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IN SITU AND EX SITU CONSERVATION

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Biodiversity and Its Conservation

The natural resources of the Earth, including air, water, land, flora and fauna of natural ecosystems must be safeguarded for the benefit of the present and future generations through careful planning and management, as appropriate – Principle of the Stockholm Declaration, 1972.

The large-scale loss of biodiversity and its global impact makes conservation the need of the hour. Conservation of biodiversity is protection and scientific management of biodiversity so as to maintain it at its optimum level and derive sustainable benefits for the present as well as future generations. It aims to protect species from extinction and their habitats and ecosystems from degradation.

General strategies in conservation

1. Identify and protect all threatened species
2. Identify and conserve in protected areas the wild relatives of all the economically important organisms
3. Identify and protect critical habitats for feeding, breeding, nursing, resting of each species resting, feeding and breeding places of the organisms should be identified and protected Air, water and soil should be conserved on priority basis Wildlife Protection Act should be implemented

Benefits of Biodiversity conservation

1. Conservation of biological diversity leads to conservation of essential ecological diversity to preserve the continuity of food chains.
2. The genetic diversity of plants and animals is preserved.

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3. It ensures the sustainable utilization of life support systems on earth.
 4. It provides a vast knowledge of potential use to the community.
 5. A reservoir of wild animals and plants is preserved, thus enabling them to be introduced, if need be, in the surrounding areas.
 6. Biodiversity conservation assures sustainable utilization of potential resources.

There are two aspects of conservation strategies

- i. In-situ conservation
- ii. Ex-situ conservation

i. In-situ Conservation:

This is the conservation of genetic resources through their protection within a natural or manmade ecosystem in which they occur. It is conservation and protection of the whole ecosystem and its biodiversity at all levels in order to protect the threatened species. Maximum protection of biodiversity hotspots regions with very high levels of species richness. Although all the biodiversity hotspots together cover less than 2 percent of the earth land area, the number of species they harbor is extremely high and protection of these hotspots could reduce the ongoing mass.

In-situ conservation includes:

1. National park
2. Wildlife sanctuaries and bird sanctuaries
3. Protected forests or Reserved forests
4. Biosphere reserves
5. Nature reserves like sacred groves, community reserves, conservation reserves.

Protected Area:

These are biogeographical areas where biological diversity along with natural and cultural resources is protected, maintained and managed through legal measures. protected areas include national parks, wild life sanctuaries, community reserves and biosphere reserves. World Conservation monitoring centre has recognized 37,000 protected areas world-wide. India has about 771 protected areas covering 162099 km²

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comprising of National Parks (104), Wild Life Sanctuaries (544), biosphere reserves (18) and several sacred groves.

National Parks (NP):

It is a natural habitat that is notified by the state government to be constituted as a National Park due to its ecological, faunal, floral, geomorphological, or zoological association of importance. No human activity is permitted inside the national park except the activities permitted by the Chief Wildlife Warden of the state.

National Park is an area which is strictly reserved for the betterment of wildlife and biodiversity and where activities like development, forestry, poaching, hunting, grazing and cultivation are not permitted.

| National Parks in Tamil Nadu | Year of establishment | District(s) |
|-------------------------------------|------------------------------|-----------------------------|
| Guindy NP | 1976 | Chennai |
| Gulf of Mannar Marine NP | 1980 | Ramanathpuram and Tuticorin |
| Indira Gandhi (Annamalai) NP | 1989 | Coimbatore |
| Mudumalai NP | 1990 | Nilgiris |
| Mukurthi NP | 1990 | Nilgiris |

Wild Life Sanctuaries (WLS):

Any area other than the area comprised with any reserve forest or the territorial waters can be notified by the State Government to constitute as a sanctuary if such area is of adequate ecological, faunal, floral, geomorphological, natural or zoological significance. This is for the purpose of protecting, endangered factual species. Some restricted human activities are allowed inside the Sanctuary area. Ecotourism is permitted, as long as animal life is undisturbed.

There are 544 existing wildlife sanctuaries in India covering an area of 118,918 km², which is 3.62 % of the geographical area of the country (National Wildlife Database, 2017).

