



BIODIVERSITY FOR ZONOTIC INFECTIOUS DISEASE CONTROL AND SUSTAINABLE DEVELOPMENT

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ABSTRACT

Biodiversity or biological diversity is the totality of all the living organisms including the genetic level *i.e.*, totality of all the living plants, animals and microorganisms of a particular region or throughout the entire World. The biodiversity of an ecosystem contributes to the sustainability of that ecosystem as well as the global ecosystem to make our Planet competent for all the living organisms. Many of our ecological services mediated by ecosystem processes are directly or indirectly related with biodiversity for the survival of all the living organisms including human beings. Biodiversity also helps to supply the natural resources by supplying the living organisms, reforming the climatic conditions, maintaining the natural food chains, giving a pollution free air, water and soil, maintaining the bio-geo-chemical cycles and conserving all the natural resources. Today global biodiversity is in a serious threat. Continuous increase of indiscriminate use of natural resources may be harmful for all the living organisms including human beings. Emergence of vector borne and infectious diseases is a common feature and the selection of hosts by the pathogens with its different serotypes is continuously changing along with the transforming climatic conditions and rapid loss of biodiversity. Conservation is the only way and strategy for protecting the biodiversity and thereby the global ecosystem. Increasing the biodiversity or biological organisms, maintaining and conserving them properly throughout the World are utmost requirement now-a-days. Hence on the onset of unusual and unwanted COVID-19 pandemic situation we are compelled to rethink about the conservation of biodiversity and the sustainable use of nature and natural resources to make our Planet pollution free and make it liveable for all the living organisms including human beings in near future. Now "It's time for Nature" and propagate the concept of "Nature-based Solutions" among the people to provide essential resources and infrastructure for supporting life on Earth.

Keywords: Biodiversity, Sustainable development, Ecosystem, Infectious diseases, COVID-19.

1. INTRODUCTION

There are so many living organisms in our surroundings starting from a variety of small insects to big animals including human beings, many types of algae to big trees, and so many microorganisms unable to see with our naked eyes. Biodiversity or biological diversity is the totality of all the living organisms *i.e.*, totality of all the plants, animals and microorganisms of a particular region or throughout the entire World. The term 'biological diversity' was used for the first time by J. Arthur Harris in 1916. The term 'Biodiversity' was first coined by W. G. Rosen in 1985.

The biodiversity is the most complex and vital feature of our planet. In global point of view biodiversity is the variety or variability of life on Earth. The ecosystem of a particular area is properly maintained by its biodiversity and makes a unit with all the living organisms. The

biodiversity of an ecosystem contributes to the sustainability of that ecosystem [1]. High biodiversity in an ecosystem means the more sustainability which is good for the environment and for people. Biodiversity is very important to the wellbeing of our planet. Human life is invariably linked to ecological services provided by other organisms. Soil formation, waste disposal, air and water purification, solar energy absorption, nutrient recycling and food production all depend on biodiversity. In many environments high diversity may help biological communities to withstand environmental stress better and to recover more quickly than those with low species [2].

2. NEED FOR BIODIVERSITY

Biodiversity helps to supply the natural resources by supplying the living organisms, reforming the climatic

conditions, maintaining the natural food chains, giving a pollution free air, water and soil, maintaining the bio-geo-chemical cycles and conserving all the natural resources. We get all type of foods, medicines and drugs, clothes, furniture by using the local biodiversity of a particular area. Biodiversity also gives us the religious, cultural as well as aesthetic values which are directly related with the economy of our country. Eco-tourism, which is also related with the local biodiversity, is a source of income and helps in economic development [3].

3. LOSS OF BIODIVERSITY

Today global biodiversity is in a serious threat, we know that biodiversity is very important in our day-to-day life for our survival but we are continuously destroying a variety of living organisms for the fulfilment of our esteemed needs and civilization. We have to think about the forests, wetlands, grasslands and natural habitats of many endangered as well as endemic species. Continuous increase of indiscriminate use of natural resources may be harmful for all the living organisms including human beings. There are some other causes also for the loss of biodiversity. Some are destruction of habitats, pollution and environmental degradation, pollution and climate change. All are responsible for the loss of biodiversity directly or indirectly. So, we have to protect biodiversity of our locality for future. We have to use them properly in scientific manner as we can live together along with all the organisms and maintain the balance of the planet.

According to IUCN the world losses about 150 species every day. Indian Biodiversity is also in great danger due to various human activities. The Eastern Himalayas and Western Ghats are the richest in biodiversity in India are losing forest cover at an alarming rate. The report on state of India's environment revealed that the total land in the country decreased from 57% in 2001 to 45% in 2009. Mangrove forests have decreased from 4,046 sq km in 1987 to 3,335 sq km in 2003. According to BSI about 3000 of our plant species are under threat. As for animals, 20% of mammals and 5% of our birds are threatened.

