Bio-diversity

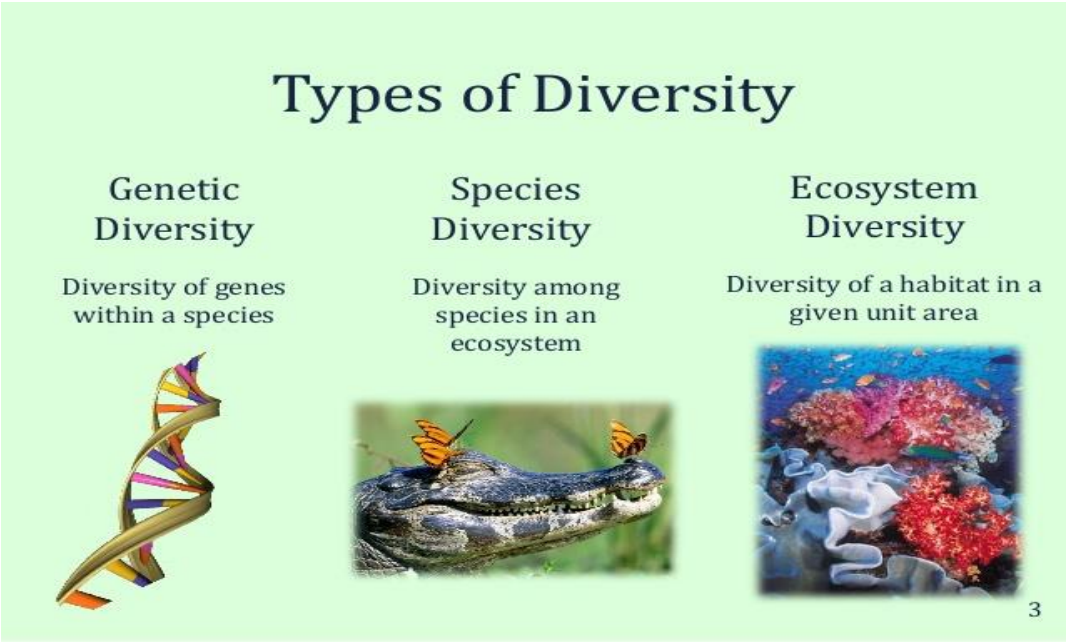
Biodiversity is the variety and differences among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are a part.

It is virtually synonymous with "Life on earth".

The biodiversity found on Earth today consists of many millions of distinct biological species, which is the product of nearly 3.5 billion years of evolution

Types or Levels of Biodiversity

1) Genetic biodiversity,
2) Species biodiversity,
3) Ecosystem biodiversity



1. **Genetic Biodiversity:**
   - It may be defined as **variability in genes of a particular species in a popu**lation
   - Recombination of gene (DNA) gives rise to some new variety

- Each member of any plant and animals species differ from others due to genetic recombination.
- Today the new varieties created By genetically **manipulation of DNA**

  i) Disease resistant, Drought resistance crops

  ii) Breed superior domestic animals (high yield Caws, plants)

  iii) Better medicines and a variety of industrial products are also developed.

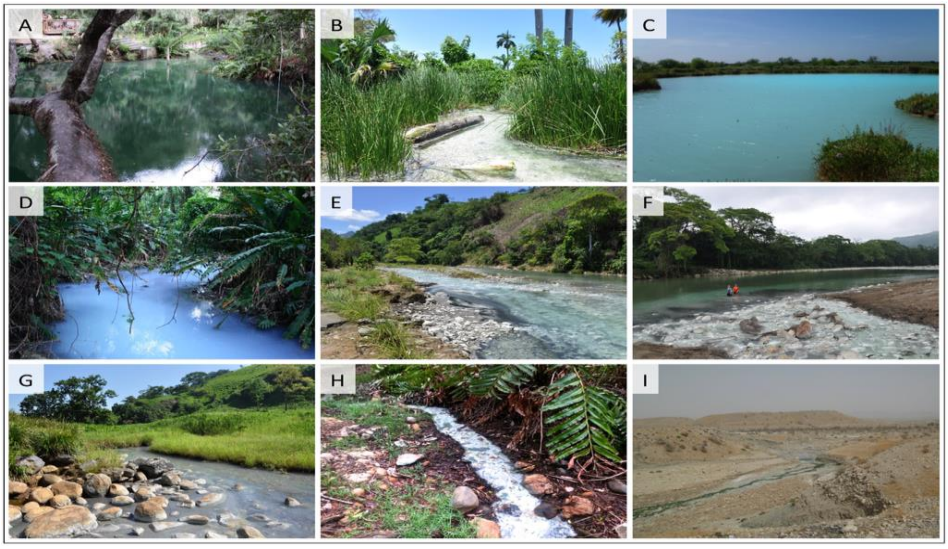
2. Species Biodiversity:

- Refers to the variety of species within a community in a region.
- It an index represents species richness and their abundance in a community.
- At present, about 1.8 million species on Earth.
- India is among the world's 15 Nations that are exceptionally rich in species diversity.
- **Species richness** is simply the number of **species** in a community.
- **Species diversity** is more complex, and includes a measure of the number of **species** in a community, and a measure of the abundance of each **species**.