Sanctuaries are tracts of land where wild animals and fauna can take refuge without being hunted or poached. Other activities like collection of forest products, regulated

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 harvesting of timber, private ownership of land is permitted. Periyar wild life sanctuary in Kerala is famous for the Indian Tiger and Asiatic Elephant. Wildlife sanctuaries in India are IUCN category IV protected areas.

| Prominent WLS in Tamil Nadu | Year of establishment | Districts |
|------------------------------------|------------------------------|------------------|
| Vedanthangal Lake Birds WLS | 1936 | Chengalpet |
| Mudumalai WLS | 1942 | Nilgiris |
| Point Calimere WLS | 1967 | Nagapattinam |
| Indira Gandhi (Annamalai) WLS | 1976 | Coimbatore |
| Mundanthurai WLS | 1977 | Tirunelveli |

Eco sensitive zones:

The National Wildlife Action Plan (2002–2016) of MoEFCC stipulated that state governments should declare land falling within 10 km of the boundaries of national parks and wildlife sanctuaries as eco-fragile zones or ESZs under the Environmental (Protection) Act, 1986. The purpose of the ESZ was to provide more protection to the parks by acting as a shock absorber or transition zone. Eco-Sensitive Zones would minimize forest depletion and man-animal conflict. The protected areas are based on the core and buffer model of management. The core area has the legal status of being a national park. The buffer area, however, does not have legal status of being a national park and could be a reserved forest, wildlife sanctuary or tiger reserve.

Biosphere Reserve (BR):

Biosphere Reserve (BR) is an international designation by UNESCO for representative parts of natural and cultural landscapes extending over large area of terrestrial or coastal/ marine ecosystems or a combination thereof. BRs are designated to deal with the conservation of biodiversity, economic and social development and maintenance of associated cultural values. Biosphere Reserves are thus special environments for both people and nature and are living examples of how human beings and nature can co-exist while respecting each other's needs. The Biosphere Reserve Programme is guided

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by UNESCO's Man and Biosphere (MAB) programme, as India is a signatory to the landscape approach supported by MAB programme. The scheme called Biosphere Reserve was implemented by the Government of

India in 1986. There are 18 Biosphere Reserves in the country. Agasthyamalai (Karnataka - Tamil Nadu - Kerala), Nilgiri (Tamil Nadu - Kerala), Gulf of Mannar (Tamil Nadu) are the BRs notified in Tamil Nadu.

The biosphere reserve consists of core, buffer, transition zones:

1.Core zone:

Fully protected and natural area of the biosphere reserve least disturbed by human activities. It is legally protected (under EPA Act 1986) ecosystem in which entry is not allowed except with permission of some special purpose. Destructive sampling for scientific investigations is prohibited. The core zone is to be kept free from all human pressure external to the system.

2.Buffer zone:

The buffer zones surround the core zone and is managed to accommodate a greater variety of resource use strategies, and research and educational activities. Limited recreation, tourism, fishing and grazing are permitted to reduce its effect on core zone.

3.Transition zone:

The outer most part of biosphere reserve, is an area of active cooperation between the reserve management and local people, wherein activities like settlements, cropping, forestry, recreation and other economic that are in harmony with the conservation goals. The transition zone is the experimental research areas used for understanding the patterns and processes in the ecosystem.

The main functions of biosphere reserves are:

- i. Conservation
- ii. Development
- iii. Scientific research, monitoring and education.



Community reserves:

Community reserves can be declared by the state governments in any private or community land not comprised with in the national park, sanctuary, or conservation reserve, where an individual or community has volunteered to conserve wild life and its habitat. Community reserves are declared for the purpose of protecting fauna, flora and traditional or cultural conservation values and practices. The declaration of such areas is aimed at improving the socio-economic conditions of the people living in such areas as well as conserving wildlife.No change in land use pattern shall be made within the community reserve, except accordance with a resolution passed by management committee and approval of the same by the state government.

Conservation reserves:

Conservation Reserves can be declared by the State Governments in any area owned by the Government, particularly the areas adjacent to National Parks and Sanctuaries and those areas which link one Protected Area with another. Such a declaration should be made after having consultations with the local communities. The rights of people living inside a Conservation Reserve are not affected.

Sacred Groves

India is also a history of religious and cultural traditions that emphasized protection of nature. A sacred grove or sacred woods are any grove of trees that are of special religious importance to a particular culture. Sacred groves feature in various cultures throughout the world. These spaces are protected by local communities because of their religious beliefs and traditional rituals that run through several generations. The degree of holiness of the scared groves varies from one grove to another.In some forests even the dry foliage and fallen fruits are not touched.

Such sacred groves are found in Khasi and Jaintia hills in Meghalaya, Aravalli hills of Rajasthan, Western ghat regions of Karnataka and Maharashtra and the Sarguja, chanda and Bastar areas of Madya Pradesh and Chhattisgarh.



2.Ex-situ conservation

Ex-situ conservation involves maintenance and breeding of endangered plants and animals under partially or wholly controlled conditions in specific areas like zoo, gardens, nurseries etc. It includes offsite collections and gene banks.

Other examples of ex-situ conservation include:

1. Botanical gardens
2. Zoological park
3. Gene Banks
4. Seed Banks
5. Cryo-preservation
6. Conservation at molecular level

Botanical gardens

Botanical garden refers to the scientifically planned collection of living trees, shrubs, herbs, climbers and other plants from various parts of the earth.

