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# Understanding Climate Change Issues and Its Impact on Some Floral and Faunal Community

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## ABSTRACT

Post industrial revolution based anthropogenic global climate change during last 250 years has led to an elevation in earth's average surface temperature. This type of change is a major threat to the floral and faunal components of our ecosystem and also the most important cause of loss of biodiversity resource. India is the 7th biggest nation encompassing a total land area of 32, 87,263 km2. It is also one of the twelve mega diversity countries of the world, however, now it is under the hammer of a threat of rapid depleting biodiversity. In this paper an attempt has been made to evaluate the key impacts of climate change on biodiversity with special reference to its flora and fauna. Major impacts on the floral community and the agro ecosystem include decreased photosynthesis, impaired reproductive growth, lower fertilization and seed set, increased pest and disease infestations on cultivated crops, threat of extinction to the species growing near threshold temperature and the like. Likewise the faunal community is also experiencing threat of extinction as a result of upward migration of species and more and more shifting of species towards poles, altered breeding seasonality, skewed sex ratio, influx of exotic species and disappearance of local variety, wild life encroachment on human habituations and the like .This change will upset the ecosystems balance and seriously endanger the survival of many plant and animal species. Climate change, besides the immediate impact on flora and fauna, has adverse impact on health, wellbeing and livelihoods of the people so immediate mitigation measures like reduction in the emission of greenhouse gases (GHG), change of governments' policy towards controlling population growth and implementation of new legislations is the need of the hour. But above all awareness campaigns and education of public regarding climate change is required for maintaining the environmental sustenance and biodiversity.

**KEY WORDS:** climate change, exotic species, greenhouse gases (GHG), environmental sustenance, biodiversity, perceptions of youths.

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## INTRODUCTION:

It was not without reason the Time magazine sounded an alarm in its cover story "Be worried, be very much worried" in the year 2006. This issue of the prominent magazine tried to presage the world public through its cover page story on global warming. Climate change is big news, bigger news than ever before, but the seriousness is nevertheless dangerous to the globe as our earth is a fragile planet[1]. The year 2006 may be called a watershed year because the issue of global warming gained much media attention which was often ignored by the media. The said story had featured in mass media, what eventually became the most familiar icon of climate change - a lone polar bear hovering on a floating piece of iceberg, gazing apprehensively at the adjacent ocean.

Climate change is being rapidly felt in Tripura as is the case throughout the globe. Reasons are not far to be dissected. An increase in global mean temperature is prevailing due to both the natural means and anthropogenic activities, chiefly because of rapid industrialization and urbanization. The changes in global temperature are very speedy and have deleterious impact on the people's lives and ecosystems. During last 30 years the average global temperature has been raised by 1 degree Celsius. According to Intergovernmental Panel on Climate Change (IPCC)[2], the average global temperature can rise by 2 to 8.6 degrees F by the year 2100 which could be due to the massive industrialization and urbanization that may lead increasing emissions of heat-trapping gases called greenhouse gases in the atmosphere. In 21st century probably the most severe threat for our survival is Global climate change also it is the toughest challenge for global community to mitigate efficiently. However, at presenttimes, global warming is the most debated environmental issue in mass media and political sphere of any international dialogue in the UN Summits. The mass media in India is also often found to be divided between coverage of impacts of global climate change issues on the one hand and on the other hand, development needs and exploitation of fossil fuel based energy resources of an emerging economy like India which has to be met more energy resources for sustaining a minimum standard of living to teeming millions of population of the country[3].

In this review paper special emphasis is given to evaluate the key factors responsible for global warming leading to change in global climate and its impact on biodiversity of earth with special reference to its floral and faunal community and find out the perception of post graduate students in Tripura about the issue of climate change. Lastly an effort is made to evaluate the remedial measures taken up by global scientific community to deal and adapt to the issue and what do the students think about the efficacy of mitigation measures.

