Conservation of Forest Biodiversity in India

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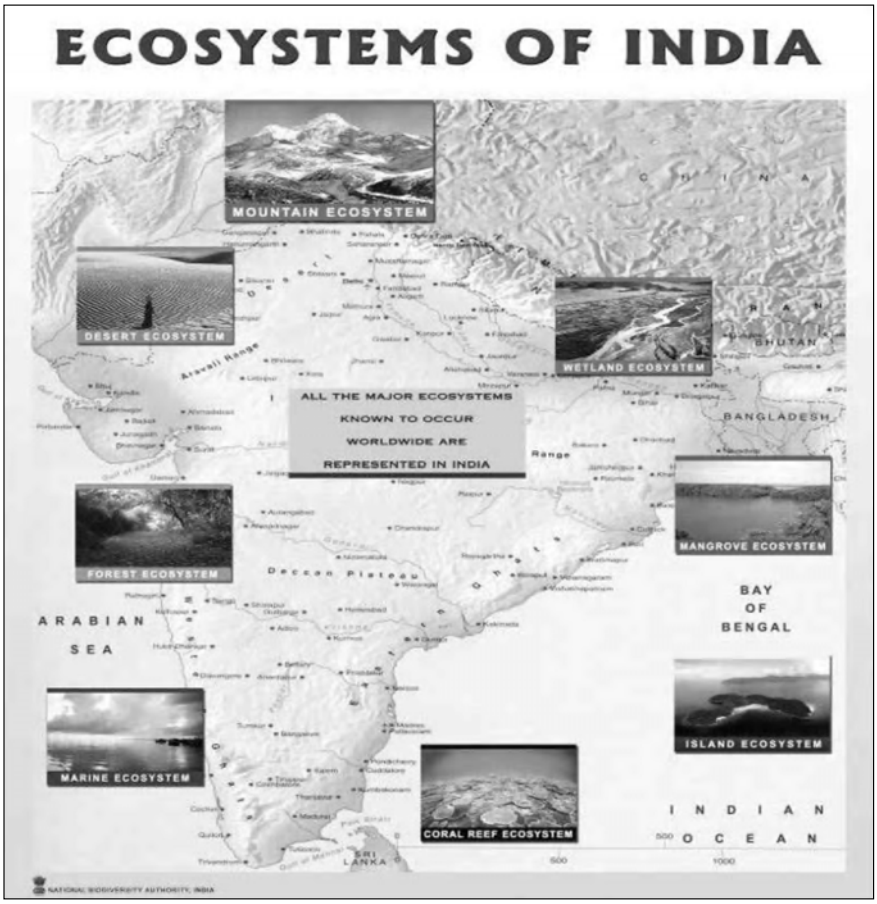
Introduction

Biodiversity encompasses the variety of all life on earth. India is one of the 12 mega biodiversity countries of the world. With only 2.5% of the land area, India already accounts for 7.8% of the recorded species of the world. Biodiversity also includes countless millions of races, subspecies and local variants of species and the ecological processes and cycles that link organisms into populations, communities, ecosystems and ultimately the entire biosphere. A more easily recognized element of biological diversity is the distinct species. An association of species in an area is another recognizable element of biological diversity which is termed as community. Communities form the biotic components of ecosystems. Biologically diverse communities contain sufficient compositional, structural and functional variety that they are assured a high prospect of continued presence and ecological influence in an area. Biodiversity is mainly recognized at three levels, namely species level, genetic level and ecosystem level. Genetic diversity refers to variation within individual species; species diversity pertains to be variety of species; and ecosystem diversity refers to diversity of ecosystems and habitats. Biodiversity is dynamic at all three levels, the genetic composition of species changes over time in response to natural and human-induced selection pressures; occurrence and relative abundance of species in ecological communities change as a result of ecological and physical factors, ecosystems strongly respond to external dynamics and internal pressures.