Purpose of botanical gardens

1. Ex-situ conservation and propagation of important threatened plant species.
2. To build public awareness through education on plant diversity and need for conservation.
3. To study the taxonomy as well as growth of plants.
4. To study the introduction and acclimatisation process of exotic species of plants.
5. It acts as germplasm collection centre and helps development of new hybrids.
6. It serves as a Centre of Excellence for conservation, research and training.
7. It augments conserving rare and threatened species.
8. It acts as a source of recreation.

◆.....◆ **Botanical Survey of India (BSI)**

BSI is the apex research organization under Ministry of Environment and Forests (MoEFCC) for carrying out taxonomic and floristic studies on wild plant resources of country. It was established in 1890 with objective to explore plant resources of country and to identify plants species with economic virtues. It has nine regional circles situated at different regions of the country.

Primary functions of BSI

1. Exploration, inventorying and documentation of Phyto-diversity in general and protected areas, hotspots and fragile ecosystems in particular.
2. Publication of National, State and District Floras.
3. Identification of threatened and red list species and species rich areas needing conservation.
4. Ex-situ conservation of critically threatened species in botanical gardens. Survey and documentation of traditional knowledge (ethno-botany) associated with plants.
5. Develop National database of Indian plants, including herbarium and live specimens, botanical paintings and illustrations, etc.

Zoological park

Zoo is an establishment, whether stationary or mobile, where captive animals are kept for exhibition to the public and includes a circus and rescue centres but does not include an establishment of a licensed dealer in captive animals. The initial purpose of zoos was entertainment, over the decades, zoos have got transformed into centres for wildlife conservation and environmental education. Apart from saving individual animals, zoos have a role to play in species conservation too (through captive breeding). Zoos provide an opportunity to open up a whole new world, and this could be used in sensitizing visitors regarding the value and need for conservation of wildlife.

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Zoological survey of India:

1. It is India's apex organization on animal taxonomy.
2. Its objective is to promote survey, exploration, research and documentation on various aspects of animal taxonomy in Indian subcontinent.
3. It also seeks advancement of knowledge on animal taxonomy.
4. It was established in 1916 and headquartered in Kolkata.
5. It has been declared as designated repository for National Zoological Collection as per section 39 of the National Biodiversity Act, 2002.

Gene Banks

Ex-situ collection and preservation of genetic resources is done through gene banks. Gene banks are a type of bio repository which preserves genetic material. Seed bank, Tissue bank, CryoBank and Pollen bank are some of the types of gene banks. Tura Range in Garo Hills of Meghalaya is a gene sanctuary for preserving the rich native diversity of wild citrus and musa species.

Seed Banks

Seed Banks store seeds at extremely low temperature and humidity. Seed banks can save large variety of plant species in a very small space. A seed bank stores seeds as a source for planting in case seed reserves elsewhere are destroyed. The seeds stored may be of food crops, or those of rare species to protect biodiversity. Depending on the species, seeds are dried to suitably low moisture content. Typically, this will be less than 5%. The seeds then are stored at -18°C or below. Because seed RNA (like animal DNA) degrades with time, the seeds need to be periodically replanted and fresh seeds collected for another round of long-term storage.

Cryopreservation (preservation under freezing conditions)

Cryopreservation is particularly useful for conserving vegetative propagated crops. Cryopreservation is the storage of material at ultra-low temperature of liquid nitrogen (-196°C) and essentially involves suspension of all metabolic processes and activities and samples can be preserved in such state for extended periods. Cryopreservation has

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been successfully applied to meristems, zygotic and somatic embryos, pollen, protoplasts cells and suspension cultures of a number of plant species.

Conservation at molecular level (DNA level)

In addition to cryopreservation, germplasm conservation at molecular level is now feasible and attracting attention. Cloned DNA and material having DNA in its native state can all be used for genetic conservation.

Conservation of Biodiversity

Conservation of bio-diversity is the proper management of the biosphere by human beings in such a way that it gives maximum benefits for the present generation and also develops its potential to meet the needs of the future generations.

The three basic objectives of biodiversity conservation are:

- (a) To maintain essential ecological processes and life supporting systems.
- (b) To preserve the diversity of species.
- (c) To make sustainable utilization of species and ecosystems.

