Week 2
Lecture 3

Anamika

1. Trans-Himalayan Region

- Total area: 5.6% (186200 Sq. Km.).
- Lie at very high altitude (4500-6000 mts.) with **cold and arid mountain.**
- Areas of Ladakh, Jammu & Kashmir, North Sikkim, Lahaul and Spiti areas of Himachal Pradesh.
- **Sparse alpine steppe vegetation** with a lot of endemic species.
- Plants: Pine, Deodar etc.
- Habitat of **Wild Sheep, Goat, Yak. Tibetan ass** and other rare animal including **Snow Leopard and migratory Black necked Crane.**

2. Himalayan Zone

- Total area: 6.4%
- Away from trans-Himalayan zone it includes, North-west Himalayas, West Himalayas, Central Himalayas and East Himalayas
- It include some of the highest peak in the world.
- Alpine and sub-alpine type of forest having grassy meadow and mixed deciduous forest. **Eg. Pine, Cork Tree, Sal, Dhaak, Castor etc.**
- Characterize with many types of **orchids, Rhododendrons**
- Various endangered species such as Bharal, Ibex, Himalayan Tahr, Musk Deer are found in this area.
- Other species are **Wild bear, Sambar, Leopard and Sikkim stag**

3. Desert

- Total area: 6.6%
- It includes Thar and Kutch desert
- Tropical thorn forest comprises with thorny plants such as **Babul (*Accacia nilotica*),** **Khejri *(Prosopis cineraria)*,** **Ber *(Zizyphus mauritiana)*** **and Date Palm** etc.
- Various **endangered species** of mammals such as **Wolf, Caracal, Desert Cat, Black buck and bird like Houbara, Bustard, Great Indian Bustard, Flamingo .**

Desert Cat, Caracal

4. Semi-Arid region

- Total area: 16.6%
- **Transition zone** between desert and dense forest of Western Ghats
- It includes the arid desert areas of Thar and Rajasthan extending to the Gulf of Kutch and Cambay and the Whole **Kathiawar Peninsula. (Central India: Gujarat-Rajwara)**
- The natural vegetation consists of **tropical thorn forests** and tropical dry deciduous forests, moisture forests (extreme north). Acacia, Date Palm and Peepal etc.
- The **Asiatic lion (*Leo persica*)** is restricted to single site (Gir National Park) found in this zone. Tiger (Sariska and Ranthambore Tiger Reserves)

5. Western Ghats

- Total area: 4%
- Extend from **Tapti river** in north to hills of South in Kanyakumari.
- Dominant with various flora such as **Sheesham, Tuna, Bahera, tea, coffee, cocoa, rubber, cardamom** etc.
- Significant **endemic species** include **Nilgiri Langur, Lion Tailed Macaque**, Grizzled Giant Squirrel, Malaber Civet, **Malabar Grey Hornbill**, most amphibian species etc.
- The area is very famous for **Tortoise, Frog, Lizards and Snakes**.

6. Deccan Peninsula

- Total area: 42% (largest)
- Semi-arid region falls in the rain shadow area of western ghats.
- It is bound by the **Sathpura** range on the north, Western Ghats on the west and Eastern Ghats on the east.
- Large part covered by **tropical forest**. Most conserve forest of India in MP, Maharashtra and Orissa.
- Various important **timber species** like **Sal and Teak** found in this zone.
- Most wildlife species spread throughout the region. E.g. **Cheetal, Sambar, Nilgai, Chowsingha, Wild Elephant and Wild buffalo** etc.

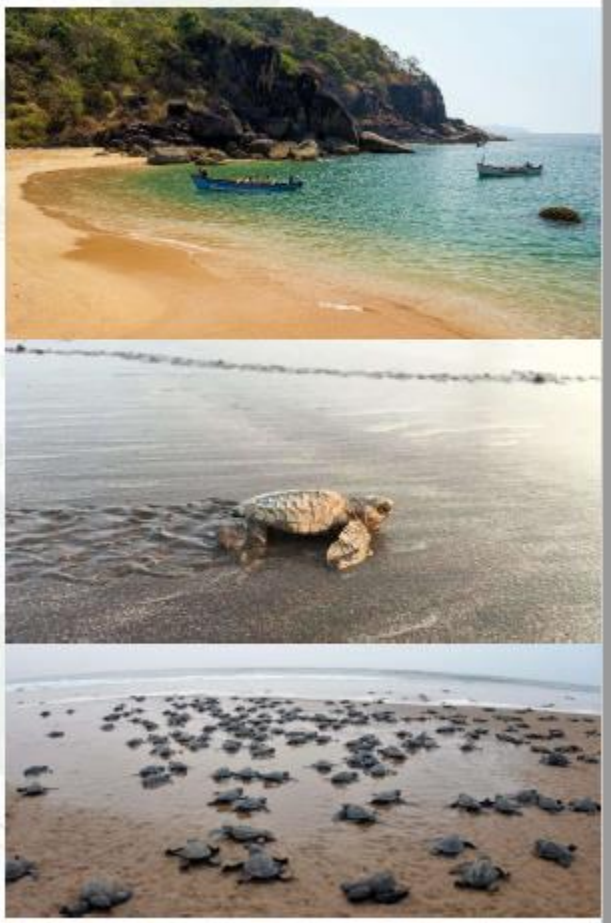
Sambar Chital Chowsinngha

7. Gangetic Plain

- Total area: 10.8%
- Stretch from Yamuna river eastward across Uttar Pradesh, Bihar, West Bengal and coastal plains of Orissa. It includes **upper gangetic plains** and **lower gangetic plains**.
- It is topographically homogeneous and **most fertile** agricultural land in the world.
- **Sal forest** found along the Himalaya and dry deciduous forest in the plains. Acacia, Mango Bael and Jamun etc.
- Species getting **threatened** due to **agriculture expansion**.
- The **Gangetic Dolphin, Gharial** are characteristic aquatic animal of Ganga river.
- The characteristic fauna of this region include **Rhinoceros, Turtle, Gazzel, Swamp Deer, Hog-Deer and Hispid Hare** etc.