  Species diversity is usually described by an index, such as Shannon's Index H'.

3. Ecosystem Biodiversity:

- This is the diversity of ecological complexity showing variations in ecological tropic structure, food chain food-webs, nutrient cycling resulted different variety of Ecosystem.
- variations is caused by change in physical parameters like hydrosphere, atmosphere, and lithosphere, moisture, temperature, altitude, precipitation etc.
  E.g. Forest, Grassland, Desert, Pond ecosystems
- **Ecological diversity** is the largest scale of **biodiversity**, and within each **ecosystem**, there is a great deal of both **species** and **genetic diversity**



Values of biodiversity

1. **Direct values (Consumptive uses)**

- Food, fuel, medicines for local community –forest ecosystem.
- Food: Fish, other edible aquatic plants and animals – Marine resources

2. **Productive use value:**

These are the commercially usable values where the product is marketed and sold. Animal products: like tusks of elephants, musk from musk deer, silk from silk-worm, wool from sheep, fir of many animals, lac from lac insects etc

- Pharmacist – New and better drugs/medicines
- Raw material for Industry – the paper and pulp industry, Plywood industry, Railway sleeper industry, Silk industry, textile industry, leather industry
- Agricultural – Developing new and better crops with plant breeding

3. **Social Values:**

- Preserved as valuable resource many sacred and holy plants like- based on religion worship: Tulsi, Peepal, and animals like Cow.

4. **Ethical and Moral values:**

- Ethical responsibility to protect all life forms.
- Preservation of nature through local traditions.
- Conservation of biodiversity & economic importance.

5. **Aesthetic Values**:

- Preservation of its inherent value, beauty, aesthetics and creativity for tourist attraction.
- Indian mythology eulogies animals like elephant, snake and cow.
- Enriched biodiversity promotes eco- tourism Industry.

6. **Option Value:**

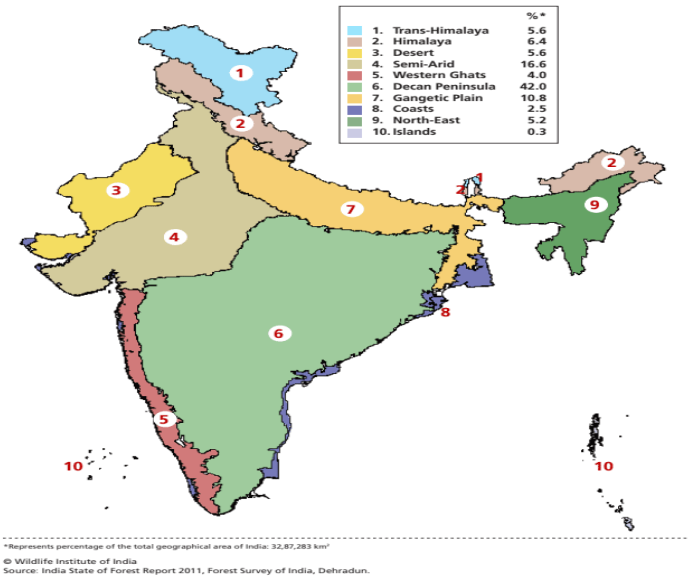
- Keeping future possibilities open for their use is called the option value. In nature many thing yet to explore, plant, microorganism.
- The preservation of biodiversity must also include traditionally used strains already in existence in crops and domestic animals.

Biogeographic classification of India

India is divided in to ten major regions based on geography, climate, vegetation pattern, mammals, birds, reptiles, amphibians, insects and other invertebrates that live in them.