4. CONSERVATION OF BIODIVERSITY

Conservation is the only strategy for protecting the biodiversity and thereby the global ecosystem. There are two main ways for conservation of biodiversity- *in-situ* i.e., on site and *ex-situ* i.e., off site. In-situ

conservation includes National Parks, Wildlife Sanctuaries, and Biosphere Reserves etc. which protects the biological organisms within their natural habitat in restricted areas. Ex-situ conservation includes Botanical gardens, Zoos, Gene Banks, Seed Bank, Sperm Banks, Tissue cultures etc. which helps the organisms or their parts outside the natural habitats [4].

Biodiversity conservation is the protection and management of biodiversity to obtain resources for sustainable development. The objectives are- sustainable utilization of species and ecosystem, to maintain life supporting system and essential ecological processes.

Biodiversity conservation and sustainable development are two inter-related topics focusing on ecological conservation on one side and environmental protection, social progress, economic growth on the other. The aim of conservation is two folds [1], viz. a) "to ensure the preservation of a quality environment that considers aesthetic and recreational as well as product needs", and b) "to ensure a continuous yield of useful plants, animals and materials by establishing a balanced cycle of harvest and renewal.

5. BIODIVERSITY IN INDIA

India has about 8% of the World's biodiversity on about 2% of the earth's surface, making it one of the 17 mega-diversity countries in the world. Of about 1.75 million species identified globally, around 1, 26,188 has been reported so far from India. The species recorded include flowering plants (angiosperms), mammals, fish, birds, reptiles and amphibians constituting about 17.3% of the total; whereas, fungi and insects make up nearly 70% of India's bio-wealth. India ranks 10th in the world both in respect of richness of flowering plants (17500 spp) and mammals (350spp); 9th and 5th in respect of richness of birds and reptiles respectively. India has also a centre of crop diversity with 167 species of crops and 320 species of wild crop relatives [5].

6. BIODIVERSITY HOTSPOTS

The concept of biodiversity hotspot was given by Norman Myer [6]. A biodiversity hotspot is an area with high concentration of endemic species. There are total 34 biodiversity hotspots rich in endemic species throughout the world covered around 2.5% of overall Earth's land surface. India, one of the mega-diversity countries of the world, has four biodiversity hotspots- The Western Ghats, The Himalayas, Indo-Burma Region and Sundaland. These hotspots are rich in many vascular plants with their original habitat. But due to

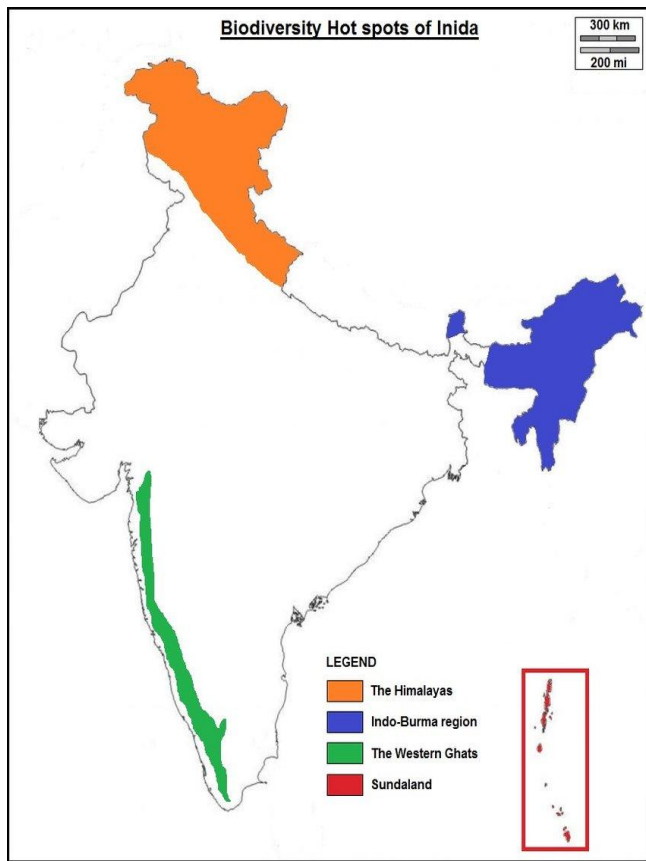


Fig. 2: Biodiversity hotspots (total 4) in India

8. BIODIVERSITY AND THE RECURRENCE OF INFECTIOUS DISEASES

The ongoing crisis focused on overproduction leading to unprecedented environmental degradation, climate change, habitat loss, social inequality and other negative planet wide consequences. This crisis is generated due to dramatic increase in human appropriation of natural resources to keep pace with rapid population growth, dietary shift towards high consumption of animal products and high demand of energy. Environmental changes bring out human health outcomes via infectious disease emergence. Emerging Infectious Diseases (EIDs) such as Ebola, influenza, SARS, MERS, and most recently COVID-19 (by SARS-CoV-2 or nCoV-2019) causes large scale mortality and morbidity and also civil unrest. The SARS outbreak in 2003, the H1N1 epidemic in 2009 and the West African Ebola outbreak in 2013-2016 each caused more than 10 billion US \$ loss in economy. The current outbreak of a novel corona virus is once again keeping the World on its toes. Both the disease and the fear of disease have had considerable economic and social impacts. International trade has been totally collapsed; a large

number of people compelled to go to quarantine. The supply chains of food and medicine, travel and tourism have been badly devastated.

