

IMPACT OF ENVIRONMENTAL CHANGES ON BIODIVERSITY

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INTRODUCTION

Biodiversity refers to variations of life forms. It is the variations among animals, plants and microorganisms. It is the totality of genes, species and ecosystem of a region. It includes diversity within species, between species, and among ecosystems. This diversity changes from one location to another and over time. Biodiversity is everywhere, both on land and in water. It includes all organisms, from microscopic bacteria to more complex plants and animals. The total number of species on earth is estimated to be between 3 million to 100 million out of which only 1435662 species are identified all over the world. India is a mega diversity nation due to its rich floral and faunal wealth. In India about 130000 species of plants and animals have been documented so far. India has many endemic plant and animal species. Among plant species, endemism is estimated at 33 % with about 140 endemic species (Botanical Survey of India 1983). The term 'biodiversity' was first used by Dasmann in 1968. There are three levels of biodiversity-genetic, species and ecosystem diversity.

Biological diversity is the very basis of human survival and economic development. Biodiversity plays an important role in the way ecosystems function and in the many services they provide. These services include nutrients and water cycling, soil formation and retention, resistance against invasive species, pollination of plants, regulation of climate, as well as pest and pollution control by ecosystems. Several aspects of human well-being including human health, social relations, and freedom of choice are influenced by biodiversity. Biodiversity is also the source of non-material benefits like spiritual and aesthetic values, knowledge system, culture diversity and spiritual inspiration. It is source of inspiration to musicians, painters, writers and other artists.

In the recent time there has been a great loss to the biodiversity which has posed a serious threat to the survival of mankind. When humans modify an ecosystem to improve a service it provides, this generally, also results in changes to other ecosystem services. For example, actions to increase food production can lead to reduced water availability for other uses. In the long term, the value of services lost may greatly exceed the short-term economic benefits that are gained from transforming ecosystems. Though species extinction is a natural part of Earth's history, but human activities have increased the extinction rate by at least 100 times compared to the natural rate. Biodiversity is declining rapidly due to natural or human-induced factors. Natural or human-induced factors that directly or indirectly cause a change in biodiversity are referred to as drivers. Drivers may be of two types Direct drivers and indirect drivers. Direct drivers influence ecosystem processes and include land use change, climate change, invasive species, overexploitation, and pollution. Indirect drivers, operate more diffusely, by altering one or more direct drivers such as changes in human population, incomes or lifestyle. Changes in biodiversity are result of combinations of drivers that work over time, on different scales, and tend to amplify each other. For example, population and income growth combined with technological advances can lead to climate change.

One of the main causes of biodiversity loss is the change in the environment. Environmental conditions play a key role in defining the function and distribution of organisms, in combination with other factors. Environmental changes have had enormous impacts on biodiversity patterns in the past and will remain one of the major drivers of biodiversity patterns in the future. Environmental changes are studied under the change in climate or changes due to overpopulation, overexploitation

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of the natural resources, deforestation, Changes in climate show significant impact on biodiversity and ecosystems. As climate change will become more severe, the harmful impacts on ecosystem are expected. Climate change is expected to exacerbate risks of extinctions, floods, droughts, population declines, and disease outbreaks. Recent changes in climate, such as warmer temperatures in certain regions, have affected species distributions, population sizes, and the timing of reproduction or migration events, as well as the frequency of pest and disease outbreaks. By the end of the century, climate change and its impacts may become the main direct driver of overall biodiversity loss

IMPACT OF CLIMATIC CHANGE-GLOBAL WARMING

Climate change refers to any change in the environment due to human activities or as a result of natural processes. Plants and animals are sensitive to fluctuations in temperature and climate. In the past, climate has varied considerably within short time scales. Evidence from fossils and paleobiological studies have indicated that these periods of rapid climate change have been associated with mass extinction events.

Human induced green house gas pollution has contributed significantly to the global warming. Industrialization, automobiles and agriculture activities are releasing greenhouse gases like carbon dioxide, methane and nitrous oxide into the atmosphere at an unprecedented rate. We are currently releasing 70 million tones of CO₂ per day into the atmosphere (Kannan and James, 2009). Carbon dioxide levels which were under 300ppm for the past 600,000 years are approaching 385 ppm and are expected to reach 550 ppm by the year 2100, if current rate of emission continues (Cicerone, 2006; Gore, 2006) Green house gases trap heat and impede its radiation back into the atmosphere. The impact of these greenhouse gases is to warm near surface global temperature through the green house effect. When the concentration of greenhouse gases increases, global temperature increases. Over the past hundred years, the earth surface has warmed by approximately 0.6 °C and if the current rate of

greenhouse gas emission continues, global air temperature could rise up to 1.5 to 4.5 °C very soon (Houghton et al., 2001). This increase in temperature has various consequences such as melting of snow, glaciers, polar ice caps and the subsequent rise of sea levels and flooding of coastal areas to increase in transmission of diseases.

