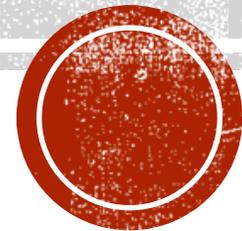


BIODIVERSITY

**THE CONCEPT, DEFINITION, SCOPE AND LEVELS OF
BIODIVERSITY— GENETIC, SPECIES & ECOSYSTEM**



CONCEPT OF BIODIVERSITY:

THE TERM "BIODIVERSITY" WAS COINED BY WALTER G. ROSEN IN 1985.

The term Biodiversity is an amalgam of two words, Biological and Diversity (**Greek words bios = life; diversity = forms**) used to describe the variety of life found on the Earth.

- It reflects the number, variety and variability of living organisms and how these change from one location to another and over time.

According to Convention on Biodiversity (1992), biodiversity is defined as

“the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.”

BIODIVERSITY IS THE WHOLE ASSEMBLAGE OF THE WHOLE OF LIFE ON EARTH



ORIGIN OF BIODIVERSITY

There are two conditions that cause population diversity. First, new genotypes are constantly cropping up in a population through mutation, recombination and related genetic phenomena. Secondly, diversity is the population eliminated by natural selection and lost through emigration of individuals.

Diversity is the result of two opposite actions:

- 1) The processes that produce new genotypes, new varieties and new species.
- 2) Process that eliminate mutations, variants and species from the system.

Natural selection is primarily responsible for the reduction of biodiversity; it acts through differential reproduction and differential mortality.



WHERE IS BIODIVERSITY?

- **Spatial Patterns of Biodiversity:**

Hotspots, Biomes, Biogeographic Realms, Ecosystems, and Ecoregions

- **Temporal Patterns of Biodiversity:**

Background Rates of Extinction and Biodiversity Loss. Knowledge of patterns of biodiversity over time allow for only very approximate estimates of background rates of extinction or of how fast species have become extinct over geological time.



WORLD BIODIVERSITY

- Perhaps the greatest value of biodiversity is yet unknown.
- Scientists have discovered and named only **1.9 million species** – less than 20 per cent of those estimated to exist.
- Of those identified, only a fraction has been examined for potential medicinal, agricultural or industrial value.
- Much of the earth's great biodiversity is rapidly disappearing, even before we know what is missing.
- Estimates vary, but the most widely accepted figure lies between 10 and 13 million species



TYPES OF BIODIVERSITY

- **Alpha (α) Diversity (within community):** Species diversity within a community or habitat, comprises two components i.e. species richness and evenness. Sometimes dominant of one vegetation stratum may affect the α diversity of the other strata.
- **Beta (β) Diversity (Between communities):** β diversity is the rate of change of species diversity of different communities. This is the change in species diversity along an environmental gradient like altitude, slope, latitude, etc.
- **Gamma (γ) Diversity (overall diversity):** Gamma diversity is the overall diversity at landscape level includes both α and β diversities. In other words Gamma diversity is the species diversity in a larger landscape like a biome or whole of biosphere.

This series can further be extended to **delta diversity for biomes** and **omega diversity for the entire biosphere**.

The relationship is as follows:

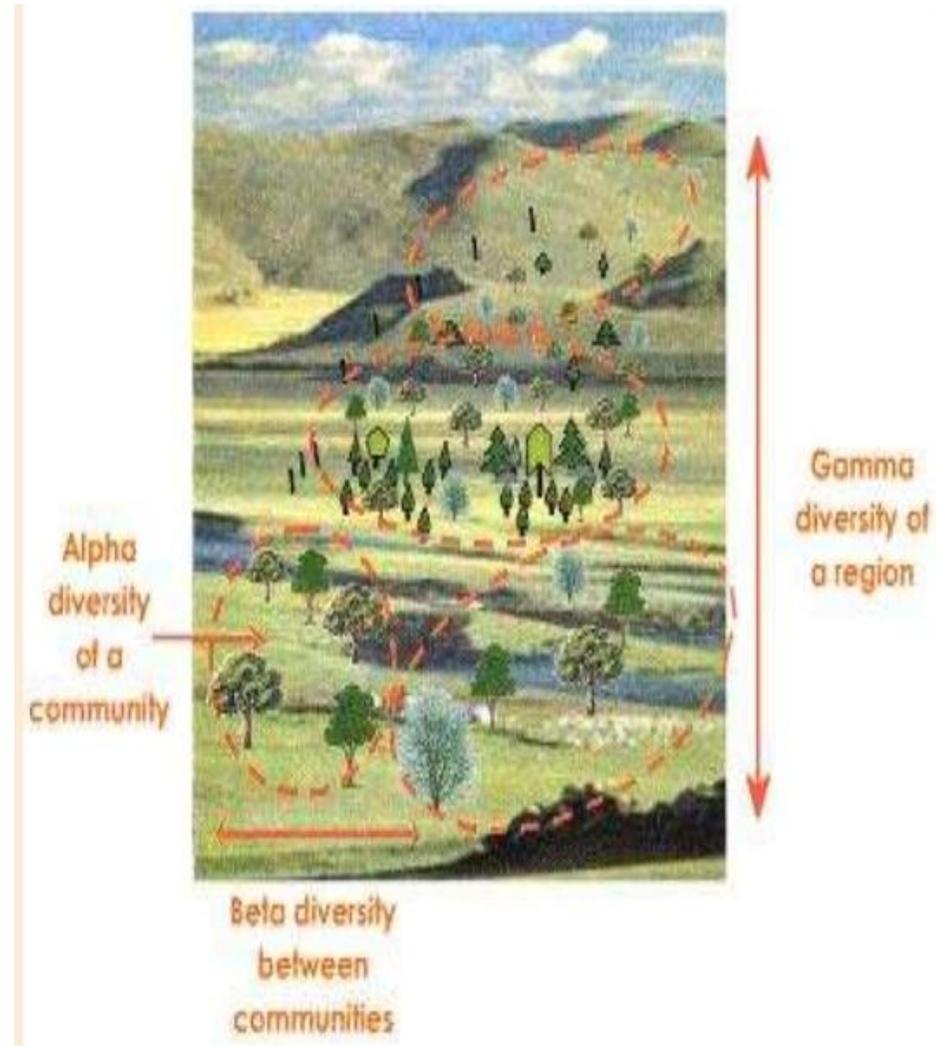
$$\gamma = a + \beta + Q$$

where,

Q = Total number of habitats or communities

a = Average value of α diversities

β = Average value of β diversities



LEVELS OF BIODIVERSITY:

THEORETICALLY THERE ARE THREE LEVELS OF BIODIVERSITY.

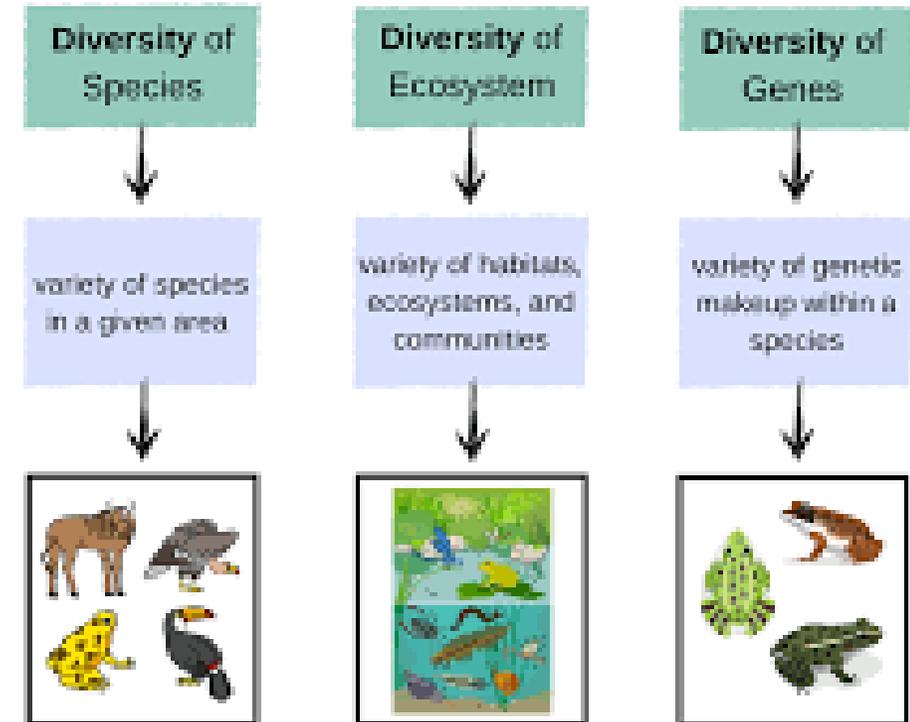
1. **Genetic diversity:**
2. **Species diversity**
3. **Ecological/Ecosystem diversity**

Organism: An individual living thing.

