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Impact of Climate Change on Biodiversity: A Review

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Abstract: ***India has a distinct identity because of its geography, culture and history and great biological diversity of its natural ecosystem. Because of this India is 12th mega biodiversity country in the world. This biological diversity is in its forest, aquatic system, wetlands and terrestrial ecosystems distributed all over the country. This richness is shown in absolute number of species and the proportion they represent of the world in total. But due to anthropogenic activities the global climate has changed since from the last few decades. The climate change of Indian subcontinent has also adversely affected the biological resources of the country. An attempt is made in the present paper to present the data in a precise form regarding the impact of climate change on biodiversity.***

Keywords: Biodiversity, Climate Change, Anthropogenic, Aquatic ecosystem

1. Introduction

Climate is defined as the weather condition of an area which are characterised by long term statistics for the methodological elements [1]. Whereas climate change means the change in climatic factors of an area caused due to the anthropogenic factors and natural disorders such as greenhouse effects and depletion of ozone layer [2]. In other words it involves temperature increase (global warming) sea level rise, change in precipitation pattern and increased frequencies of extreme events. Even change of one degree in mean global temperature over long period of time is sufficient to cause change of climate of an area and even the composition of many plant communities. The climate change (CC) though due to the alteration in external forces i. e natural factors or human activities, but future projections indicate the influence of only anthropogenic increase in greenhouse gases and other human related factors [3]. Therefore the twentieth century experienced the strongest warming trend of the last millennium with average temperature rising by about 0.6^{o}c [4]. But temperature rise in future are likely to exceed this with a predicted rise between 0.1 and 0.2^{o}c per decade. [5]. As far as India is concerned climate change is having a profound impact which is ranked fourth among the list of countries most affected by climate change in the period from 1996 to 2015 [6]. India emits about three gigatones of Carbon dioxide of green house gases each year and about two and half tones per person which is less than world average [7]. The country emits 7/of global emission [8].

The Indira Gandhi Institute of Development Research has reported that if the prediction related to global warming made by the intergovernmental panel on climate change come to fruition, climate related factors could cause India's GDP to decline by upto 9/ and this could lead to the shifting of growing season for major crops such as rice and production may fall upto 40/.

Due to the climate change, temperature rises0.7^{o}c between 1901to2018in India [9]. A study was carried out in 2018 projected that drought to increase in Northern and Northern Western India in the near future. It was also projected that at the end of the century most part of the India will likely face more and more severe droughts [10]. Besides this several landslides and floods are projected to become increasingly common in states like Assam [11]. In case of severe climate change that leads to the rising of sea level will submerge Bangladesh and parts of India that border sea may lose vast tract of coastal land. Due to the ongoing sea level rise that have submerged low lying islands in Sunderban and as a result thousands of people have been displaced [12]. It has been reported that due to temperature rise on the Tibetan Plateau are causing the Himalayan glaciers to retreat threatning the flow rate of Ganga, Brahmputra, Yamuna and other major rivers, the livelihood of hundreds of thousands of farmers depend on these rivers [13]. Report of worldwide fund for Nature (WWF) states that the Indus river may become dry because of climate change [14].

The threat posed by the climate change to biodiversity is expected to increase, yet thriving ecosystem also have the capacity to help reduce the impact of climate change. A major impact of climate on Biodiversity is the increase in the intensity and frequency of fires, storms or periods of drought. Due to fire surrounding habitats were destroyed by intense fire that is now known to have been made worse by climate change. This adds to the threat to biodiversity which has already been placed under stress by other human activities. Rising global temperature also have the potential to alter ecosystem over longer period by changing when can grow and live within them. As evidence suggest that reduction in water vapours in atmosphere since the 1990s has resulted in 59/ of vegetated areas showing pronounced browning and reduced growth rate worldwide. . Rising temperature in the oceans affects the marine life. Corals are particularly vulnerable to rising temperature and ocean acidification can make it harder for shellfish and corals in the upper oceans to form shells and hard Skelton. There are also changes in occurrence of marine algal blooms.