## REVIEW OF LITERATURE:

As per Framework Convention on Climate Change (UNFCCC) climate change can be defined as: a change of climate which is attributed directly or indirectly to human activity that

alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods (UNFCCC, 2007).

Global warming is almost synonymous with Climate Change as key factor for climate change is global warming. Major consequences of warming of the globe is change in global climate which is reflected by unusual raise in temperature of earth, atmosphere and oceans which is responsible for rising sea levels, acidification of oceans, changed water cycle and extreme weather pattern like severe draught in some areas and flood in the other parts. The changed weather pattern is responsible forlowering food production and crop security and decreasing biodiversity. Higher frequency of epidemics and more pest outbreaks are also related to climate change which is impacting human health and settlements.

Day by day our climate is changing drastically due to natural and anthropogenic activities by human race and over exploitation of natural resources. As per recent scientific studies it is evident that animals, birds and plants are severely affected by climate change and global warming which also changed their distribution and behaviour. To mitigate this problem greenhouse gas emissions are to be reduced considerably and carbon footprints are to be cut down. Climate change could also cause extinction of huge number of land animals, birds and plants and the damage may be up to the rate of 25% which can have deleterious impact to our fragile ecosystems[4].

Global Climate change has severe impacts on different biotic components of Ecosystem i.e. on floral and faunal components as a whole in terms of changed physiological processes and metabolism, behavioural pattern, reproduction and reproductive strategies, changes in genetic content of gene pool by reducing diversity pattern, altering distribution of organisms and lowering production in agriculture[5].

**EFFECT OF TEMPERATURE RISE ON PLANT LIFE**:

This can be summarised under following headings.

***EFFECT ON PHOTOSYNTHESIS AND GDP***: Carbon emissions is one of the most important causes of climate change as it also helps agriculture by enhancing the rate of photosynthesis in many important C3 plants (such as wheat, rice, and soybeans). This phenomenon is not at all beneficial to C4 plants (such as sugarcane and maize), which by value accounts about one-fourth of all crops that are being cultivated globally. Photosynthesis can be strongly affected by temperature. When atmospheric temperature is considerably high, the rate of photosynthesis decreases due to conformational changes in key enzymes of the plants. It also has a bearing on the changes in the rate of various other related physiological processes. This decrease is reversible at moderately high temperatures but becomes increasingly irreversible with length and intensity of high temperature exposure. The C4 plants varieties are generally found in comparatively warmer and drier habitats.

Global warming alone is therefore likely to favour C4 species of plants at the expense of C3 species which can have negative in global food production and as well as impact the Gross domestic product (GDP) of a developing country like India.

***EFFECT ON REPRODUCTIVE GROWTH***:Reproductive development of various plant varieties is more sensitive than vegetative development at higher temperatures. Fluctuation in mean temperature strongly affects crops during their reproductive phases, from pollen formation to fertilization. Very low and high temperatures during this period can prevent crop fertilization and cause seed abortion in economically important plants[8] this changes in plants could reduce the quantity of global food production.

***PHENOLOGICAL SHIFT***:In flowering plants and insect pollinators, global warming and change of climate causes phenological shifts i.e. alterations of the timing of life cycle events as per seasonal aspects and coevolution pattern a in a drastic manner. Consequently it is causing a mismatch between plant and pollinator species during the process of pollination. Climate change may lead to extinctions of both the plant and the pollinator species. This may force the farming community to respond to global warming by changing the timing of sowing the crops and even the types of crops grown during that period of the year.

***EFFECT ON PLANT DISTRIBUTION*:** Because of drastic changes in the climate due to global warming, species may no longer be adapted to the set of environmental conditions prevailing in a given geographical region. Cool and moist areas may be inhabited by additional plant species in future as biodiversity is higher in tropical humid areas. Species growing near equatorial region and at lower altitude may spread towards Polar Regions and towards higher altitude. On the contrary species found near the pole where the temperature remains relatively low may shrink their habitat as it becomes warmer[9].