1. The cold mountainous snow covered **Trans-Himalayan region** of Ladakh.
2. The **Himalayan ranges** and Kashmir valley, Himachal Pradesh, Uttarkhand, Assam and other North-eastern states.
3. The **Thar desert** of Rajasthan
4. The **semi-arid** grassland region of Gujurat, Madhya Pradesh
5. The **Western Ghats** in Maharashtra, Karnataka and Kerala.
6. **Deccan plateau** of Chattisgarh, Andhra Pradesh, Karnataka. The North-eastern states of India.
7. **The Gangetic plain** of Bihar, West Bengal
8. The long **western and eastern coastal belt** with sandy beaches, forests and mangroves.
9. The **North-East region** of Manipur, Nagaland
10. The **Andaman and Nicobar Islands**

10 biogeographic zones in India



Biodiversity at Global, National and Local Levels

- 1.8 million known species have been documented. Estimated number of species of plants and animals could be 15-20 billion, that means majority of species are yet to be discovered.
- If biodiversity should form the 'common property resource', to be shared by all nations, there is no reason to exclude oil, uranium or even intellectual and technological expertise as global assets.
- India has a rich biological diversity of flora and fauna.
- Overall 6% of the global species are found in India.
- India ranks 10th among the plant rich countries of the world, 11th in terms of number of endemic species of higher vertebrates, 6th among the centers of diversity and origin of agricultural crops.
- The total number of living species identified in our country is 150,000.

India as a mega-diversity nation

- India is one of the 12 mega-diversity countries in the world. It is among the top 10-15 countries with high biodiversity.
- It is10th among the plant rich countries of the world and 4th among the Asian countries.
- 350 mammal species – 8th in the world
- 1200 bird species – 8th in the world
- 453 reptile species -5th in the world
- 45,000 plant species – 15th in the world
- 18% Indian plants are endemic to the country and found nowhere in the world
- 62% amphibians are endemic
- 50% of the lizards are endemic
- Gene banks have collected - 34,000 cereals
  - 22,000 pulses
  - 27 breeds of cattle
  - 40 breeds of sheep
  - 22 breeds of goat
  - 8 breeds of buffalos

Many of these are dying out due to misguided adoption of all foreign things.

MOEF is the nodal agency for implementation of CBD in India.
National Biodiversity Action Plan (NBAP) was formulated in 2007

Why is India a mega diversity nation?

- Nearly 5000 species of flowering plants, 166 species of crop plants and 320 species of wild relatives of cultivated crops have their origin in India.
- Marine diversity: Along 7500 km long coastline has more than 340 species of corals and is rich in mollusks, crustaceans (crabs etc.).
- Several species of Mangrove plants and sea grasses (Marine algae).
- 93 major wet lands, coral reefs and mangroves need to be studied.
- Indian forests cover 64.01 million hectares having a rich biodiversity of plants in the Trans-Himalayan, north-west, west, central and eastern Himalayan forests, western ghats, coasts, deserts, Gangetic plains, deccan plateau and the Andaman, Nicobar and Lakshadweep islands.

Threats to Biodiversity

There are different threats to biodiversity because of which their population is going on decreasing day by day. The threats may be natural on anthropogenic. Some of the causes are discussed below;

1. **Habitat loss, degradation, fragmentation.**

Habitat loss & degradation are major causes of species extinction, affecting 89% of all threatened birds, 83% of mammals & 91% of all threatened plants assessed globally (IUCN, 2000).

The main causes of habitat loss are agriculture activities, mining, large hydro power plants, development of human settlement area and industry etc.

2. **Poaching of wildlife**

Poaching is another threat that has emerged in recent decades as one of the primary reason for decline in number of species.

Wildlife is sold and traded in many countries for live specimens, folk medicines, furs, skin, and other products such as ivory, horns etc. amounting to millions of dollars.

3. **Man – wildlife conflicts**

Due to the lack of stable food and disruption of movement, wild animals came out of forest area and attack the agricultural field and humans and in turn got killed by the humans.

4. **Introduction of exotic species**

Organisms introduced into new habitats where they are not native are termed as exotics are also considered as Biological Pollutants.

5. **Climate change and environmental pollution**

A changing global climate threatens species and ecosystems.

The air, water and soil pollution are the major factor to extinct number of species in both terrestrial and aquatic ecosystems.

Endangered and Endemic species in India

According to The International Union of Conservation of Nature and Natural Resources (IUCN), the species that considered in imminent danger of extinction and whose survival is unlikely, if factors causing their decline continue to operate.

- Out of about 47,000 species of plants in our country, 7000 are endemic.
- In India, 53 species of mammals, 69 birds, 23 reptiles and 3 amphibians are considered as threatened species.
- As many as 3,000- 4,000 higher plants may be under high degree of threat in India.
- **Red Data Book of IUCN(International Union for Conservation of Nature and Natural Resources, 1964)**

Classification of plant and animal as per Red Data Book

- **Endangered (E)**

  Species whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

- **Vulnerable (V)**

Species believed likely to move into the endangered category in the near future if the casual factors continue operating.

- **Rare (R)**

  Species with, small world populations that are not at present endangered or vulnerable, but are at risk.

- **Threatened (T)**

  Threatened is used in the conservation context for species which are in one of the categories Endangered, Vulnerable and Rare.

- **Out of danger (O)**

  Species formerly included in one of the above categories, but which are now considered relatively secure because effective conservation measures have been taken

- **Inderterminate (I)**

  Species that is suspected of belonging to one of the first three categories, but for which insufficient information is currently available.

