Impact of Pollution On Biodiversity: A Review

DEV BRAT[1], I.R. PATHAK[2]
[1] Department of Zoology, T.D. College Jaunpur (U.P.)
[2] Department of Zoology, P.G. College Ghazipur (U.P.)

Abstract- By nature plants are less able to adapt to sudden changes in pollution levels and climate than animals, which can often migrate or change their source of food. A wide survey of the literature gave evidence of more than three times as many terrestrial plants being affected by pollution as animals. In freshwater ecosystems on the other hand the decline is greater among animal species than among plants due to reduction of the water's pH values. While most affected species decline as a result of air pollution.

Indexed Terms- Biodiversity, Climate change, Pollution

I. INTRODUCTION

Environmental pollution, particularly due to human activities, has become a cause of global concern. A pollutant is a substance that may be defined as constituents in the wrong amount at the wrong place or at the wrong time. It may cause diseases, allergies and even death to plants and animals including humans. Thus now days, environmental pollution is considered one of the most important universal challenges facing both developed and developing states, affecting greatly environmental health of people all over the world. Continuous population growth, increased economic movements in addition to climate change all participate in spoilage of natural resources, so threatening the biodiversity and the whole ecosystem as well. The most terrible issue is that almost primitive ecosystems are amongst the threatened ones. Biological diversity means the variability among living organisms from all sources including '*intera alia'*, terrestrial, marine and other aquatic ecosystem.

Biodiversity of inland water is important to sustain health of the ecosystem. Biodiversity of inland water is also important for its economic value as habitat for species of commercial value. Although aquatic ecosystems are known to be from the wealthiest habitats by their diversity and number of species, the Millennium Ecosystem Assessment (MEA5) announced in 2005 that biodiversity degradation in freshwater systems occur double the ratio of other ecosystems. Therefore, their capability to present ecosystem services decreases causing negative impacts on human health.

In the present review, the relation between pollution and biodiversity will be covered including importance of biodiversity and its relation to ecosystems then their main threats. Assessment of biodiversity impacts on ecosystems and communities is needed to be elucidated and finally what are the conservation challenges facing biodiversity. A number of workers are associated with the study of different aspects of biodiversity and its conservation across the India including Verma (2017a; 2020), Prakash (2020), (Prakash *et al.*, (2000), Prakash and Verma (2020), Yashmeen and Dugaje (2020) and so on.

II. BIODIVERSITY IMPORTANCE

Biodiversity is defined by the United Nations Convention on Biological Diversity as follows: "living species variations from sources that include terrestrial, marine, different aquatic ecosystems and also ecological groups to which they belong: including diversity among species and also ecosystems. So, it can be seen that, biodiversity involves the whole range of species, genetic and ecosystem variation. It underlies the most processes of biotic ecosystem, for example: production and decaying. Biodiversity is the very basis of human survival and economic development. It plays an important role in the function of an ecosystem by providing many services like nutrients and water cycling, soil formation and retention, resistance against invasive species, pollination of plants, regulation of climate, as well as pest and pollution. Biodiversity is also the source of non-material benefits like spiritual and aesthetic values, knowledge system, cultural diversity and

spiritual inspiration. The biodiversity has different levels and values (Verma, 2015; 2016). The climate change influences the entire composition and biodiversity (Sugumaran *et al.,* 2020).

III. THE MAIN THREATS TO BIODIVERSITY

Global aquatic biodiversity suffers from major threats that can be grouped in the following categories: (i) Climate change (ii) pollution; (iii) invasion by exotic species (iv) Overexploitation and (v) habitat degradation. Climate change is known as the alterations in atmospheric, biogeochemical and hydrological cycles. The fluctuations such as: delicate variations in average daily temperatures, the period of rainy seasons, carbon cycle, night-time temperature, and also solar radiation that may affect biological organisms. Only a small change in pattern of climate has severe impact on the biodiversity, altering the habitats of the species and presenting a threat for their survival, making them vulnerable to extinction (Prakash and Srivastava, 2019).

