

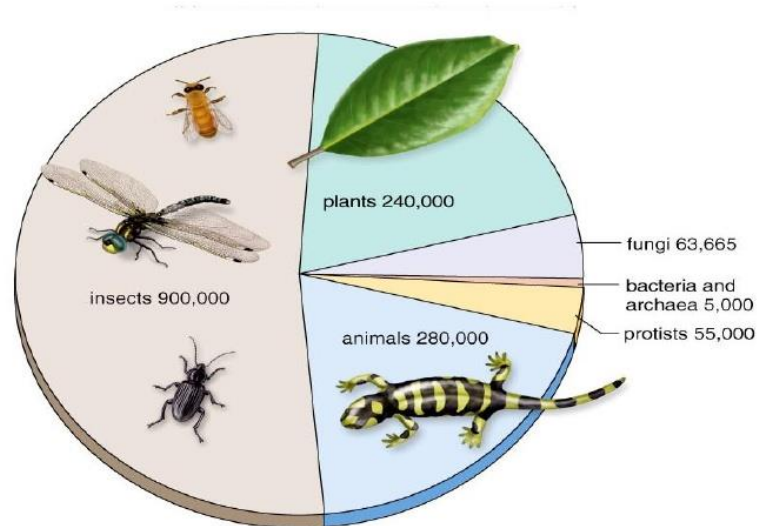
Biodiversity



Biodiversity

- The term biodiversity was coined by **WALTER G.ROSEN** in 1985.
- Defined as “ the richness in variety and variability of a species of all living organism in a given habitat”.
- It is the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part..(Convention of Biological Diversity,1992)

Biodiversity of the Earth



Levels of bio diversity

Includes three hierarchical levels;

Genetic diversity- variation of genes within species. It could be of alleles or chromosomal structure.

Species diversity- variety of species within a region. i.e species richness.

Community and Ecosystem diversity- diversity at the level of community and ecosystem .