India is located in the south of Asia, between latitudes 6° and 38° N and longitudes 69° and 97°E. The Indian landmass, extending over a total geographical area of about 329 m ha, is bounded by the Himalaya in the North, the Bay of Bengal in the East, the Arabian Sea in the West, and Indian Ocean in the South. In terms of landmass, it is the seventh largest country in the world. Its coastline of about 8000 km extends over 200 nautical miles in the off-shore forming an Exclusive Economic Zone (EEZ) of 2.02 million sq km. India has a tropical monsoon climate. The south-west monsoons and north-east monsoons bring rain into India. Rainfall is unevenly distributed and it varies both temporarily and spatially. Western Ghats, along the states of Goa, Maharashtra, Karnataka and Kerala, West Bengal, and Assam receive an annual rain fall of 2000 mm. Maharashtra, Bihar, and Madhya Pradesh along the Vindhya Mountains receive annual average rainfall of 1000-2000 mm. South coastal plains and North Western Deccan and upper Gangetic plains receive an annual rain fall of 500-1000 mm. Hot desert areas of Rajasthan and Gujarat and the cold desert areas of Ladakh in Jammu and Kashmir and Lahul-Spiti in Himachal Pradesh receive an annual rainfall of 100 mm.

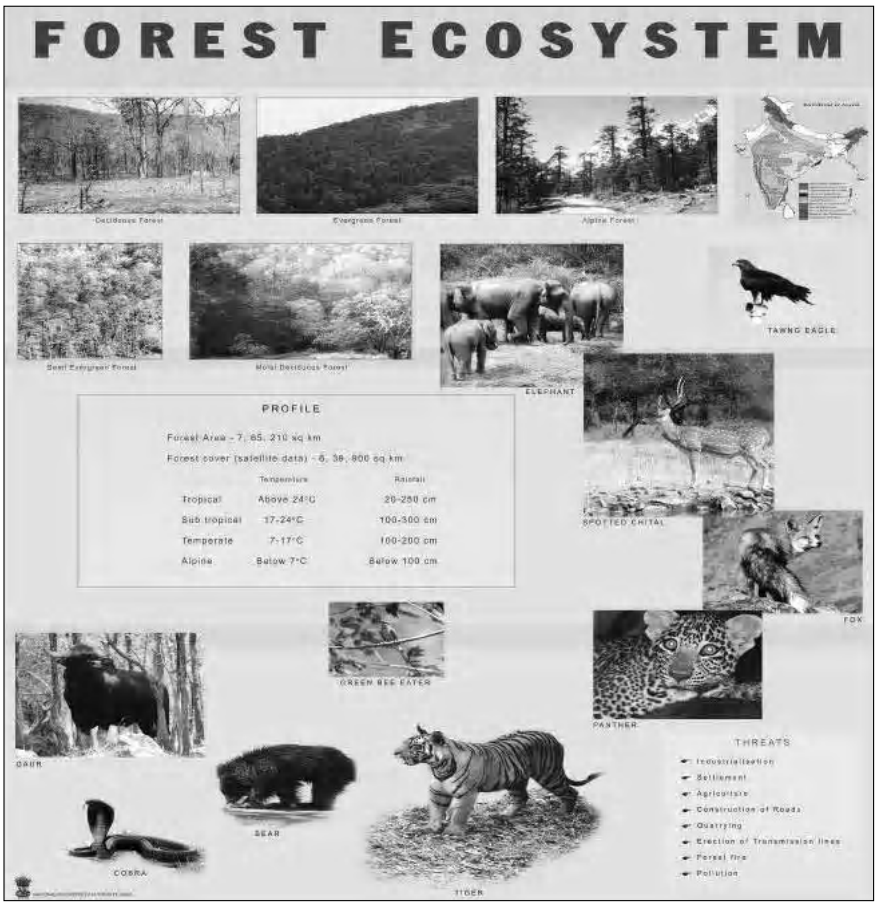
The wide variety in physical features and climatic situations have resulted in diversity of ecological habitats such as forests, grasslands, wetlands, coastal and marine ecosystems and desert ecosystems which harbour and sustain the immense biodiversity.

