

**BIODIVERSITY CONSERVATION****Why Should We Conserve Biodiversity?**

Uses of Biodiversity:

- (A) Narrowly utilitarian
- (B) Broadly Utilitarian / Ecosystem Services
- (C) Ethical / Aesthetic and Cultural Benefits

**(A) Narrowly utilitarian:**

- As a source of food, medicine, pharmaceutical drugs, fibers, rubber, and timber.
- In modern agriculture, biodiversity serves three main purposes:
  - (a) Providing new crops.
  - (b) Supplying material for breeding improved varieties.
  - (c) Offering new biodegradable pesticides.
- Less than 20 plant species are cultivated to produce about 85% of the world's food. Wheat, corn, and rice are the three major carbohydrate crops that provide most of the food for the human population.
- Commercially domesticated species are bred with their wild relatives to enhance their fruits.
- Genes from wild species are used to introduce new traits like disease resistance and high yield. For example, rice grown in Asia is protected from four main diseases by genes obtained from a single wild rice species, *Oryza nivara*, from India.
- Biodiversity is a rich source of substances with medicinal value:
- Morphine from *Papaver somniferum*.
- Quinine from *Cinchona*.
- Taxol from the bark of the yew tree (*Taxus brevifolia*, *T. baccata*).
- Twenty-five percent of drugs are derived from 120 species of plants.
- Botanochemicals are plant chemicals used in preparing synthetic products.

**(B) Broadly Utilitarian:**

- Diversity is crucial for preserving and sustainably using the benefits and services provided by ecosystems or individual species. Some of these ecosystem services include:
- Oxygen production: The Amazon forest, for instance, produces around 20% of the Earth's oxygen through photosynthesis, earning it the nickname "Lungs of Earth."
- Pollination by various animals like bees, birds, and insects.
- Climate regulation by forests and ocean ecosystems (Hydrological Cycles).
- Natural pest control.
- Soil protection.
- Conservation and purification of water.
- Nutrient cycling.
- These ecosystem services have been estimated to be worth between 16 to 54 trillion ( $10^{12}$ ) US dollars per year, with an average of 34 trillion dollars. Robert Constanza and his colleagues recently attempted to assign a monetary value to nature's life support services, estimating it to be around 33 trillion US dollars on average. Soil formation accounts for 50% of the total cost of various ecosystem services, while recreation and nutrient cycling account for less than 10%, climate regulation for 6%, and habitat for wildlife for 6%.

**(C) Ethical / Aesthetic and Cultural Benefits:**

- Ecotourism.
- Bird Watching
- Wild life
- Pet keeping, Gardening.
- Cultural and religious beliefs also play a significant role:
- In India, plants like *Ocimum sanctum* (Tulsi), *Ficus religiosa* (Pipal), and *Prosopis cineraria* (Khejri), as well as animals like rats (associated with Lord Ganesha), lions (linked with Mata Di), owls (related to Laxmi ji), swans (associated with Saraswati ji), peacocks (associated with Kartikaya ji), and snakes (linked with Shiv Ji), are considered sacred and worshipped.
- Plants and animals serve as symbols of our cultural heritage and national pride. Philosophically and spiritually, it's important to understand that every species has intrinsic value, regardless of its economic significance to us. It is our moral obligation to care for their well-being and ensure that we pass on our biological legacy intact to future generations.

**How do we conserve Biodiversity?**

It includes two kinds of methods:

- (1) In situ Conservation
- (2) Ex situ Conservation

**(1) In situ (on-site) Conservation:**

- This conservation happens within natural habitats or human-made ecosystems. Two different methods are employed to preserve biodiversity.
  - (i) Protected areas
  - (ii) Hot spots

**(i) Protected areas:**

- Protected areas are special places set aside by law to keep plants and animals safe and healthy. The World Conservation Monitoring Centre has identified 37,000 such areas around the world.
- In 2005, India established 90 national parks, 448 wildlife sanctuaries, and 14 biosphere reserves. Additionally, there were many sacred groves covering 4.7% of the land surface.

**(a) National parks:**

- National parks are big areas kept for science, learning, and fun activities like hiking. They are not for making money from nature. India has 100 national parks, taking up about 1.1% of its land.

**(b) Wildlife sanctuaries:**

- Wildlife sanctuaries are places where wild animals can live safely without being hunted. People can gather forest items, cut trees, and own land there. India has 551 sanctuaries, covering more than 3.6% of its land area as of 2005.

**(c) Biosphere reserves:**

- Biosphere reserves are special areas created as part of UNESCO's Man and Biosphere program. They have been established since 1975, with 408 set up by May 2002. Biosphere reserves are places on land or near the coast that have multiple purposes. They protect different types of plants and animals, including those found in unique ecosystems. They also safeguard the way of life of tribal communities and the genetic diversity of domesticated plants and animals. India has established 18 biosphere reserves so far.