Global warming affect plants, animals and microorganisms both by changing their habitats and by direct effect of temperature. Increases in temperature raise the rate of many physiological processes such as photosynthesis in plants, to an upper limit. Each organism-plant or animal has a tolerance limit. Extreme temperatures can be harmful when beyond the physiological limits of a plant or an animal. A number of species have been affected physiologically by global warming. There is evidence that some species are physiologically more vulnerable to temperature spikes. For example, the green ringtail possum, an endemic species of Queensland's tropical rainforests, cannot control its body temperature when the ambient temperature rises above 30° C. The distribution of these forests is already severely limited by rainfall and temperature, and relatively small changes in either could have a dramatic effect. Warmer sea surface temperatures are can also lead to coral bleaching, whitening of coral caused when the coral expels a single-celled, symbiotic alga called zooxanthellae. Zooxanthellae are expelled when the coral is under stress from environmental factors such as abnormally high water temperatures or pollution. Since the zooxanthellae help coral in nutrient production, their loss can affect coral growth and make coral more vulnerable to disease

Increase in atmospheric CO₂ concentration affects how plants photosynthesize, resulting in increases in plant water use efficiency, enhanced photosynthetic capacity and increased growth. Rising levels of atmospheric carbon dioxide could also decrease the calcification rates of corals, meaning that reefs damaged by bleaching or other agents would recover more slowly.

Many species of plants and animals are becoming extinct because of habitat loss, overexploitation, pollution, overpopulation and threat of global climatic changes. Rapid climatic changes could lead to increased diseases, land slide, forest fire which result in destruction of animals and

plants. All organisms are adapted to a particular range of physical and chemical conditions. Change in the climate has caused a danger to the survival of hundreds of plants and animals (insects, amphibians, birds, mammals and others). Extinction of many species has begun and many organisms are being pushed to extinction or local extermination as a direct or indirect result of climate change.

All species are likely to be not only directly impacted by the changes in environmental conditions but also indirectly through their interactions with other species. Indirect impacts are equally important in determining the response of plants to climate change. A species whose distribution changes as a direct result of climate change may 'invade' the range of another species for example, introducing a new competitive relationship.

IMPACT OF HABITAT LOSS, OVERPOPULATION AND OVEREXPLOITATION

Besides climatic change, other human activities are also largely responsible for biodiversity loss. It is estimated that about 27000 species become extinct every year. If this goes on 30% of world's species may be gone by the year 2050. The current extinction rate is 100 to 1000 times that of natural rate of extinction. Other human activities are: habitat destruction, invasive species, pollution, population and overexploitation of natural resources. Rapidly increasing population has forced down the men to cut own the forests to fulfill the requirements of food and shelter. Deforestation has led to the destruction of the habitats of plants and animals. Loss of habitats the most important cause of extinction of species. Habitat extinction compels the species to move where they find it difficult to adapt and this may ultimately lead to there extinction. Physically larger species and those living at lower latitude or in the forests or oceans are more sensitive to reduction in habitat area (Drakare et al., 2006). Human activities like deforestation, pollution, overpopulation are ultimately responsible for habitat destruction.

Introduction of exotic species is also responsible for the loss of biological diversity. The endemic and other local species may not be able to compete with the exotic species and are unable to survive. Overexploitation, in the

form of hunting of animals and plants for their commercial value is one of the major reasons for loss in biodiversity. Illegal wildlife trade is the single largest threat to biodiversity loss. Overpopulation of human and over consumption of natural resources is the root cause of all biodiversity loss.

CONCLUSION

It is evident that the loss in biodiversity is due the change in environment. All these changes in environment, adversely affecting the biodiversity, are mainly due to the human activities. Some of the impacts of global warming may be sudden, but in many cases societies will have some years to adapt their management of biodiversity as conditions change. Increasing our understanding of the affects of climate change on biodiversity, and developing ways of mitigating such effects, are critical to limit such damage.

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