Forest cover of the country is 7,65,210 sq km (23.42%) while forest cover analysed by the satellite is 6,39,900 sq km (19.47%). India is endowed with diverse forest types ranging from the Tropical Wet



evergreen forests in North-East to the Tropical Thorn forests in the Central and Western India. The forests of the country can be divided into 16 major groups comprising 221 types. The following are the forests types: 1. Tropical wet evergreen (North East and South and Andaman and Nicobar Island), 2. Tropical semi evergreen (South and East), 3. Tropical moist deciduous (Central and East), 4. Tropical littoral and swamp (Along the coast East and West), 5. Tropical dry deciduous (West and Central), 6. Tropical thorn (West and Central), 7. Tropical dry ever green (Central and South), 8. Subtropical broad leaved hill forests (South), 9. Subtropical pine (Sub-Himalayan tract), 10. Subtropical dry evergreen (North-East and South), 11. Mountain wet temperate (Himalaya and Nilgiris), 12. Himalayan Moist temperate (Temperate areas of Himalaya), 13. Himalayan dry temperate (Dry temperate areas of Himalaya), 14. Sub-alpine (Himalaya), 15. Moist Alpine shrub (Himalaya) and 16. Dry alpine shrub (Himalaya).

These forests provide several essential services to mankind. Forests are the source of a number of food items, fuel, wood, fodder, medicine and timber. Other economic uses include providing raw material for forest based industries. Some of the minor forest produce include gums, resins, honey etc. Forests perform important ecological functions such as maintaining delicate ecological balance, conserving

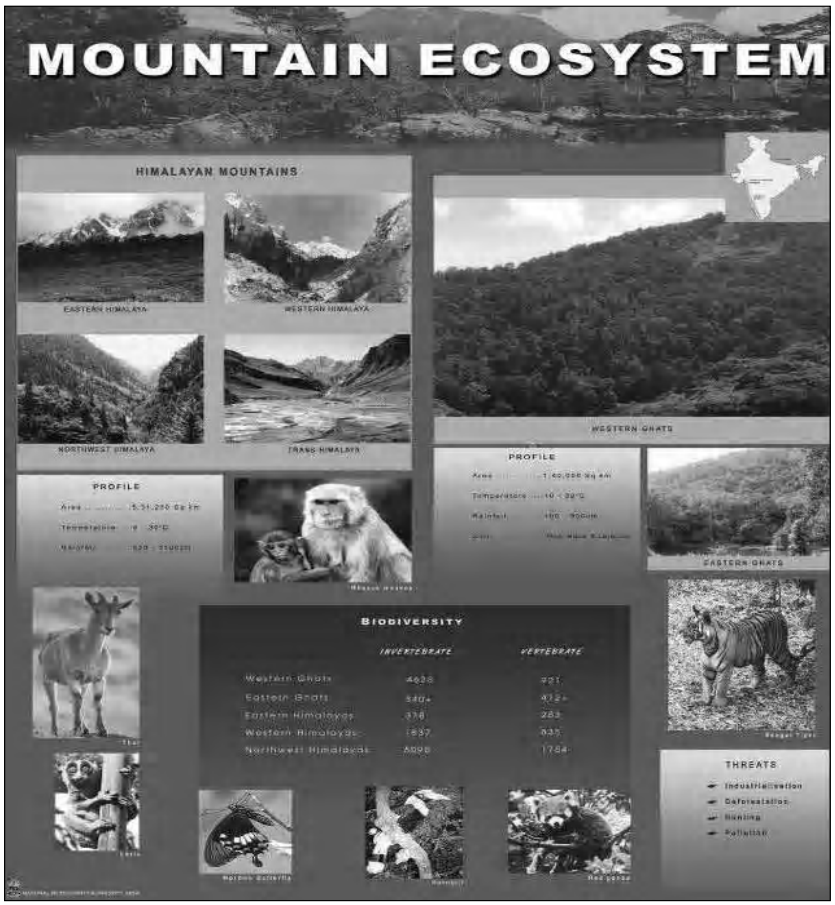


soil, controlling floods, drought and pollution. Forests provide habitats for innumerable plants animals and microorganisms. Forests are a source of recreation and religious inspiration.

