people depend on. Flexible, proactive strategies that take into consideration future climate change effects will be necessary for effective management. Effective ecosystem management and conservation depend on an understanding of the intricate relationships that exist between biodiversity and environmental changes. To meet the problems faced by environmental change and preserve biodiversity for future generations, interdisciplinary approaches that incorporate ecological, evolutionary, and socio-economic views are necessary (20,21).

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