***EFFECT OF TEMPERATURE RISE ON AGRICULTURE:***

As per the studies of Agarwal*et al*, 2010 it is predicted that an increase in temperature will show overall negative effects on agriculture in the world. It is expected that, agricultural productivity in developing countries may decline by 9-21% because of global warming. Beyond a certain range of temperatures, global warming reduces the yield of crops effect the process of agriculture. And higher temperatures also interfere with the ability of plants to get accustomed to warmer moist conditions. Evaporation from the soil accelerates when temperatures rises and plants increase transpiration rate[11] which impacts on ground water availability. Every rise of 1°C temperature during the cultivation period, even after considering application of carbon based fertilization of various soil amendments, will tend to decline 4-5 million tons of wheat production in India alone. Rice yield is assumed to

decline by 10% for a minimum temperature raise of 1°C during the growing season. Hence crop production will be affected by global warming, resulting in world-wide food shortages and starvation among low income economic groups.

***EFFECT OF GLOBAL WARMING AND CLIMATE CHANGE ON FAUNAL COMMUNITY*:** Faunal community includes all animals under macro, micro and meso-faunal groups where many seasonal processes are also affected by global warming. Some of the notable events are:

**1**.**Changed Timing Of Egg-Laying And Hatching:** Many animals specially fish, amphibians and reptiles have changed the timing of egg-laying due to increased temperature and hatching pattern has also changed due to changes in metabolism. Warmer climate is the main reason behind such biological alteration among several fauna.

**2**. **Change In Breeding Seasons**: Strong evidence have pointed out that climate change has resulted in advancement of breeding period by 24 days in the common Murre (a bird variety) per decade over the past 50 years in response to higher temperatures.

**3**.C**hanges In Migration Patterns:** Many migratory animals like birds and fishes have changed their migration pattern over the last few decades as well as route of migration due to global climate change, best example for this is timing of arrival of Siberian birds in Bharatpur bird sanctuary, Chilika Lake, DeeporBeel, Loktak Lake, RudraSagar and similar other biodiversity hot spots of the country has changed considerably during the last two decades.

**4**. **Coral Bleaching:** This is caused by increased sea temperature and reduction of number of algal species associated with corals namely- zooxanthallae found amongst coral reef communities from Australia to the Caribbean region. Coral reefs found in and around Andaman and Nicobar Islands have been under threat due to global warming.

**5.SPECIES SHIFTING:** Many animal species are found to shift their normal habitat a very common example is the Baltimore oriole (a bird variety) which has shifted northward and may soon disappear entirely from the Baltimore area, Australia where it was found in abundance earlier.

**6.**. **Decline In Species Population:** Various animal groups have declined notably like Polar bear populations in the poles. These animals are coming under threat as food is becoming harder for them to find and hunting becomes a real problem for their survival.

**7**. **Shifts In The Ranges:**About of 35 species of non-migratory butterflies in United States have shifted their ranges of nectar collection and breeding. Similar is the case of mosquitos in countries like India which may lead to more incidence of vector borne diseases.

**8**.**Decline In Life Span And Body Weight Of Polar Bears:** Declining ecosystem of the polar regions is adversely affecting the lifespan of the animals of the region. Early melting of snow has

lowered food availability. This has also resulted in the reduced reproductive life cycle and body weight of many polar animals like polar bears.

**9..Changes In The Abundance Of Species:** Winter songbirds are no longer found in large number as it was earlier in Plains of United States as the seasonal pattern of winter months has changed considerably.

**10.Reduction Of Phytoplankton Growth:** Oceans are acidifying and loosing phyto-planktons and thus the whole marine food chain is been affected, best example is of the Ross Sea that could disrupt the Antarctic food chain.

**11..Species Extinction:**Due to excessive dry season and extreme heat most of the species are going upward in higher altitude and towards north[15] and there also they have to struggle a lot and need to adapt to the new environmental conditions. Those who retain their original habitat even they have to suffer the hardships of the abrupt climatic shifts which were same for the Golden toad of Costa Rica[14]. Near relatives of this variety of toad have shifted their habitat and others became extinct and hence the whole food chain of that area has been effected and many bird species who feed on them also got extinct. According to Sarkar[15], the migratory species face particular extinction risk as these animals require multiple habitats in a particular season in order to procreate. Also at risk are endemic species with narrow elevation ranges, and species with limited dispersal ability or long reproductive period.