Population: A group of individuals belonging to one species living in an area.

Species: A group of populations of similar organisms that reproduce among themselves, but do not naturally reproduce with any other kinds of organisms

3 TYPES OF BIODIVERSITY



GENETIC DIVERSITY:

- The variation among members of a single species because of genes is called genetic diversity. This type of diversity is seen in different population groups of a species or even among different members of a population.
- For example: differences in height, skin colour, facial features, hair colour, etc. among human beings show genetic diversity. A higher level of genetic diversity among members of a species ensures that the species is at lower risk of becoming extinct; because genetic diversity increases the ability to adapt to the
- A species with different genetic characteristics is known as sub-species or 'genera'. Within individual species, there are varieties that are slightly different from one another. And these differences are due to differences in combination of genes.
- Genes are the carriers of heredity from parents to offspring and contain the information that determines the essential physical and biochemical characteristics of each organism.



SPECIES DIVERSITY:

SPECIES IS A GROUP OF LIVING ORGANISMS CONSISTING OF SIMILAR INDIVIDUALS CAPABLE OF INTERBREEDING. MEMBERS OF ONE SPECIES DON'T BREED FREELY WITH MEMBERS OF OTHER SPECIES.

- The total number of species of plants and animals in a given region is called species diversity of that region. It refers to the number and variety of species in the world or in a particular region.
- Diversity is greatest when all the species present are equally abundant in the area. There are two constituents of species diversity:
 - i. **Species richness:** Number of different species present in an ecosystem. Tropical areas have greater species richness as the environment is conducive for a large number of species
 - ii. **Species evenness:** Relative abundance of individuals of each of those species. If the number of individuals within a species is fairly constant across communities, it is said to have a high evenness and if the number of individuals varies from species to species, it is said to have low evenness. High evenness leads to greater specific diversity
- It is possible in an ecosystem to have high species richness, but low species evenness.
- The species diversity varies in a different geographical location with tropics having highest and declines as we move towards poles. The most species-rich environments are tropical rainforests, coral reefs and ocean bottom zone.



ECOSYSTEM DIVERSITY:

- The system of interaction among different creatures and between living beings and abiotic components in a region is called ecosystem.
- There are many types of ecosystem on earth, e.g. grasslands, mountains, desert, marshes, ocean, river valley, tropical forest, etc. Each ecosystem has its unique geographical and environmental features. Such features are responsible for diversity among creatures in a particular region. This type of diversity is called ecosystem diversity. In other words, the differences in geographical and environmental conditions in different ecosystems is are called ecosystem diversity. The number and variety of ecosystems or habitats within a given region.
- **Ecological or ecosystem diversity is the variety of ecosystems in an area. An ecosystem can cover a small area, like a pond, or a large area, like an entire forest.**
- Ecological diversity is the intricate network of different species present in local ecosystem and the dynamic interplay between them.



THE IMPORTANCE OF BIODIVERSITY

OUR **HEALTH, FEEDING AND SAFETY** DEPEND ON BIODIVERSITY. SIMILARLY, **ANY ECONOMIC ACTIVITY** DEPENDS IN THE LAST INSTANCE ON NATURE

MAIN THREATS



BIODIVERSITY IN A WORLD OF CONSTANT CHANGE



Between **1970 and 2014** the size of the populations of species was reduced by

60%.

The loss of species is particularly acute in the tropics: in **South America and Central America**, this loss amounted to

89%.



THE LOSS OF BIODIVERSITY IN DETAIL

Actualmente, más de **26.500 especies** se encuentran en peligro de extinción, lo que supone el **27%** de todas las especies evaluadas:



AMPHIBIANS
40%



MAMMALS
25%



CONIFERS
34%



SHARKS AND RAYS
31%



BIRDS
14%



CORAL REEFS
27%



CRUSTACEA
27%

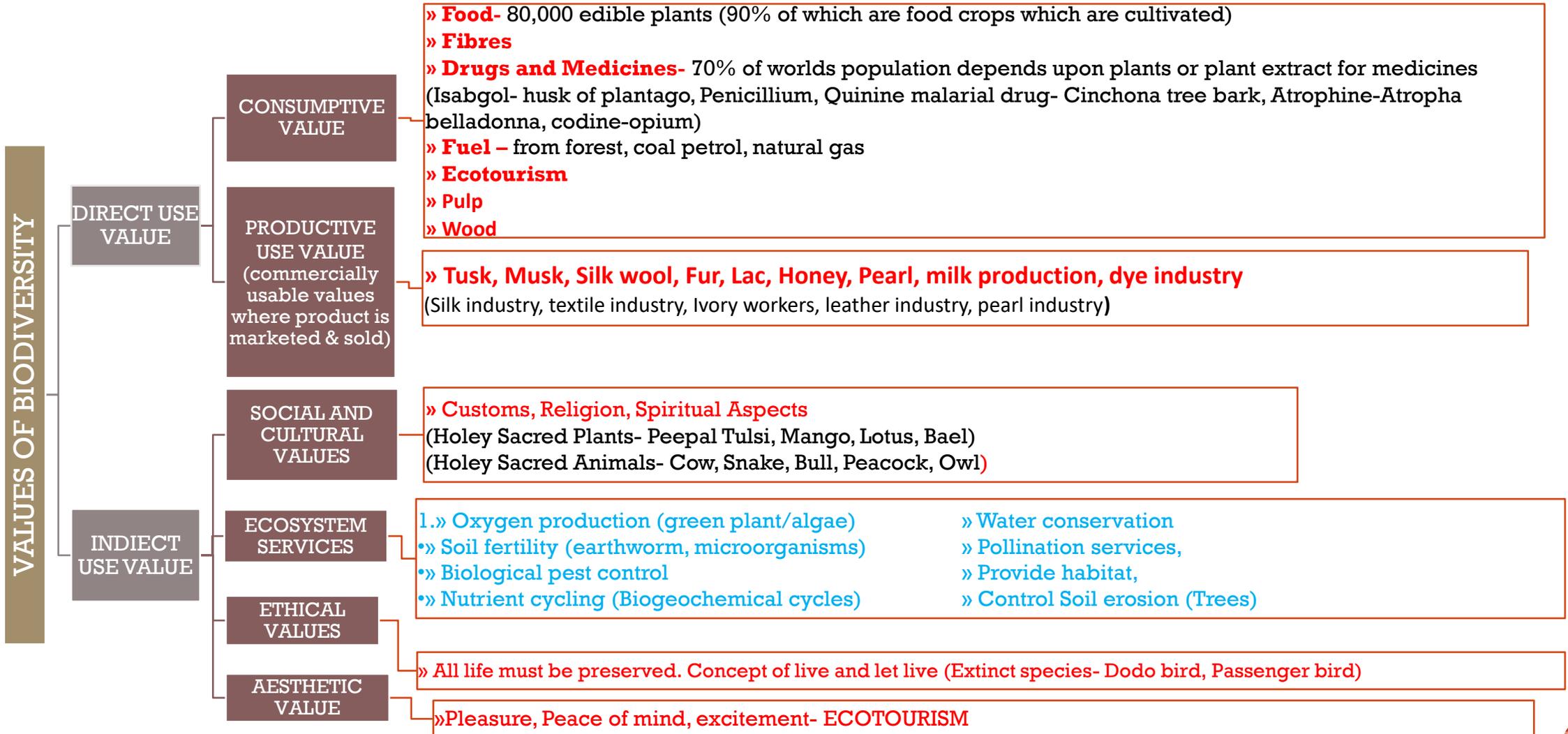
WHAT FUTURE DO WE WANT?

More ambitious measures are required to stop the loss of biodiversity.

The indicators must help us to draw up good policies and supervise their evolution.



VALUES OF BIODIVERSITY



PLANTS AS NATURAL RESOURCES

Plants as food

- Cereals (Major- wheat, rice, maize; Minor- Oat, barley Rye, jowar)
- legumes (pea, soya bean, channa, masoor, ground nut)
- Nuts (one seeded fruits, dry, hard pericarp ; coconut, almonds, walnut, pine nuts)
- Vegetables 1. Root as food; carrot, radish, turnip, beetroot, sweet potato, onion, garlic)
- 2. stem & foliage; spinach, cabbage, cauliflower
- 3. fruit vegetable: tomato, brinjal, cucumber, bitter guard
- Fruits
- Algae
- Fungai (mushroom-agaricus campestris, Morchella cseulenta)

Plants as medicine

- Aconite drug from *Aconitum napellus*
- Asafoetida- hing used asthma, cough
- *Glycyrrhiza glabra* – Mulathi
- *Rauvolfia serpentina*- Sarf gandha- snake bite
- *Withania somnifera*- ashwandha- skin lesions, ulcers
- Quinine obtained from bark of *cinchona calisaya*- malaria treatment
- Alovera
- *Atropa belladonna*