Most of the forest ecosystems in India are under acute form of degradation mainly due to: **i.** loss of forest land due to agriculture, industries and human settlement; **ii.** loss of forest land due to multi-purpose projects, construction of roads, erection of transmission lines, quarrying, shifting cultivation etc; **iii.** Degradation due to illicit felling lopping for fodder and fuel wood, overgrazing, forest litter removal, forest fires, over felling, conversion to monoculture, mining, army operations, introduction of exotics, fire and pollution; and iv. human and cattle population exploitation around forest land. The other causes of degradation of this ecosystem are poverty, landlessness, derivation of livelihood from forests, lack of land use planning, biotic interferences and lack of restrictive covenants and punitive legislations.

Threats to Forest Biodiversity

Biological resources have traditionally been a major source of food for local inhabitants and of major economic value in terms of commercial exploitation. The human exploitation of biological resources has increased dramatically in the last few decades for reasons, both commerce and subsistence



living. Ecosystems and biological diversity of India have been exploited since long time but it is only in the last century that the rate of exploitation has increased dramatically, due mostly to the increase in the human population. Except for some of the Andaman-Nicobar Islands, no pristine area exists today. At the end of the last century or in the beginning of this century, very few areas of India remained unaffected, whereas most were partially deteriorated and a few were severely affected.

Natural threats

The major stresses on terrestrial ecosystems cause removal of top soil by flash flood and earth quake and destruction of the marine ecosystems by storm and waves, particularly cyclones. Cyclonic disturbances develop during October-November along the coast. These cyclones have sustained winds with speed ranging from 65 to 120 km per hour. High-speed winds cause extreme wave action that kills many fauna and flora, also break coral into rubbles and sometimes-large amounts of sand and other materials may be dumped onto the coral reef. Also freshwater runoff kills many fauna and flora in semi-enclosed bays and lagoons by lowering salinity and depositing large amounts of sediments and nutrients.

Human impacts

Varied human activities which are, a cause for

concern over and above the natural disturbances, include habitat destruction due to development, industrialization, pollution, eutrophication from sewaged and bad agricultural practices, runoff and sedimentation from development activities (projects), physical impact of maritime activities, dredging, collecting, and destructive fishing practices, pollution from industrial sources and oil refineries and the synergistic impacts of anthropogenic disturbance. A general rule for coastal zone is: whatever is used on land today ends up in the aquifer or coastal zone tomorrow.

Conservation of Forest Biodiversity in India

The Indian Wildlife (Protection) Act, 1972 intended to provide a comprehensive National legal framework for wildlife and forest protection, with conservation of species as the main criteria. The strategy includes total environmental protection and conservation with the assumption that all such protected areas should be free from human activities. The act prohibits hunting of wildlife, protects their habitats and restrains trade in wild animals, trophies etc. The two-pronged approaches of this act are:

- Specified endangered species are protected regardless of its location and
- All species are protected in specified areas

The scope of this act was slightly ambiguous in the initial stages, as the definition of wildlife included only selected wild animals and birds. However, the scope was broadened in Wildlife Protection Amendment Act 1991 to include flora as well as fauna.

