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## **Biodiversity, challenges and Covid-19 pandemic: A way forward**

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### **Abstract**

Biodiversity can be defined as the variability among the living organism from all sources, including terrestrial, marine and other aquatic ecosystems and ecological complexes of which they are part, this includes diversity within species, between species and of ecosystem. The growing awareness that biodiversity is a precious global asset to present and future generation and that species survival and the integrity of habitats and ecosystems are at serious risk, has increased significantly the importance of biodiversity related research. The loss of biodiversity is a global crisis, there is hardly a region on the earth that is not facing ecological catastrophes. Of the 1.7 million species known to inhabit the earth (Human is just one of them), one third to one fourth of the species is likely to extinct within the next few decades. Therefore onus of safeguarding biodiversity is not just on government or indigenous communities, but on all of us as this is our common heritage.

**Keywords:** Biodiversity, ecosystem, species, government, global, challenges, Covid -19 pandemic

### **Introduction**

Biodiversity refers to the variety of life forms i.e. plants, animals and even the micro organism are included in this category. It is typically a measure of variation at the genetic, species and ecosystem level <sup>[1]</sup>. Biodiversity is not distributed evenly on earth and is richer in the tropics <sup>[2]</sup>. These tropical forest ecosystem cover less than 10 percent of earth's surface and contain about 90% of the earth's species <sup>[3]</sup>. According to United Nations 1992 summit defined biological diversity as the variability among living organism from all sources, including interalia, terrestrial, marine and other aquatic ecosystem and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystem <sup>[4]</sup>. According to Food and Agricultural organization (2020). Forest biological diversity is a broad term that refers to all life forms found within forested area and the ecological roles they form. As such forest biological diversity encompasses not just tree, but the multitude of plants, animals and microorganisms that inhabit forest areas and their associated genetic diversity. Forest biological diversity can be considered at different levels including ecosystem, landscape, species population and genetics. Within specific forest ecosystem, the maintenance of ecological processes is dependent upon the maintenance of their biological diversity <sup>[5]</sup>.

Biodiversity is not evenly distributed rather it varies greatly across the globe as well as within regions. Among other factors the diversity of all living things. (biota) depends on temperature, precipitation, altitude, soil geography and the presence of other species. The study of the spatial distribution of organism, species and ecosystem is the science of biogeography <sup>[6]</sup>.

Diversity is higher in tropics and in other localized regions such as Cape Floristic region and lower in polar regions generally. Besides, tropical rain forest is also rich in biodiversity <sup>[7]</sup>. The biodiversity of forest varies considerably accordingly to factors such as forest type, geography, climate and soil, in addition to human use <sup>[8]</sup>. Most forest habitats in temperate regions have few animals and plant species and species that tend to have large geographical distributions. Where as mountane forests of Africa, South America and South east Asia and lowland forests of Australia coastal Brazil, the Caribbean island, Central America and insular Southeast Asia have many species with small geographical distribution <sup>[8]</sup>. But areas with dense human population and intense agricultural land use, such as Europe, China, India and

parts of Bangladesh and North America, are less intact in terms of their biodiversity. Conservation of biodiversity and its use in sustainable development have been impeded by many obstacles, there is a need of cooperation with different agencies such as regional bodies and organizations to mainstream the conservation and sustainable use of biological resources across all sectors of national economy, the society and the policy making frame work as a complex challenge at the heart of convention on Biological Diversity (CBD). The strategic plan can promote broad based action by bringing about a convergence of actions around agreed goals and collective objectives.

### Challenges

**Habitat degradation:** The major threats to biodiversity that result from human activity are habitat loss, fragmentation and degradation, over exploitation of species for human use, introduction of exotic species and possibility of spread of disease. This leads to threats to the threatened species and result in the extinction of such species. Typically these threats develop so rapidly and on such a large scale that species are not able to adapt genetically to the changes or disperse to more hospitable location.

This habitat degradation becomes threat to biodiversity in different appearance and dimensions. The loss in biodiversity due to habitat loss is different in different countries. E.g. before Vietnam war Cambodia was a quite forest rich country. The war disrupted all aspects of the country's life for 20 years and this lead to the environmental consequences that could be felt for many more years to come. Cambodia has lost approximately 3/4<sup>th</sup> of its wildlife habitat and pressure on its wetland.