9. SUSTAINABLE DEVELOPMENT AND AGENDA 2030

Sustainable development is an emerging topic in the present scenario. The struggle for growth and excellence has created disparity in the economic development among countries, depleted natural resources at a rate which cause an ecological imbalance. Sustainable development is a term coined to ensure that development takes place in such a way that natural resources are sustained and passed on to the future generation unimpaired [9].

All UN states are committed to achieve SDGs, Agenda 2030 of 17 goals and 169 targets, spanning the three dimensions of economic, social and environmental development. Under this framework all National Government as well as other stakeholders including local government, business and civil society have to do achieving the goals.

India is a signatory to this UN Sustainable Development Summit and is strongly committed to the 2030 Agenda. SDGs which came into effect on 1st January, 2016 is an improvement on the Millennium Development Goals (MDGs). In India, as far as MDGs are concerned, considerable progress has been made in the field of basic universal education, gender equality in education and global economic growth [10]. Though there are some loopholes, the India Government is trying to integrate the efforts taken towards achieving MDGs with SDGs. The 17 SDGs as follows: -

Sustainable Development Goals

- ✓ Goal 1. End poverty in all its forms everywhere
- ✓ Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture
- ✓ Goal 3. Ensure healthy lives and promote well-being for all at all ages
- ✓ Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
- ✓ Goal 5. Achieve gender equality and empower all women and girls
- ✓ Goal 6. Ensure availability and sustainable management of water and sanitation for all
- ✓ Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all

- ✓ Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
- ✓ Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
- ✓ Goal 10. Reduce inequality within and among countries
- ✓ Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable
- ✓ Goal 12. Ensure sustainable consumption and production patterns
- ✓ Goal 13. Take urgent action to combat climate change and its impacts
- ✓ Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development
- ✓ Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
- ✓ Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
- ✓ Goal 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development

Sustainability stands on three pillars, viz. economy, society and the environment (fig. 3).

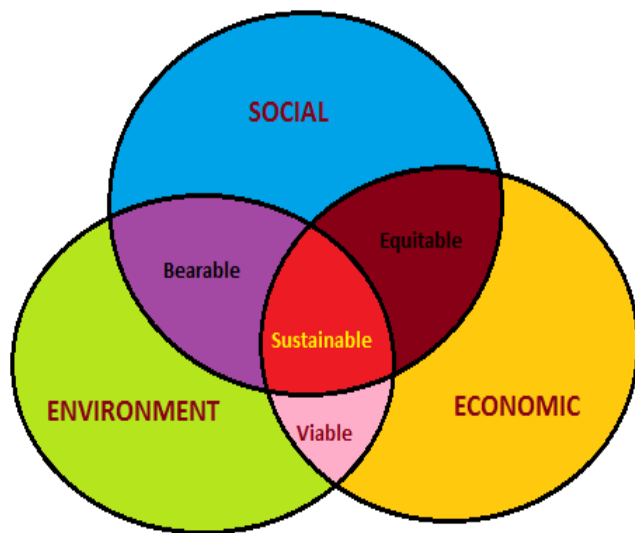


Fig. 3: Interrelationship between three pillars for Sustainable Development

The 2030 Agenda for Sustainable Development represents an historic agreement among Member States of the United Nations for people, planet, prosperity, peace and partnership. Its 17 sustainable development goals (SDGs) are to be achieved by the year 2030.

Biodiversity and healthy ecosystems are a foundation for sustainable development, and thus play a key role in supporting the achievement of all 17 SDGs, including and beyond SDGs 14 and 15 which address life below water and life on land.

10. CONCLUSION

If there is no biological diversity, there is no life on the Earth including human beings. The diversity of life provides us clean water in the oceans and rivers, fresh oxygen in the air, clothes for all human beings, diet and shelter for all the living organisms, and a lot of psychological and aesthetical benefits for all.

On the onset of COVID-19 pandemic we are compelled to rethink about conservation of biodiversity and its sustainability.

We should adopt the Sustainable Development Goals (SDGs) with a vision of ending poverty, protecting planet and ensuring that all people enjoy peace and prosperity.

So, we have to think about this, we have to taking measures to protect our natural resources and biodiversity immediately. Hence increasing the biodiversity or biological organisms, maintaining and conserving them properly throughout the World is utmost requirement now-a-days. We have to think globally but act locally. The perfect idea for near future is stop the pollution and go for green.

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