Today, the protection of environment is a global concern, as evinced by the numerous International Conventions in this area. The objectives of these International Conventions are :

- Establish uniform conservation rules;
- Express the commitment of the contracting parties to conserve species and their habitats; and
- Organise effective international cooperation

Some such scientific conventions include: International. Biological Programme (World Conservation Union), MAB Programme (UNESCO), and The World Conservation Strategy (IUCN, UNEP & WWF) for which the Government of India is a signatory. The most important convention on the preservation of wildlife is the Convention on International Trade in Endangered Species of Wild Fauna and Flora, CITES (also known as Washington Convention) signed on 3rd March 1973, which was subsequently amended at Bonn on 22nd June 1979. The Convention's goals are to monitor and stop commercial international trade in endangered species, maintain those species under international commercial exploitation as an ecological balance and assist countries enabling a sustainable use of the species through international trade. The draft policy of the CITES includes 25 articles, highlighting definitions, fundamental principles, regulation of trade of animals in Appendix I- III, international measures, legislation, amendments and resolution of disputes.

CITES parties regulate wildlife trade through controls, regulations and certifications on the species listed in three appendices. The Ministry of Environment & Forests, Government of India adopts a national legislation to provide official designation of a Management Authority for issuing the permits and certificates based on the advice of a designated Scientific Authority (Zoological Survey of India for faunal matters). These two designated national authorities also enhance the CITES enforcement through cooperation with customs, police or appropriate authorities.

Appendix-I, II and III of CITES includes articles related to trade and export of any specimen of a species that require prior grant and presentation

of an export permit issued by scientific and management authority. Similarly, such authorities also regulate the import. The scientific authorities' permits only after satisfying that such export-imports will not be detrimental to the survival of the species. The principle of such export-import policy is to determine that the species in question have a consistent level throughout its range/ecosystem.

Appendix-I include all species threatened with extinction, which are or may be affected by trade. Trade in specimens of these species must be subject to particularly strict regulation in order not to endanger further their survival and must only be authorized in exceptional circumstances.

Appendix-II includes– i. all species which although not necessarily now threatened with extinction may become so unless trade in specimens of such species is subject to strict regulation in order to avoid utilization in compatible with their survival; and ii. other species which must be subject to regulation in order that trade in specimens referred to in above subparagraph (i) may be brought under effective control.

Appendix-III shall include all species, which any party identifies as being subject to the regulation within its jurisdiction for the purpose of preventing or restricting exploitation, and needing the cooperation of other parties in the control of trade.

The first Red Data Book on Indian Animals containing data in the 1993 IUCN format on vertebrate species (except fishes) threatened with extinction was published by Zoological Survey of India in 1994. The categorization in this book was according to 1993 IUCN Criteria. They were Extinct, Critical, Endangered, Vulnerable, Rare and Insufficiently Known. It was based generally on the updated information on population size and degree of threat to the population and habitat. The species account followed the standard IUCN Red Data Book format. The Red Data Book on Indian Animals (Part-1) Vertebrates includes an updated data on 77 mammals, 55 birds, 20 reptilian and 1 amphibian species. Similar attempt was done earlier in 1983, when a species-wise account was published on threatened animals of India on the basis of the then IUCN Criteria. The account covered data on 81 mammal, 47 birds, 15 reptiles and 3 amphibian rare species.

IUCN Red List Categories and Criteria

Prepared by the IUCN Species Survival Commission, as approved by the 51st meeting of the IUCN Council Gland, Switzerland, 9 February 2000, IUCN-The World Conservation Union, 2001.

Extinct (EX)

A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

Extinct in the Wild (EW)

A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a period appropriate to the taxon's life cycle and life form.

Critically Endangered (CR)

A taxon is Critically Endangered when the best available evidence indicates that it is not Extinct and it is considered to be facing an extremely high risk of extinction in the wild. Survey should be over a time appropriate to the taxon's life cycle and life form.

Endangered (EN)

A taxon is endangered when the best available evidence indicates that it is not Critically Endangered but is considered to be facing a very high risk of extinction in the wild in the near future, as defined by any of the criteria.

Vulnerable (VU)

A taxon is Vulnerable when the best available evidence indicates that it is not Critically Endangered or Endangered but is therefore considered to be facing a high risk of extinction in the wild in the medium-term future, as defined by any of the criteria.