Geographical location of India and its climate:
India lies in the tropical belt of Asia and is Asia's second and world's 7th largest nation. It falls between 8.4 to 37^{o} 6' latitude and 68^{o}7' to 97^{o} 25' east longitude with a land frontier of 15, 200km and a coastline of 7516km with an

area of approximately 2.4/ of world geographical area, which supports 16.2/ of human global population. The country is divided into four well defined regions, the Himalayan Mountains, the Gangetic River plains, the Southern (Deccan Plateau) and the Island of Lakshadweep, Andaman and Nicobar. The Climate of India depends on monsoon where rains come mainly from south west monsoon between June and October and in North between Dec. to Feb. Thus, monsoon are most the critical climatic factor for drinking water supplies and rain fed agriculture. But India is however prone to annual floods and droughts.

British Hadely Centre for climate prediction and Research (PRECIS) carried the authentic study regarding the climate change in India that general increase in precipitation and surface air temperature will be more in Northern India. The all round warming will be observed and both nights and days will get warmer in the future.

Impact of Climate Change on Biodiversity:
Since biodiversity of the globe is the total genetic pool, all organism i. e plants and animals and even microorganism in all ecosystems which plays an integral part in man's survival and sustenance and their well being on this earth. As in India 21/ of land area is covered by the forest, but due to deforestation, encroachment of forest land, poaching of wildlife, over exploitation biodiversity is losing at an alarming rate.

In India the species in high elevation ecosystem are projected to shift higher, vegetation changes occur. Weedy/ invasive species with a wide range of ecological tolerance will have an advantage over others. Sunderbans which have Mangroves and Coral reefs and which support a diversity of wildlife and is at great risk due to rising of sea level. These coastal Mangroves forest provide habitat for various species of animals such as spotted dear, wild bores, Bengal tiger, esturine crocodiles and mud crabs etc. But with the rise in the sea level the habitat of these animals is greatly affected. Biodiversity hotspots like Western Ghats are important resources because of their high degree of endemism, biodiversity and productivity and as a result warming could put their stability at risk since they cannot move to higher altitudes. .

Ecosystem that cannot move northwards at a rate dictated by global warming will be most at risk which includes glaciers, coral reefs and Himalayan ecosystem. According to the study conducted by Sodhi et al (2004) [15] to cope up with the developmental activities, natural resources utilization could intensify in several parts of Asia. In South-East Which includes India also intensification of forest utilization can intensify deforestation that can lead to the loss of much of its original forest and biodiversity by 2100.

According to N. H. Ravindernath a senior scientist in Indian Institute of Science Bangalore that 85/ of the forest grid will undergo drastic change in the forest types [16], the higher impact will be on the Savannah biomes. Teak and Sal forest of central and east And temperate biomes of Himalayas. It is been reported that by 2050 there will be significant impact, moist and dry Savannah are likely to replaced by tropical dry forest and seasonal forest. During these changes species composition and their dominance could also be altered and large scale forest depletion and loss of biodiversity shall take place.

Due to the climate change however can causes an irreversible damage to unique forest ecosystem and biodiversity rendering several species extinct. According to study carried by Prof. Peter Mayhew of the University of New York has predicted that half of the world's plant and animal species shall become extinct due to the climate change by the end of present century [17]. The loss of biodiversity is actually the contribution of climate change. As biodiversity is degraded or lost through human activities, we may be losing some our best tools for coping with global climate change as well. Climate change however can cause an irreversible to unique ecosystem and biodiversity and as a result leads to the several species extinction. As some species which are critically endangered at present could become extinct in future and it is estimated that quarter are at the risk of extinction.

2. Conclusion

According to the IPCC's 4th report India is going to be badly affected by the climate change. As biodiversity is one of the main component / pillar for our survival and sustenance and is going to hit by the climate change. The impact on forest shall be negative on balance although some positive effects may be seen in the short run. Biodiversity which is already in constant threat due to developmental activities shall be further stressed by climate change and possibly half of the species shall disappear in next 50 years.

Although biodiversity provides food for all life forms and used as primary health care for more than 60-80/ of worlds human population, it has been affected by human activities and climate change. Thus increase in temperature and carbon dioxide concentration level would have an impact on timing seasons of flora and fauna. Accordingly species ecosystem composition and function have been affected both directly and indirectly and as a result species have been shown a modification in their morphology, physiology, behavior and they are forced to migrate due to changes in climatic variables globally. There is wide scope of more research on forest productivity, behavior of different species and productivity under different climatic scenarios.

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