### Exotic species

Introduction of exotic species in another major challenge of biodiversity conservation and its use in development. Invasive alien species includes plants and animals and pathogens that are not native to an ecosystem causes the economic and environmental harm or adversely effect the human health. According to CBD reports invasive alien species have contributed to nearly 40% of all animal extinction. Introduced fish species threaten to decimate the diverse fish fauna of big African lake. Exotic weeds such as *Lantana* and *Parthenium* pose threat to forest management system.

Introduction of African magur (*Clarias gariepinus*) and Red Piranka (*Pygocentrus natterii*) are in Bangladesh, the ecosystem, get drastically consumed without maintaining the chronology of the ecological pyramids pattern in an ecosystem. These introduced species drastically reduce the population of animals of all tropic levels and create ecological hazards for the population of all other aquatic plants also and result in alteration of aquatic ecosystem.

### Government Policies

For the sustainable development the country at least have to full filled two conditions towards the target of realizing the biodiversity use. One relates to the capacity of the country to implement policies and programs effectively, but in most developing countries governance is poor in terms of human capability on one hand and lack of transparency and accountability on other hand. It is important that the developing countries take necessary steps to establish good

governance including rule of law and improvement in the economic and social management capacity.

The maintenance of species richness and proper functioning of the ecosystem, biodiversity has a great role in it. The conservation of biodiversity means conservation of both biotic and abiotic factors together and their interaction to provide the sustainable situation for living organism in an ecosystem. The ecological imbalance makes an environment unfavorable for initiating any kind of development plan. That is why biodiversity conservation stands at epicenter of sustainable of the global development goals and targets population growth and increasing demand for biological resources.

The biodiversity of bio resources which are used to meet our demand in our daily life, thus population increase in the world stand as a major problem because it increases consumption creating pressure on the biological resources more and more. The world is losing its tropical forest at the alarming rate of almost 42 million acres per year. This means that nearly 1.3 acres of tropical forest disappear every second. Among this largest area of forest loss occurred in Latin America followed by Africa. However when deforestation is measured as a percentage of remaining forest, the most losses appear to occurred in Asia.

At the beginning of the British rule the Indian subcontinent have the inexhaustible forest resources. Rannell's map (1886) indicated that the area of Sundarbans sal forest of the Bhawal Madhupur tracts covered an area several times larger than it is at present.

Environmental biology and Biodiversity Laboratory (EBBL), university of Dhaka has recently made a study on the traditional and cultural involvement of local people and the causes of deforestation in some forest area of Chittagong and Cox's Bazar districts. The study shows that impact of population growth and increased in demographic has put a lot of pressure on the bioresources.

### Importance of Biodiversity

The biodiversity offers a great support to mankind and has following benefits.

1. **Economic role of Biodiversity:** Biodiversity is first resource for daily life for the human beings. E.g. crop diversity which is also agro biodiversity. Most people see biodiversity as a reservoir of resources to be drawn upon for the preparation of food, pharmaceuticals and cosmetic products. Some of the important economic commodities that biodiversity supplies to making are:-
  - a. Food Crops, livestock, forestry and fish Mangroves and reefs in coastal zone support fisheries.
  - b. Modern agriculture biodiversity is used as a source of material for breeding improved variety, and as biopesticides, biofertilizers etc.
  - c. Fibers are used for clothing, wood for shelter, energy and various other uses. Biodiversity may be a source of energy (such as biomass). Other industrial products are oils, fragrance, dye papers, waxes, rubber, latexes, resins, poisons and lark. Which all can be derived from various plant species. The products from animal origin include wool, silk, fur, leather, lubricants and waxes. The animal can also be used as a source of transport.
  - d. The drugs obtained from the wild plants since before the beginning of human civilization. E.g. Quinine comes from *Cinchona* tree (used to treat

malaria), digitalis from the foxglove plant (chronic heart trouble), morphine from poppy plant (pain relief and depression). According to National cancer institute over 70% of the promising anti cancer drugs come from plants in the tropical rainforest. It is estimated that of the 250000 known species only 5000 species have been investigated for possible medical applications.