i. Impact of climate change on Biodiversity:
Only a small change in pattern of climate has severe impact on the biodiversity, altering the habitats of the species and presenting a threat for their survival, making them vulnerable to extinction. Millennium Ecosystem Assessment (MEA) predicts that a changing global climate change to be the principal threatens to the biological diversity and ecosystem (Anonymous, 2007). The distribution of species (biogeography) is largely determined by climate, as is the distribution of ecosystems and plant vegetation zones (biomes). Climate change may simply shift these distributions but, for a number of reasons, plants and animals may not be able to adjust hence some species and ecosystems are likely to be eliminated. This causes a type of biodiversity loss (Kumar and Verma, 2017). When a species becomes extinct, the species associated with it in an obligatory way also become extinct. .

Due to increase in temperature several plant species like *Berberisa siatica, Taraxacum officinale, Jasminum officinale* etc have shifted towards higher altitude in Nainital. Teak dominated forests are predicted to replace the Sal trees in central India and also the conifers may be replaced by the deciduous types. According to Gates (1990) increase in 3^0C temperature may leads to the forest movement of 2.50 km / year which is ten times the rate of natural forest movement.

Slight change in climatic condition leads to the extinction of animal species. For example Climate change has resulted in extinction of animals like golden toad and Monteverde harlequin frog ; Polar bears are in danger due to reduction in Arctic ice cover; North Atlantic whale may become extinct, as planktons, its main food have shown decline due to climate change. Though the exact impact of climate change on India's natural resources is yet to be studied in detail, pioneering studies show that endemic mammals like the Nilgiri tahr face an increased risk of extinction (Sukumar *et al.,* 1995). Further, there are indicative reports of certain species e.g., Black-and-rufous flycatcher (*Ficedula nigrorufa*) shifting their lower limits of distribution to higher reaches, and sporadic dying of patches of Shola forests with the rise in ambient surface temperatures.

The sex ratio of sea turtle disturb because as a result of high temperature more female turtles are produced. Some threatened species (frogs, toads, amphibians, tigers and elephants) are vulnerable to the impacts of climate change like sea level changes and longer drier spells. Changes in ocean temperature and acidification may lead to loss of 95% of the living corals of Australia's Great Barrier Reef (Anonymous, 2007).

Climate change also alters the disease behavior in animals. The devastating amphibian disease chytrid fungus, likely exacerbated by warmer temperatures, has left many amphibian populations dwindling or extinct.

Climate changes could also have positive effects on biodiversity. For example, more increase in temperature and increased carbon dioxide are likely to be beneficial to many plants, resulting in an acceleration of biomass production. Milder winters might increase survival of many currently threatened species might in temperate regions. Increased precipitation may also benefit some plant communities and species depending on them. Moreover, several studies reported detrimental effects of climate change on biological invasions (Parmesan *et al*., 2008).

Although few studies report beneficial effects of global changes on biodiversity, they certainly exist and add to the difficulty of getting a clear overview of the effects of climate changes on the biodiversity of our planet.

ii.   Impact of Pollution on Biodiversity:
As a result of temperature change, some oceanic coral reef ecosystems declined. The coastal regions may be quickly submerged due to the rapid increase of sea levels, which estimated to increase 0.1 to 0.2 meters by the last century. This is considered catastrophic to some species and also diverse communities in the ecotone. The past climatic changes lead to ecosystems with various species composition, due to species' different capabilities to adapt to the climate changes. The maintenance of present day biodiversity and ecological balance both are necessary for mutual survival of living beings including humans (Verma, 2017b; 2018).

Air pollution is a foremost crisis of recent decades, which has a great toxicological impact on climate change. Air pollution is a serious threat to the biodiversity. This factsheet deals primarily with the effects of acidification, nitrogen fallout, and ground-level ozone where the specific pollutants are sulphur dioxide, compounds of nitrogen and volatile organic substances. Another potentially serious threat is releasing of greenhouse gases. Green house effect has led to increase in migration of tree species towards high altitude. Climate change and global warming are a great concern of today as they affect the natural ecosystem. Climate change refers to variations in the global climate or regional climate over a long time period (Mandal and Singh, 2020).