Genetic diversity



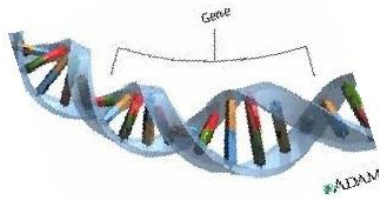
Genetic Diversity
within the humans



diversity found
in native
chickens

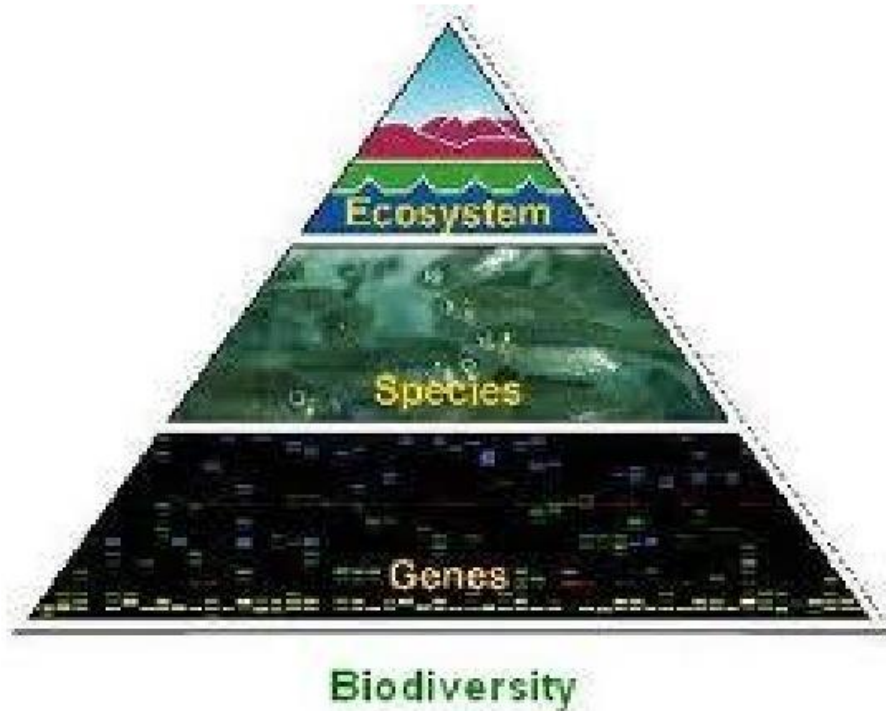


**Genetic
diversity** in the
bambara
groundnut

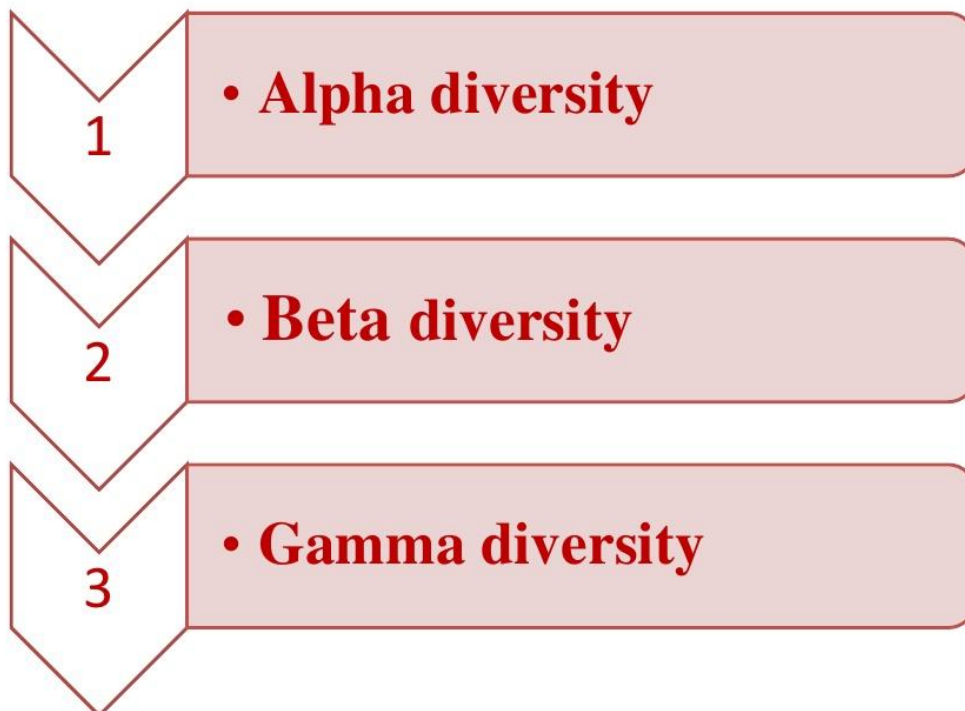


Species diversity-





Community diversity has three perspectives ;



Alpha diversity (α -diversity)

- is the biodiversity within a particular area, community or ecosystem.
- usually expressed by the number of species (*i.e.*, **species richness**) in that ecosystem.
- This can be measured by counting the number of taxa (distinct groups of organisms) within the ecosystem (eg. families, genera, species).

Beta diversity (β -diversity)