There are two types of conservation methods namely in-situ and ex-situ conservations.

| In-situ Conservation | Ex-situ Conservation |
|---|--|
| It is the on-site conservation or the conservation of genetic resources in natural populations of plant or animal species. | This is a conservation strategy which involves placing of threatened animals and plants in special care locations for their protection. |
| It is the process of protecting an endangered plant or animal species in its natural habitat, either by protecting or restoring the habitat itself, or by defending the species from predators. | It helps in recovering populations or preventing their extinction under simulated conditions that closely resemble their natural habitats. |
| National Parks, Biosphere Reserve, Wild Life Sanctuaries form in-situ conservation strategies. | Zoological parks and Botanical gardens are common ex-situ conservation programs. |



Conservation Programmes For Species Oriented:

Certain species have been identified as needing a concerted and specifically directed protection effort to save the ecological balance and biodiversity of the region. The projects are enacted to save the mentioned species, which are threatened or in the brim of extinction with their prey and habitat.

These species play significant role in ecosystem functions and also acts as indicator species to showcase the quality of their habitat.

The projects are:

1. Project Tiger:

The Government of India launched the 'Project Tiger' in 1973 to protect our national animal. From 9 tiger reserves since its inception, the Project Tiger coverage has increased to 50 at present and spread out 18 ranges. Project Tiger is an ongoing Centrally Sponsored Scheme of the Ministry of Environment and Forests, providing central assistance to the states for tiger conservation in designated tiger reserves. Project Tiger was launched in the Jim Corbett National Park, Uttarakhand in 1973. The project ensures a viable population of Bengal tigers in their natural habitats, protecting them from extinction and preserving areas of biological importance as a natural heritage. The state government shall on recommendation of the NTCA notify an area as a tiger reserve.

A tiger reserves includes:

a) Core zone:

Critical tiger habit areas established on the basis of scientific and objective criteria. These areas are required to be kept as inviolate for the purposes of tiger conversation, without affecting the right of the scheduled tribes or such other forest dwellers. These areas are notified by the state government in consultation with an expert committee.

b) Buffer zone:

The Act defines buffer zone as the area peripheral to the critical tiger habitat or core area providing supplementary habitat for dispersing tigers, besides offering scope

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for co-existence of human activity (tribes). It aims at promoting co-existence between wildlife and human activity with due recognition of the livelihood, developmental, social and an Expert committee constituted for the purpose. The limits of such areas are determined with the concerned Gram Sabha and an Expert Committee constituted for the purpose. No alteration in the boundaries of a tiger reserve shall be made except on a recommendation of National Tiger Conservation Authority and National Board for Wildlife. No state government shall de-notify a tiger reserve except in public interest with the approval of National Tiger Conservation Authority and National Board for Wildlife.

National Tiger Conservation Authority:

The National Tiger Conservation Authority (NTCA) is a statutory body of the Ministry, created under the Wildlife (Protection) Act, 1972. India holds over half the world's tiger population. There are 50 tiger reserves in the country. The Authority will have eight experts or professionals having qualifications and experience in wildlife conservation and welfare of people including tribes, apart from three Members of Parliament of whom two will be elected by the House of the People and one by the Council of States. The Inspector General of Forests, in charge of project Tiger, will be ex-officio Member Secretary. The NTCA set up under the chairmanships of MOEFCC.

Objectives:

The objectives of NTCA are:

1. Providing statutory authority to Project Tiger so that compliance of its directives become legal.
2. Fostering accountability of Center-State in management of Tiger Reserves, by providing a basis for MoU with States within our federal structure.
3. Providing for an oversight by Parliament.
4. Addressing livelihood interests of local people in areas surrounding Tiger Reserves.

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Power and Functions:

Powers and functions of the National Tiger Conservation Authority as prescribed under section 380 of the Wildlife (Protection) Act, 1972, as amended in 2006 are as under:-

1. To approve the tiger conservation plan prepared by the State Government.
2. Evaluate and assess various aspects of sustainable ecology and disallow any ecologically unsustainable land use such as, mining, industry and other projects within the tiger reserves
3. To Lay down normative standards for tourism activities and guidelines for project tiger from time to time for tiger conservation in the buffer and core area of tiger reserves and ensure their due compliance
4. Provide for management focus and measures for addressing conflicts of men and wild animal and to emphasize on co-existence in forest areas outside the National Parks, sanctuaries or tiger reserve, in the working plan code.
5. Provide information on protection measures including future conservation plan, estimation of population of tiger and its natural prey species, status of habitats, disease surveillance, mortality survey, patrolling, reports on untoward happenings and such other management aspects as it may deem fit including future plan conservation
6. Approve, co-ordinate research and monitoring on tiger, co-predators, prey habitat, related ecological and socio-economic parameters and their evaluation
7. Ensure that the tiger reserves and areas linking one protected area or tiger reserve with another protected area or tiger reserve are not diverted for ecologically unsustainable uses, except in public interest and with the approval of the National Board for Wild Life and on the advice of the Tiger Conservation Authority
8. Facilitate and support the tiger reserve management in the State for biodiversity conservation initiatives through eco-development and people's participation as per approved management plans and to support similar initiatives in adjoining areas consistent with the Central and State laws