At higher altitudes and latitudes, alpine and boreal forests are expected to expand northwards and shift their tree lines upwards at the expanse of low stature tundra and alpine communities (Srivastava *et al.,* 2019). According to FAO (2000), due to these changes many about 9% of all known plant species are at verge of extension.

There are some however the benefit of air pollution for instance, appearance of many aphids (Singh and Singh, 2019) are stimulated by air pollutants. Other species are resistant to them and expand to fill the space left by the disappearance of more sensitive kinds. Noise pollution has the potential to affect the physiology, behaviour and reproduction of a range of animal taxa. Types of effects include changes in foraging and reproductive behaviours, reduction in animal fitness, increased risk of predation and reduced reproductive success (Maheshwari *et al*., 2020).

iii.   Impact of Invasion by exotic species on Biodiversity:
Anonymous (2009) reported that changes in climate affects the normal life cycle of plant. He also reported that invasive species are a threat to native species being more tolerant to climatic variations. The major invasive alien plant species include *Lantana camara, Eupatorium odoratum, Eupatorium adenophorum, Parthenium hysterophorus, Ageratum conyzoides, Mikania micrantha, Prosopis juliflora* and *Cytisus scoparius* Variation in temperature and precipitation patterns can result in more frequent droughts and droughts and floods making indigenous plants more vulnerable to pests and diseases (Tibbetts, 2007).

iv.   Impact of Overexploitation on Biodiversity:
The rapid increase of human population is putting an incredible strain on our environment. Humans also continue to put a great demand on the natural resources of our planet. The growth of population puts larger demands on our already limited resources. The depletion of resources and biodiversity, the production of waste, and the destroying of natural habitat are serious problems that must be addressed in order to ensure that life on earth will be sustainable throughout the next century. The loss of arable land has been caused by a number of factors, many or most of which are tied to human development. The primary causes are deforestation, overexploitation for fuelwood, overgrazing, agricultural activities and industrialization. On the global basis, the soil degradation is caused primarily by overgrazing (35%), agricultural activities (28%), deforestation (30%), over exploitation of land to produce fuel-wood (7%), and industrialization (4%) (Mittal and Mittal, 2013). Overpopulation is a negative solution for everyone; plants, animals, land, water, and humans.

v. Impact of Habitat degradation on Biodiversity:
Habitat loss is a process of environmental change in which a natural habitat is rendered functionally unable

to support the species present. This process may be natural or unnatural, and may be caused by habitat fragmentation, geological processes, climate change, or human activities such as the introduction of invasive species or ecosystem nutrient depletion. In the process of habitat destruction, the organisms that previously used the site are displaced or destroyed, reducing biodiversity. Human destruction of habitats has accelerated greatly in the latter half of the twentieth century. Natural habitats are often destroyed through human activity for the purpose of harvesting natural resources for industry production and urbanization. Clearing habitats for agriculture, for example, is the principal cause of habitat destruction. Other important causes of habitat destruction include mining, logging, and urban sprawl. Habitat destruction is currently ranked as the primary cause of species extinction worldwide.

CONCLUSION

Food and medicine are an important aspects of life, is mainly provided by natural plant resources all over the world. The natural region of the world harbours specific type of plants vegetation with their specific characteristics on the basis of plant type, habitat and climatic condition of particular regions. The specificity of the region is directly or indirectly governed by plant vegetation, local specific region and climatic conditions. The cumulative loss of glacier mass is currently occurring ubiquitously and uncharacteristically rapidly with increasing rates of ice loss since mid 1980's in India. The Himalayan mountain ranges are known as the towers of Asia since the glacier fed rivers originating from the mountains comprise the largest river runoff from any single location in the world. Changes in these influence water resources, agriculture, infrastructure, livelihood, biodiversity and cultures and world affect the lives of about 40% of world's population. Other affects due to environmental pollution and 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, stromes, and flash, flood etc.

Thus, there is urgent need of environmental management plan focus on land environment, water environment, flora and fauna, air environment, aesthetic and socio-economic aspects etc. Anthropogenic global warming affects all the nations and humans populations. The integrated approach is essential to solve the problem by public awareness and primary education of pollution, importance of biodiversity conservation and the effects of pollution on biodiversity.

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