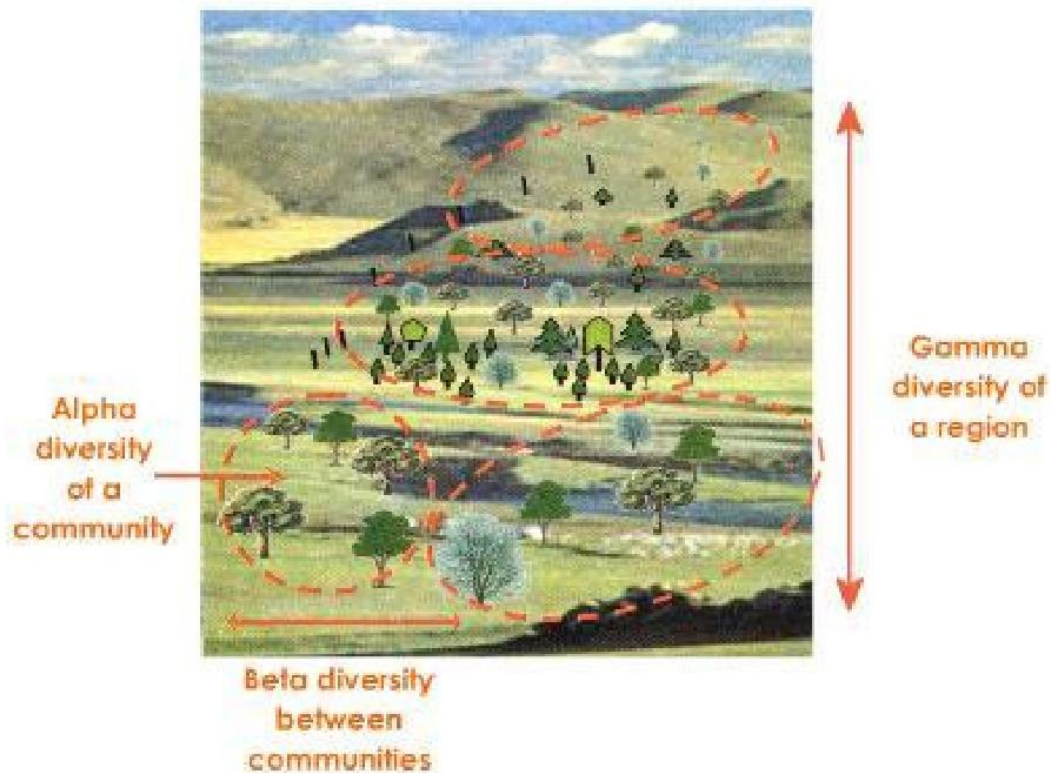
- **Beta diversity** (β -diversity) is a measure of biodiversity which works by comparing the species diversity between ecosystems . This involves comparing the number of taxa that are unique to each of the ecosystems.
- It is the rate of change in species composition across habitats or among communities. It gives a quantitative measure of diversity of communities that experience changing environments

Gamma diversity (γ -diversity)

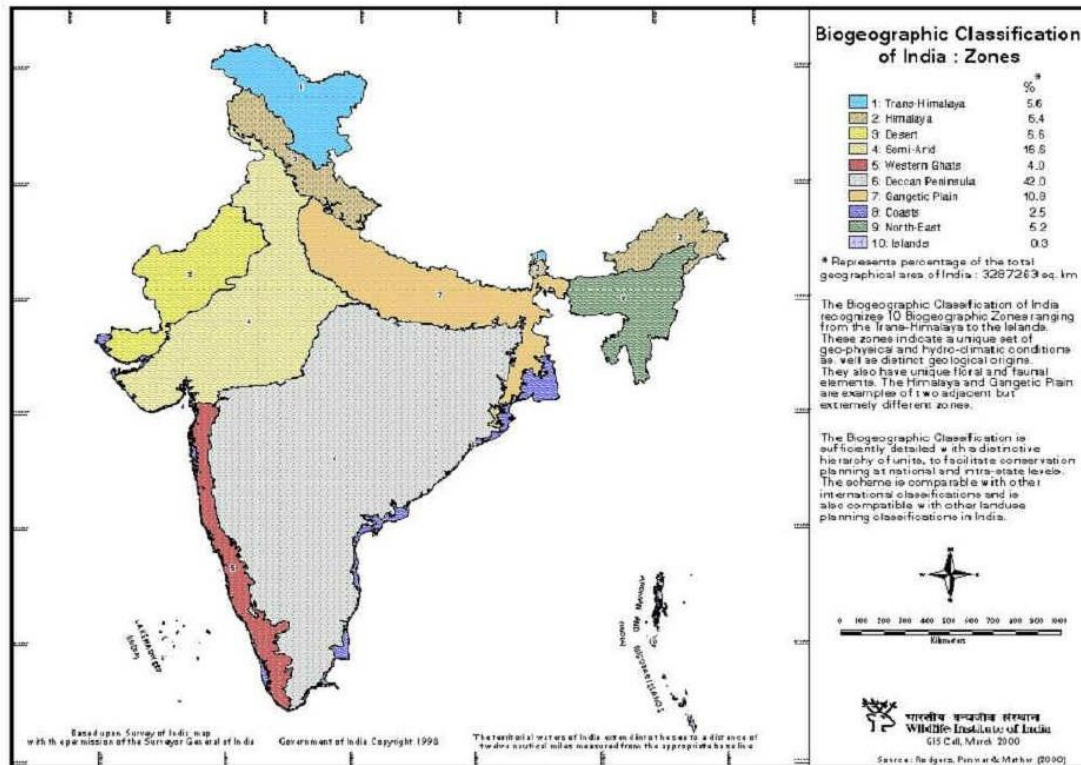
- refers to the total species richness over a large area or region.
- a measure of the overall diversity for the different ecosystems within a region.
- It is the product of the α diversity of component ecosystems and the β diversity between component ecosystems.
- Gamma diversity can be expressed in terms of the species richness of component communities as follows:

$$\gamma = S_1 + S_2 - c$$

- where, S_1 = the total number of species recorded in the first community,
- S_2 = the total number of species recorded in the second community,
- c = the number of species common to both communities.



Biogeographical classification of india



- Biogeography comprises of phytogeography and zoogeography.
- Geographical regions of India when considered along with the plants and animals form the Biogeographical regions.
- Earlier there were 12 biogeographic zones but recently the wildlife institute of india has regrouped them into 10 zones.

Value of Biodiversity

- A. **Consumptive value** (direct use value).

1. Food

- About 80,000 edible plant species
- Edible animals

2. Drugs and medicines.

Plant and plant extracts extensively used in medicines.

Penicillin → penicillium (fungi)

Tetracyclin → Actinomycetes (bacterium)

Malarial drugs → Cinchona tree

Anticancer drugs → Vinorelbine & Vincristine
(flower of Catharanthus plant)

3. Fuel

Fossil fuels → coal, petroleum, natural gas

- **B. Productive values** (Commercially usable values).

Musk, silk, ivory, leather industry.

Milk products industry

Textile and dye industry

Wood industry

- **C. Social value**

Holy and Sacred trees Tulsi → Peepal etc.

- **D. Aesthetic value**

Eco-tourism (to enjoy the aesthetic value of biodiversity)

- **E. Ecosystem service value**

Prevention of soil erosion, floods.

Maintains Soil fertility, nitrogen fixation

Biogeochemical cycle, hydrological cycle.

Biodiversity Hotspots

- A **biodiversity hotspot** is a biogeographic region with a significant reservoir of biodiversity that is under threat from humans.
- A hotspot is an area which faces serious threat from human activities and supports a unique biodiversity (endemic, threatened, rare species)
- The concept of biodiversity hotspots was originated by [Norman Myers](#)(1988).
- Myers originally recognized 25 hotspots around the world.
- Recently 9 more biodiversity hotspots has been added which makes the present number to 34.
- To qualify as a biodiversity hotspot on Myers 2000 edition of the hotspot-map, a region must meet two strict criteria:
 1. It must contain at least 0.5% or 1,500 species of plants of the world.
 2. It has to have lost at least 70% of its primary vegetation.

India as a Mega Diversity region

- India is one of 12 mega diversity countries of world.
- It has 47,000 species of plants and 81,000 species of animals.
- Many endemic plants and animals.
- Centre of origin of many flowering and crop plants.
- Great marine diversity due to 7500 km long coastline

India has two major hotspots.

BIODIVERSITY HOTSPOTS OF INDIA

- **1. Western Ghats -:**
 - Known as Sahyadri mountains. Floristic richness highest.
 - At least 325 globally [threatened](#) species occur. eg. purple frog, black leopard.
- **2. Eastern Himalayas -:**
 - Numerous large birds and mammals, including vultures, tigers, elephants, rhinos and wild water buffalo.
 - Many endangered plants sps.



Sapria himalayana(parasitic angiosperm)



Black frog



IUCN categories for species under threat

- Endangered species : on verge of extinction
- Vulnerable species : not endangered but is facing a very high risk of extinction in the future.
- Rare species :These are species with small total population size in the world ,their distribution are usually localized within restricted area of world.
- Threatened species: decline in number significantly in total numbers and may be on verge of extinction in certain localities.



DODO



Passenger Pigeon

IUCN Red list objectives

- Red data book or red list is a catalogue of taxa that are facing the risk of extinction.
- The main objectives are:
 - 1. Identification and documentation of endangered species.
 - 2. Providing a global index of the decline of biodiversity.
 - 3. Developing awareness about the importance of threatened biodiversity.
 - 4. Defining conservation priorities at the local level and guiding conservation action.