Conservation of biodiversity

The convention on Biological Diversity held in June, 1992 stressed the need of the conservation of Biodiversity for sustainable development.

Conservation is defined as "the management of human use of the biosphere so that it may yield the greatest sustainable benefit to the present generation while maintaining its potential to meet the needs and aspirations of the future generations".

The two basic approaches to wildlife conservation in protected habitats are:

1) In- Situ conservation 2) Ex- Situ conservation.

In- Situ conservation It simply means conservation of species in its natural ecosystem or habitat through a network of "protected area".

Protected Areas: an area of land and/or sea specially dedicated to the protection and maintenance of biological diversity and managed through legal effective means.

These include:-

- Biosphere reserves
- National parks
- Wild Life Sanctuaries etc.

Biosphere Reserves

Biosphere Reserves have been described as undisturbed natural areas for scientific study as well as areas in which conditions of disturbance are under control. These serve as the centre for ecological research and habitat protection, The "Biosphere Reserve consists of two main zones as:

1. Core zone (undisturbed area)
2. Buffer zone(open for tourism)

Indian Government has established 18 Biosphere Reserves. The main objectives of the programme are as follows:

• Conserve biological diversity

• Safeguard genetic diversity

• Provide areas for basic and applied research

• Opportunity for Environmental Science and training

• Promote international cooperation

• Promote management of biotic resources.

National Parks

According to the Indian Board for Wild Life (IBWL), “A National Park is an area dedicated by statute for all time to conserve the natural scenery and historical objects to conserve the wild

life there in and to provide for enjoyment of the same in such manner and by such means, that will leave them undisturbed for the enjoyment of future generations .

India's first national park was established in 1936 as Hailey National Park, now known as Jim Corbett Natioal Park.

In 1972, India enacted the Wildlife Protection Act and Project Tiger to safeguard the habitats of conservation reliant species.

10 Top National Parks of India

- Kanha National Park – Madhya Pradesh
- Bandhavgarh National Park - Madhya Pradesh
- Kaziranga National Park - Assam
- Nagarhole National Park - Karnataka
- Ranthambhore National Park - Rajasthan
- Periyar National Park - Kerala
- Gir National Park - Gujrat
- Sunderbans National Park – West Bengal
- Sariska National Park – Rajasthan

Wildlife sanctuary

The Indian Board for Wild Life has defined a sanctuary as, 'An area where killing, hunting, shooting or capturing of any species of bird or animal is prohibited except by or under the control of highest authority in the department responsible for the management of the sanctuary and whose boundaries and character should be sacrosanct as far as possible.

Examples of some Wild Life Sanctuaries of India:

- Ghana Bird sanctuaries
- Hazaribagh sanctuaries

- Abohar wild life sanctuaries
- Jaldapara wild life sanctuaries
- Mudamalai wild life sanctuaries

Ex- Situ conservation

It is defined as "the conservation of component of biological diversity (Sample of genetic diversity, particularly of endangered species) outside their natural habitats".

1. **Botanical/ zoological gardens, aquarium and research centre.**

There are more than 1500 Botanical gardens in the world containing more than 80,000 species. There are more than 800 zoos around the world with about 3,000 species of mammals, birds, reptiles and amphibians.

2. **Field Gene Banks**

These are places where wide varieties of plant are growing in order to maintain the widest range of biodiversity.

3. **Seed Banks**

These are most efficient and effective method of Ex-Situ conservation of plants whose seeds are suitable for long term storage.

Organizations working for protection of biodiversity

- India's Department of Environment functions as the nodal agency for United National Environment Programme (UNEP)
- The South Asia Cooperation Environment Programme (SACEP)
- The International Union for Conservation of Nature and Natural Resource (IUCN)
- India has been actively participating in the various sessions of UNEP with a view to ensure that programmes are more relevant to the developing countries.

Biodiversity Hotspot

A biodiversity hotspot is a biogeographic region with significant levels of species richness, high species endemism and biodiversity that is threatened by human habitation.

To be classified as a **biodiversity hotspot**, a region must have lost at least 70 percent of its original natural vegetation, usually due to human activity.

There are over 30 recognized **biodiversity hotspots** in the world

Biodiversity hotspots in India

- India hosts 4 biodiversity hotspots**: the Himalayas, the Western Ghats, the Indo-Burma region and the Sundaland (Includes Nicobar group of Islands).** These hotspots have numerous endemic species.
- The Himalayas is the prime hotspot for biological diversity in India
- India is considered a mega diversity hotspot because of the large diversity of organism found here ranging from eastern to Western Ghats and North and South India too. Mainly Western Ghats are at high risk now.