**CONCLUSION**: Climate change is one of the most complex issues our world is facing today. It encompasses many dimensions including science, economics, society, politics, and philosophy. It also involves moral and ethical issues. Though it is a global problem, its consequences are observed on local scales. The impact of global warming will be around for decades and centuries to come. Carbon dioxide, the heat-trapping greenhouse gases which is the culprit for recent global warming. This process lingers in the atmosphere for hundreds of years even if one part of the globe is emitting more of carbon dioxide than others. Sea level rise and ocean acidification is another facet of global warming. So even if we stop emitting all greenhouse gases today, global warming and climate change will continue to affect future generations. However, the best way to deal the situation is to follow strategy of “Adaptation and Mitigation” summarised in the following figure.

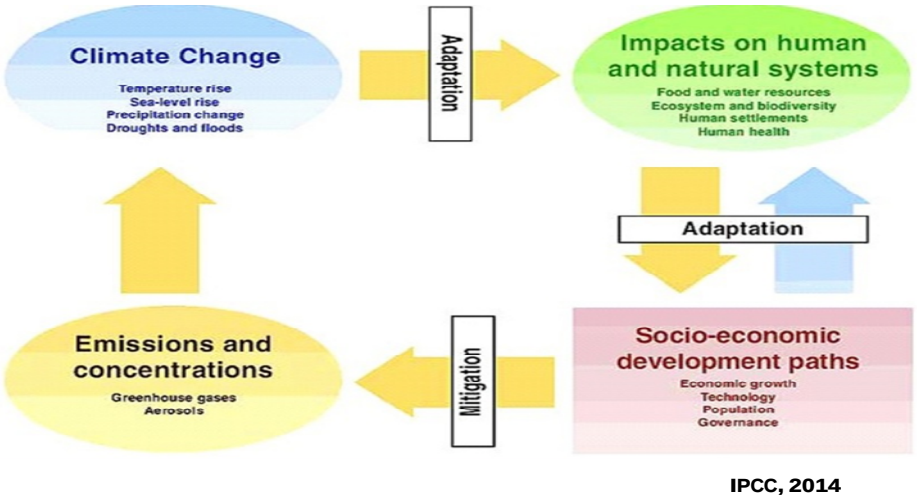


**Figure 1Diagrammatic Representation of Adaptation and Mitigation to Climate Change (adapted from IPCC 2014)**

**MITIGATION:** Steps to mitigate climate change involves reduction of the flow of heat-trapping greenhouse gases into the atmosphere which can be done by adoption following measures like- Reducing sources of these gases, Enhancing "carbon sinks" that accumulate and store these gases and avoiding significant human interference with the vulnerable climate systems.

**ADAPTATION**: Adaption to life in a changing global climate involves adjusting to present climate which could be achieved by following measures like:

i. **The human race shall have to learn to adapt:** Human beings should try to strike a balance between their need and greed. This was the sentiment advocated by Mahatma Gandhi too. The father of our nation would often goad us to remember that, it is not important for us what we have received from our society but it is more important as what we are giving back to our society and leaving behind for our generations to come.

ii. **Solving own climate problems:** Local community should act together to solve own problems at a small level like car-pooling and cycling to short distances that will definitely reduce carbon dioxide emissions to a greater extent.

iii. **To follow the principle of Basudhaivakutumbakam:** Living together and collectively working to solve the problems of global climate change. The following concept calls us to remember that the whole world is our family and so problem of others are also our problem and it has to be solved together.