**Each biosphere reserve has three zones****(a) Core zone:**

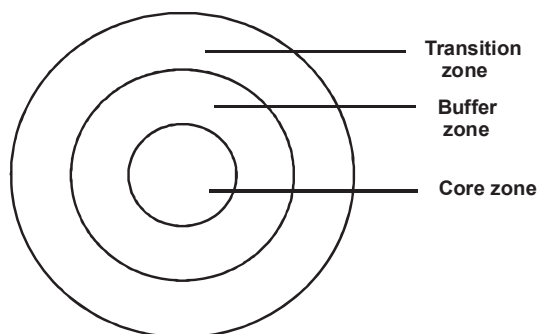
- No human activity is allowed.

**(b) Buffer zone:**

- This is an area where some human activities, such as using natural resources, conducting research, and teaching, are allowed but are kept under strict limits.

**(c) Transition zone:**

- This is a region where certain activities like living, farming, raising animals, managing forests, and tourism are permitted.



**Fig: Zonation in terrestrial biosphere.**

**(ii) Hot spots:**

- Hot spots are places where there are many different kinds of plants and animals, but they are also in danger of being harmed or destroyed.
- They can also be described as areas on the map where there are lots of plants and animals found only in that specific place.

**Ecologically hot spots are determined by four factors as:****(a) Number of species / species diversity.****(b) Degree of endemism.****(c) Degree of threat to habitat due to its degradation and fragmentation.****(d) Degree of exploitation.**

- Initially, Myers found 12 hot spots where only 0.2% of the land contained 14% of all plant species. Later, four more hot spots were identified, bringing the total to 34. These areas cover less than 2% of the Earth's surface, but about 20% of people live there.
- India is naturally diverse, covering 2.4% of the world's land area and hosting 8.1% of global biodiversity. Some of the main biodiversity hubs in India are the Agasthyamalai hills, silent valley, and Amambalam Reserve.
- India has three hotspots: the Indo-Burma region, the Himalayas, and the Western Ghats-Sri Lanka area. These areas are home to a high number of species found only there, including flowering plants, amphibians, reptiles, some mammals, and butterflies.
- The valleys in these regions are teeming with species found nowhere else. They have played a key role in the evolution of flowering plants, containing many ancient plant genera like members of the Magnoliaceae and Winteraceae families.

**Sacred forests and sacred lakes:**

- Sacred forests and lakes: In India and some other Asian countries, there is a long-standing tradition of protecting biodiversity through sacred forests. These are areas of forest, of different sizes, that tribal communities keep safe because they consider them sacred for religious reasons.
- The sacred forests are like untouched islands within the forest, remaining undisturbed by human activity, despite being surrounded by degraded areas.
- In India, sacred forests are found in various regions such as Karnataka, Maharashtra, Kerala, Meghalaya, etc. They provide a safe haven for many rare, endangered, and unique species. Similarly, local communities, resulting in the protection of aquatic plants and animals, have deemed certain water bodies like Khecheopalri Lake in Sikkim sacred.

**(2) Ex-situ Conservation**

- Ex-situ conservation methods involve various approaches such as botanical gardens, zoos, conservation areas, and banks storing genes, pollen, seeds, seedlings, tissues, and DNA. Seed gene banks are simple and store plant germplasm at low temperatures in cold rooms. Field gene banks preserve genetic resources in normal growing conditions.
- In vitro conservation, particularly cryopreservation in liquid nitrogen at  $-196^{\circ}\text{C}$ , is beneficial for conserving crops that reproduce vegetative like potatoes. Cryopreservation involves storing material at extremely low temperatures by quickly cooling and dehydrating it, allowing long-term storage in compact refrigeration units with minimal maintenance.
- Botanical gardens play a crucial role in conserving biodiversity, with over 1500 worldwide containing more than 80,000 species. Many have adopted ex-situ technologies like seed banks and tissue culture facilities. Similarly, there are over 800 professionally managed zoos globally, housing about 3,000 species. These zoos often have successful captive breeding programs.
- Conserving wild relatives of crop plants and off-site conservation of crop varieties and micro-organisms provide breeders and genetic engineers with vital genetic material. Plants and animals in botanical gardens, zoos, and aquaria can be used to rehabilitate degraded land, reintroduce species into the wild, and replenish dwindling populations.
- International efforts to conserve biodiversity include the Convention on Biological Diversity (CBD), initiated during the Earth Summit in Rio de Janeiro in 1992. Signed by 152 nations, its recommendations came into effect in December 1993. India joined the Convention in May 1994. Agenda 21, another outcome of the Earth Summit, outlines measures for promoting sustainable development and biodiversity conservation in the 21st century.