2. **Ecological Role of Biodiversity:** All the organism are interlinked with each other through food chain and food web, and the species provide some kind of function to ecosystem. They can capture and store energy, produce organic material, decompose organic material help to recycle water throughout the ecosystem. These physiological process are important for ecosystem function and human survival. Diverse ecosystem can better able to with stand environmental stress and as a result is more productive. The loss of a species is thus likely to decrease the ability of the system to maintain itself or to recover from the damage or disturbance. The species with high genetic diversity, an ecosystem with high biodiversity may have a greater chance of adopting to environmental changes. In other words, the more species present in an ecosystem the more stable likely to be.
3. **Scientific value of Biodiversity:** Biodiversity is important because each species can give scientist some due as to how life evolved and will continue to evolve. In addition biodiversity helps scientists to understand how life function and role of each species in sustaining ecosystems. From the above it is clear that the survival and well being of the present day human population, depends on several substance obtained from plants and animals. The nutritional needs of the mankind are also met by wild and domesticated plants and animal. In deed the biodiversity in wild and domesticated form is the source for most of humanity's food, medicine, clothing and housing, much of the cultural diversity and most of the intellectual and spiritual inspiration and is without doubt the very basic of mankind. It is believed that 1/4<sup>th</sup> of the known biodiversity which might be useful to mankind in one way or the other is in serious risk of extinction. This call for an integrated approach for conserving biodiversity at local or global level.
4. **Aesthetic and cultural values:** Biodiversity has great aesthetic value e.g. Eco-tourism, bird watching, wildlife, gardening etc. eco-tourism is a source of economical wealth for many are s, such as many parks and forest, where wild animals and nature are a source of beauty and joy for many people. Biodiversity is also part of many cultural and religious beliefs. In many Indian villages and towns, plants like *Ocimum sanctum* (Tulsi) *Ficus religiosa* (Pipal) and *Prosopis Cineraria* (Khejri) and various other trees are considered scared and worshipped by the people. Several birds and animals and even snakes have been considerd scared. Many animals are symbols of national and heritage importance.
5. **Emergence of infectious diseases and biodiversity loss:** The biodiversity loss aggravate transmission of infectious disease from animals to humans. The scientist still are in a debate that there is a "biodiversity dilution effect" in which declining biodiversity results in increased infectious disease transmission. The

rationale is that greater host diversity in a biodiversity rich region provides range of hosts, many incompetents for the pathogen. The presence of a range of hosts and incompetents reservoirs, hosts dilutes the risk of explosive to zoonotic infections spread by animals and transmission chain to humans.

According to Rajan Patil, associate professor of epidemiology at SRM university Chennai, who says that "biodiversity has greater influence on magnitude and impact of epidemics". Scientist have observed a clear link between decrease in disease frequency with increase in host diversity says Patil, citing examples of west Nile. Disease and Lyme Disease whoes incidence has been linked to the biodiversity dilution effect.

In 2018 report in the Indian Journal of Ccommunity Medicine, patil's group attributed an outbreak of anthrax in Chhattisgarh state to the loss of biodiversity. According to Patel biodiversity and human health are inter connected because man is part of ecological systems comprising diverse flora and fauna. Any human action that alters the ecological balance and put some species at risk of extinction can directly impact human health. E.g animals of tropical medicine and Public Health that biodiversity can be described in terms of species richness which represent the diversity or different types of species and "species evenness" which represent the proportional representation of each of these species. In case of diseases transmission dynamics species evenness is important as it indicates the total distribution of vectors available for a pathogen to feed. The West Nile virus is a mmosquito born disease in which the primary reservoir is wild "passerine" bird or perching birds that comprise half of the total bud species. When alternate hosts including non passerine birds crows, horse and even crocodile are available for the mosquitos, the vector get less infected, leading to fewer transmissions among humans.

Richard ostfeld, a disease ecologist at the non profit Cary Institute of Ecosystem studies New York says that his teams research shows a "consistent general pattern that loss of biodiversity is associated with increase in transmission of infections disease'. This relationship occurs not only for human disease, but also for disease of wildlife, livestock and plants, Ostfeld says it is not found in every disease system, but it is found in most and is often quite strong". Several meta analysis shows without question that this link is strong and widespread. When humans disrupt or destroy natural evosystem, some species are lost, but unfortunately not the weedy one that often thrives in these human impacted system with reduced biodiversity.

### **Biodiversity and Covid-19 Pandemic**

This coronavirus disease -2019 (COVID-19) pandemic is the recent episode in the string of environment borne human tragedies, catastrophic in its magnitude, reach and repercussions. The scientific literature has focused on the cause and consequences of the pandemic from an anthropocentric viewpoint. Scientific reports on the impacts of the pandemic on the use of conservation concern are minuscule in comparison with reports on social, economic, political and health related consequences. The sudden rapid outbreak of the disease, short time frame since the commencement of the lockdown, and inaccessibility to field sites to start new empirical studies and monitor ongoing

studies have resulted in the absence of the scientific evidence of direct impact of lockdown on species and ecosystem of concerns. As a result much of the direct impact of the lockdown is still anecdotal. Here is the account of the possible consequences of the pandemic on biodiversity conservation and the way forward for a more stringent and comprehensive planetary conservation strategy.