iv. **Education and awareness campaigns for the common public**: Mass media can shoulder a great responsibility in this regard. Nobody can set the agenda for the

country as efficiently as the print and electronic media of the country in addressing global warming issues. The print and electronic media in India should come forward in facilitating a discourse between government bodies and the public to demand better goods and services from the government which are necessary in mitigation efforts of climate change. For example, allocation of funds on those sectors which are in need of immediate attention to curb carbon dioxide emissions, procurement of efficient mass transit system in the urban areas of the country, enactment of laws for industry and commerce to adhere to compulsory reduction targets of greenhouse gases and the like. Again, it is the print and electronic media that can only compel the absconding industrial sector by exposing their lapses. Media activism can deliver justice even when the administration is hands in glove with perpetrators and defaulters who are responsible for global warming. It is time the mass media of the country comes forward to effectively lead another mass revolution which is aimed at cleaning our environment and goading the private individual from wasteful consumption patterns and thereby reducing carbon footprints.

v. **Adopting NASA's approach:** As per American space agency NASA, following strategies could work effectively for adapting climate change and they include- living smarter, adoption of vegetarian diet, single child for controlling huge amount of population, adoption of clean fuels and harnessing renewable energy like solar and wind energy which are more eco-friendly.

## REFERENCES:


1. Doulton, H., & Brown, K. "Ten years to prevent catastrophe? - Discourses of climate change and international development in the UK press." Tyndall Centre Working Paper No. 111. Published by Tyndall Centre of Climate Change Research, University of East Anglia; 2007: 297-316.
2. IPCC. Climate Change 2014: Synthesis Report (Summary for Policymakers). Published by Intergovernmental Programme on Climate Change, Geneva; 2014:299-330.
3. Boykoff M.T. Indian Media Representations of Climate Change in a Threatened Journalistic Ecosystem. *Climatic Change*; 2010; 99(1): 17-25.
4. IPCC Publications retrieved from http://www.climateandweather.net/global-warming/climate-change-and-animals.html. Accessed on 05.04.18
5. Climate Report of India Government retrieved from http://chimalaya.org/2012/06/07/impact-of-climate-change-on-the-fauna-of-sikkim-india/. Accessed on 05.04.18

6. Kiers, E. T., Palmer, T. M., Ives, A. R., et al. Mutualisms In A Changing World: An Evolutionary Perspective. *Ecology Letters*; 2010; 13:1459–1474.
7. Berry, J. and Bjorkman, O. Photosynthetic response and adaptation to temperature in higher plants. Annual Review of Plant Physiology 1980;31: 491–543.
8. IPCC. Climate Change 2014: Synthesis Report (Summary for Policymakers). Published by Intergovernmental Programme on Climate Change, Geneva; 2014:299-330.
9. Cline, W. R. Global Warming and Agriculture. *Finance and Development*; March 2008:23-27.
10. Agarwal, P. K., Kumar, S. N., Pathak, H. Impacts of Climate Change On Growth And Yield of Rice And Wheat In The Upper Ganga Basin. *Indian Agricultural Research Institute* (IARI); Dehradun,2010.
11. Peng, S., Huang, J., Sheehy, J., Laza, R., et al. Rice Yields Decline with Higher Night Temperature From Global Warming. *P. Natl. Acad. Sci*. USA; 2004; 101: 9971-9975.
12. Sarkar, S. Impact of Global Warming On Biodiversity.*The Science Probe*. 2012;1(2):22-33.
13. Kiers, E. T., Palmer, T. M., Ives, A. R., et al. Mutualisms In A Changing World: An Evolutionary Perspective. *Ecology Letters*; 2010; 13:1459–1474.
14. Yamazaki, K. Growth and Physiology of Vegetable, In Vegetable Horticultural Dictionary, S. Shimizu, (Ed.); 1985: 245-252.
15. Sharma, U. Effect of Global Warming on Biodiversity of India, *In National conference on Forest Biodiversity: Earth's Living Treasure*, 22nd May 2011, UP, INDIA.
16. ibid.,7.
17. NASA Publications retrieved from https://climate.nasa.gov/news/. Accessed on 05.04.18.