Near Threatened (NT)

A taxon is Near Threatened when it has evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

Least Concern (LC)

A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

Data Deficient (DD)

A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available.

In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

Not Evaluated (NE)

A taxon is Not Evaluated when it has not yet been evaluated against the criteria.

Convention on Biological Diversity

The Convention on Biological Diversity (CBD) is a landmark in the environment and development field, as it takes for the first time a comprehensive rather than a sectoral approach to the conservation of Earth's biodiversity and sustainable use of biological resources. It was in the year 1984 that the needs to have in place a global convention on biological diversity started gaining momentum. In response, the United Nations Environment Programme (UNEP) in the year (1987) recognized the need to streamline international efforts to protect biodiversity. It therefore established an ad hoc working group to investigate "the desirability and possible form of an umbrella convention to rationalize current activities in the field". This group by 1988 concluded that– a. the existing treaties were inadequate to address the issue of conservation and sustainable use; and b. a new global treaty on biological diversity was urgently needed. Organizations such as the World Conservation Union (IUCN) and the Food and Agricultural Organization (FAO) contributed draft articles in addition to specific studies commissioned by the UNEP. The UNEP Secretariat prepared the first draft and the formal negotiating process was started in 1991. The Inter-governmental Negotiating Committee for a Convention on Biological Diversity (INC) was given the task of ensuring the adoption of the Convention. On May 22, 1992 the nations of the world adopted the CBD in Nairobi and on June 5, 1992 the CBD was tabled at the UN Conference

on Environment and Development in Rio de Janeiro where a record 150 countries signed the Convention.

The Convention on Biological Diversity (CBD) was negotiated and signed by nations at the UNCED Earth Summit at Rio de Janeiro in Brazil in June 1992. The Convention came into force on December 29, 1993. India became a Party to the Convention in 1994. At present, there are 175 Parties to this Convention.

The main objectives of the Convention are:

- Conservation of biological diversity;
- Sustainable use of the components of biodiversity;
- Fair and equitable sharing of benefits arising out of the utilisation of genetic resources.

Re-affirming the sovereign rights of Parties over their own biodiversity, the Convention balances conservation with sustainable utilisation and access to and use of biological resources and associated knowledge with equitable sharing of benefits arising out of such use. The CBD offers opportunities to India to realise benefits from its rich biological resources and associated traditional knowledge.

The CBD stipulates that the parties, even though having sovereign rights over their biological resources, would facilitate access to the genetic resources by other parties subject to national legislation and on mutually agreed terms. The CBD also provides for equitable sharing of benefits arising from the utilization of traditional knowledge and practices, with holders of such knowledge. This has made it necessary for a legislation to be put in place, which lays down the framework for providing access, for determining the term of such access and for ensuring the equitable sharing of benefits.

India is a Party to the Convention on Biological Diversity (CBD) (1992). Recognizing the sovereign rights of States to use their own biological resources, the Convention expects the Parties to facilitate access to genetic resources by other Parties subject to national legislation and on mutually agreed upon terms (Article 3 and 15 of CBD). Article 8(j) of the Convention on Biological Diversity recognizes contributions of local and indigenous communities to the conservation and sustainable utilization of biological resources through traditional knowledge, practices and innovations and provides for equitable sharing of benefits with such people arising from the utilization of their knowledge, practices and innovations.

Conclusion

The wide spread loss of the global biological wealth is one of the most serious crises today at International level. As many of the World's diverse life forms from microbes to higher animals and plants have a direct or indirect influence on agricultural conservation of these organisms is essential for sustainable agriculture. To feed growing population, agriculture must be intensified to provide more food. It will also be essential to increase the resilience of agriculture by maintaining a wide array of life forms with unique traits, such as trees that survive drought conditions and cattle that reproduce in harsh conditions. Sustainable agricultural practices can both feed people and protect oceans, forests and other ecosystems that harbour biological diversity.