**Immediate impacts:** Conservation development projects requiring a mandatory human presence such as surveillance of protected areas, treatment of disease of wild animals and plants and eradication of invasive alien species, may take as a backseat. The anthropogenic pressure owing to the mass migration and unemployment in the biodiversity rich developing world, the species and habitats of concern may be in danger of hunting, poaching, mining, logging and diseases. The reduction in ecotourism and human presence may help species sensitive to anthropogenic pressure to thrive. Anecdotal evidences' suggest that the lockdown has resulted in increased pregnancies in zoo animals, reintroduction programme of vulnerable species and increase sighting of wild life close to human inhabitation from around the world <sup>[9]</sup>.

The diversion of funds to more urgent causes, as well as travel restrictions, are likely to have a direct impact on research activities such as long term monitoring programme, species and ecosystems of conservation priority, socio ecological research involving human subjects, and expeditions to understudied locations. The research work got suffered due to the lack of monetary support <sup>[10]</sup>. Which will further impact conservation research, development and outreach. On the other hand lockdown has seen an upsurge in virtual citizen science projects <sup>[11]</sup>. Several impactful changes in national and international conservation policies and practices have taken place since the pandemic started. The positive news includes a temporary ban by china on wildlife markets, the resultant stand still in the wildlife trade industries in South East Asia, and the possibility of further bans by other countries on wildlife trade. However, a blanket ban will harm millions of poor people dependent on the wildlife for their livelihood and nutrition eventually resulting in possible overexploitation <sup>[12]</sup>. The European Union's Green New deal which is central to the road to post covid recovery to greener economies, has received world wide support <sup>[13]</sup> and may pave the way for greener economies.

The negative perception of wildlife as disease carrier may result in retaliatory killings of possible carrier species such as bats and pangolins, resulting in several repercussions for these threatened species <sup>[14]</sup>. E.g all Asian pangolins are endangered or critically endangered and any future retaliatory killings may push the species towards extinction. Unemployment and mass migration as a result of pandemic may result in added pressure on wildlife and habitats for food and livelihood by increased poaching, hunting and logging leading to closer contact between human and wildlife, resulting in future outbreak of zoonotic disease <sup>[15]</sup>. On the positive side there has also been a significant decrease in noise as well as in air pollution since the lockdown. The noise pollution is known to affect the anatomical, morphological development, physiology and behaviour in an invertebrates and vertebrates species both in

terrestrial and aquatic habitat <sup>[16]</sup>. It is also known to reduce diversity, changing the community structure and interspecific interactions.

If we look at the review of the past five global economic and political crisis, these demonstrate that despite a temporary improvement in the indicators of environmental health immediately after the crisis, the desire to return to economic normally often resulted in even less regard for environmental health in comparison with the previous period resulting in a more rapid rate of decline of environmental health. Besides indicators of environment health take longer to review than economic indicators, suggesting the fragility of conservation indicators and a need to stabilize them during and after global crisis.

### A way forward

Although catastrophic, the ongoing global crisis is not unique in its magnitude, reach and resultant costs to humanity. For decades, ecologist have warned about climate change, the unprecedented rate of extinction of species and subsequent social and economic disenfranchisement of millions of poor people in developing biodiversity rich countries. This pandemic has brought realizations regarding the connections among the human and non-human components of the planet the grave consequences of causing an imbalance in natural processes shaped over millennia and unpreparedness of the humanity surrounding such catastrophes. The way forward for the biodiversity conservation should be four pronged with the involvement of policy, conservationist, industry and general public.

### Conclusion

The rapid and visible changes in environmental variables within few weeks of the lockdown were surprising even for experts which should create an optimistic attitude towards biodiversity conservation. The scientific community will need to lead from the front, in creating solutions and in steering the socio-political will required to implement these solutions for a more long lasting process of environmental conservation. Besides there is an urgent need to create awareness among rural and urban population to highlight the importance of conserving biodiversity. In the absence of such realization, the environment and biodiversity conservation may take an even further backseat in national and international agenda in the post Covid-19 world.

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