Data of endangered species

TAXANOMIC GROUP	→	NUMBER OF SPECIES.
• 1. Mammals	→	86
• 2. Birds	→	70
• 3. Reptiles	→	25
• 4. Amphibians	→	36
• 5. Plants	→	244
• 6. Fish	→	79

Threats to biodiversity

- **Habitat Loss**
- **Pollution**
- **Over exploitation of selected species**

Causes of Threat

- **Pollution** – 29% of amphibians are affected by pollution and 17% by disease.
- **Air pollution**
- Emissions of Toxic gases
Acid Rain

Water Pollution

Eutrophication

Bioaccumulation followed by biomagnification

Toxicity imparted by domestic and industrial effluents

Causes of Threat

Over exploitation of selected species

Poaching :Targeting of certain selected species takes place even after legal protection , products from endangered species are traded within and between the nations.

Animals are killed for their skin, teeth, horn bones, medicinal use, research and educational purpose etc.

CONSERVATION OF BIODIVERSITY

There are two basic strategies for biodiversity conservation,these are most effective and efficient mechanism for conservation.

1-insitu(onsite) conservation

2-exsitu (off site) conservation

INSITU CONSERVATION

The term insitu conservation denotes conservation of species in its natural habitat ,that is where the species is normally found.

The insitu conservation strategies stress on protection of total ecosystems through a network of protected areas.

PROTECTED AREAS

To facilitate the growth and reproduction of plants and animals in their habitat, the area is protected by restricting human activities like **hunting, firewood collection, timber harvesting etc.**

Today, there are about 37,000 protected areas, parks, sanctuaries and biosphere reserves all around the world.

**INDIA has over
600 protected areas, which includes over 90 national parks,
over 500 animal sanctuaries and 15 biosphere reserves.
Protected areas contain maximum biological diversity.**

NATIONAL PARKS

It is an protected area which is strictly reserved for the conservation/betterment of the wild life and where activities like forestry, grazing and cultivation are not permitted.

Their boundaries are well marked and circumscribed. They are usually small reserves spreading in an area of 100 sq,km. to 500 sq,km.

In national parks, the emphasis is on the preservation of a single plant or animal species.

Kaziranga national park in Assam

Gir national park in Gujarat.

Kanha national park in M.P etc.

WILDLIFE SANCTUARIES

It is an protected area which is reserved for the conservation of only animals and human activities like harvesting of timber, collection of minor forest products are allowed to a certain extent.

Boundaries of sanctuaries are not well defined and controlled biotic interference is permitted, e.g-tourist activity.

Anamalai wildlife sanctuary,Tamil nadu

Bir moti bagh wildlife sanctuary,Punjab

Chilka lake bird sanctuary,Orissa

Jaldapara sanctuary in West Bengal etc.

BIOSPHERE RESERVES

It is a special category of protected areas where human population also forms a part of the system.

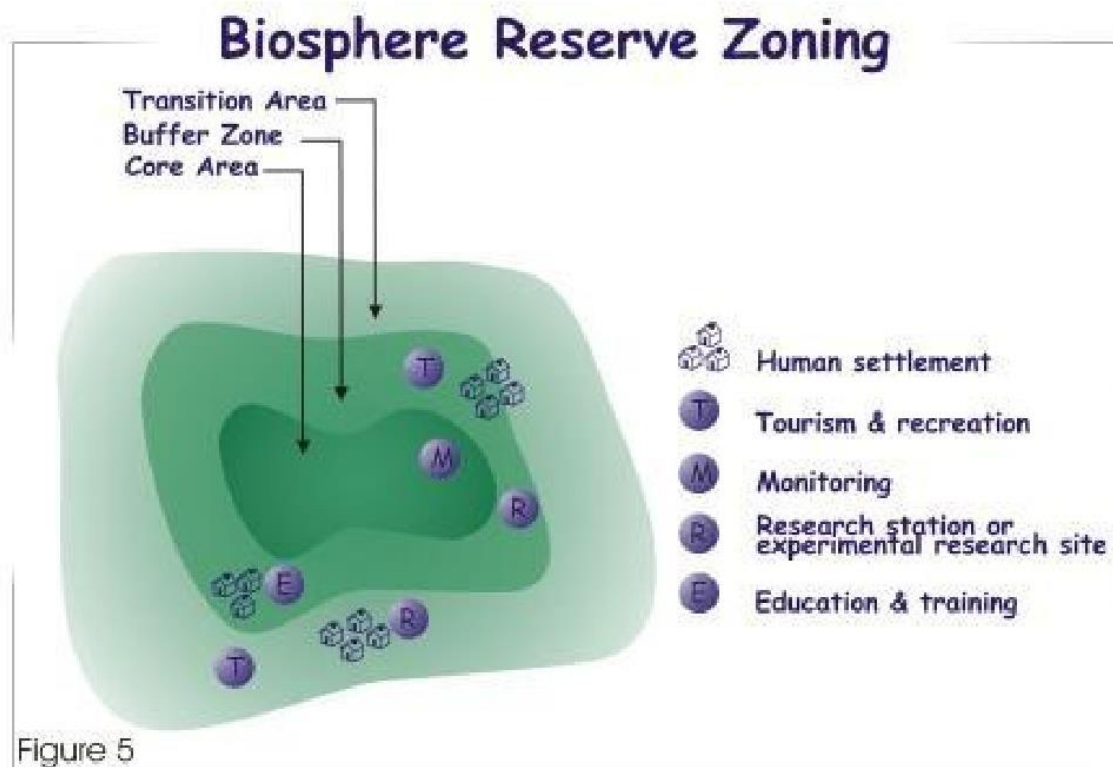
They are large protected area of usually more than 5000 sq.km.

A biosphere reserves has 3 parts- core, buffer and transition zone.

1-The **core zone** is innermost zone, this is undisturbed and legally protected area.

2-**Buffer zone** lies b/w the core and transition zone. Some research and educational activities are permitted here.

3-**Transition zone** is the outermost part of biosphere reserves. Here cropping, forestry, recreation, fishery and other activities are allowed.



MAIN FUNCTIONS OF BIOSPHERE RESERVES:

(1)-CONSERVATION-To ensure the conservation of ecosystem, species and genetic resources.

(2)-DEVELOPMENT-To promote economic development while maintaining cultural, social and ecological identity.

(3)-SCIENTIFIC RESEARCH-To provide support for research related to monitoring and education, local,national & global issues.

Some biosphere reserves of India:-

Nilgiri (Kerala,Karnataka and Tamilnadu)

Nanda devi in U.P,Sunderbans in Rajasthan,Manas in M.P,Gulf of Mannar in Assam.etc.

EXSITU CONSERVATION

This is a conservation of species outside their habitat.

This includes gene, pollen,seed,tissue cultures and DNA banks and also includes various zoos & botanical gardens etc.

=>To conserve all these we have various methods of exsitu conservation:- etc.

1. Seed bank, gene bank, germplasm bank
2. Translocation area
3. Botanical parks
4. Zoological parks

(1)USE OF SEED BANK,GENE BANKS OR GERMPLASM

Some seeds show variable periods of dormancy. Most of seed plants therefore can be preserved in the form of their seeds in small packets for long durations. Places where seeds are stored are called seed banks or gene banks or sometimes germ plasm banks.

Term germplasm refers to any of plant organ or its part(living) from which new plants can be generated. They utilize the technique of cryopreservation in liquid nitrogen at a temp. of (minus)-196 degree Celsius.

(2)-ANIMAL TRANSLOCATIONS

Release of animals in a new locality:

Translocation is carried in following cases:

1-when a species on which an animal is dependent becomes rare.

2-when a species is endemic or restricted to a particular area.

3-due to habit destruction & unfavorable environment conditions.

4-increase in population in an area.

(3)-BOTANICAL GARDENS:

A botanical garden is a place where flowers, fruits and vegetables are grown. The botanical gardens provide beauty & calm environment. Most of them have started keeping exotic plants for educational & research purposes.

Many rare & endangered plants live in botanical gardens which have taken the task of conservation of plants in a real sense.

In INDIA, the 1st botanical garden was established in Bombay in 1830 by agricultural society and in 1838 one more garden was established in Madras.

Some Botanical gardens of INDIA:

Lloyd botanical garden at Darjeeling, Indian botanical garden at Calcutta, National Botanical garden at Lucknow etc.