8. The Coasts

- Total area: 2.5%
- The coastline from Gujarat to Sunderbans. It includes **West Coast** and **East Coast**.
- Consist of sandy beaches, mangrove, mud flats, coral reefs and marine angiosperm pastures.
- The natural vegetation consist of **mangroves**. Other are: **Coconut, Banana and Cashew nut etc.**.
- There are **26 species of fresh water turtles and tortoises** in India and **5 species of marine turtles**, which inhabit and feed in coastal waters and lay their eggs on suitable beaches. Tortoise live and breed mainly on the land. **Dugong, Dolphin, Aligator and Molluscs** are other animal species found in the area.



9. North East Region

- Total area: 5.2%
- Transition zone between the **Indian, Indo-Malayan and Indo-Chinese regions** as well as meeting place of Himalayan mountains and Peninsula India.
- It includes **Brahmputra Valley and North-eastern Hills**.
- 40% of the zone covered by state of Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura is forest.
- Jack fruit, Chestnut, Castor, Bamboo and Sal are some important plant species.
- Among animals, the **hornbill and the small carnivore communities** display a species richness not known anywhere. Eg. **Large Indian Civet , Porcupine etc.**

10. The Islands

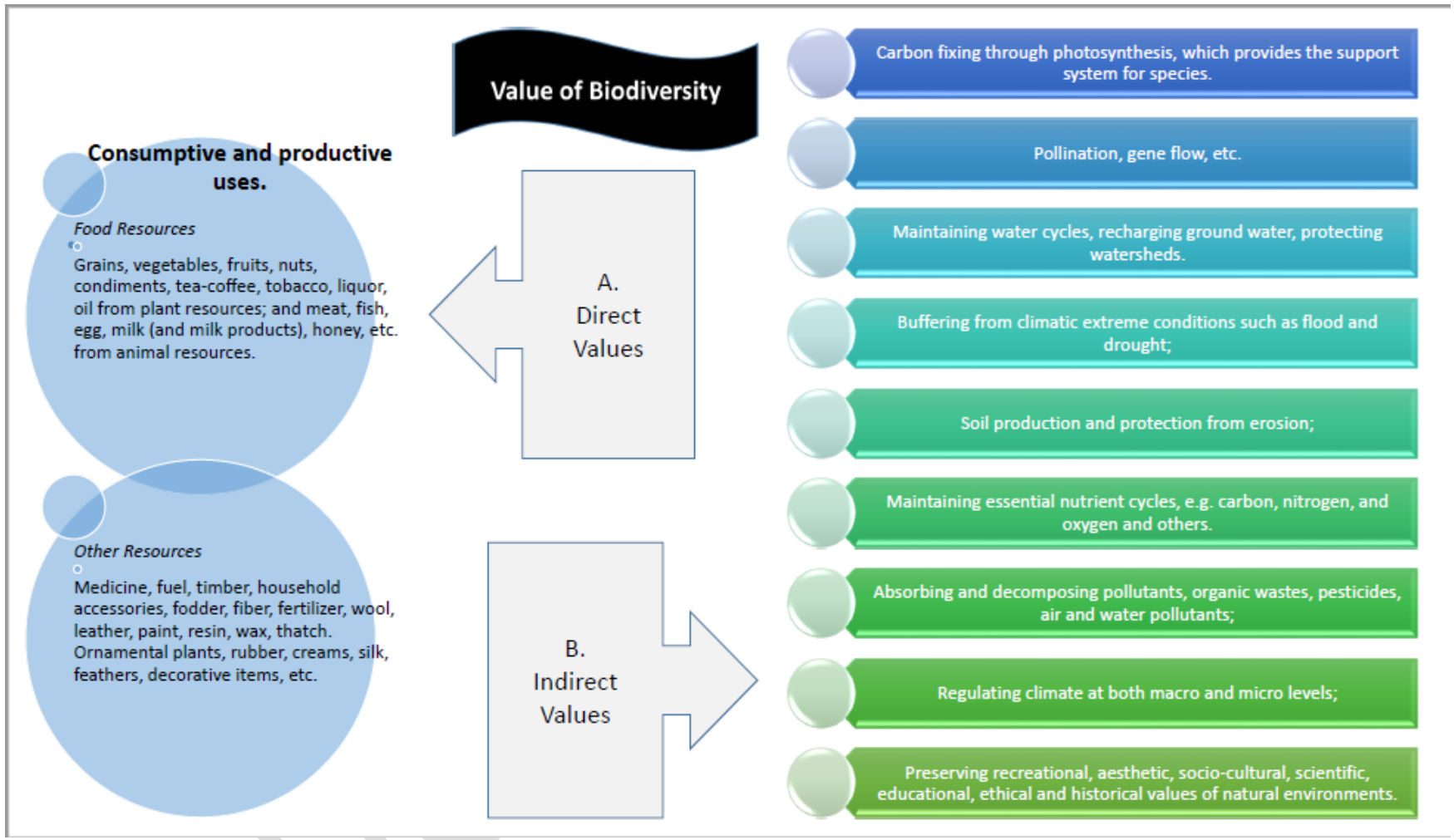
- Total area: 0.3%
- The islands are center of high endemism and contain **India's finest evergreen forests**. Bahera, Harar and Jack fruit are some specific plant species.
- It supports a **wide diversity of corals.**
- Coral reefs are stretched over an area of 11,000 sq.km. in the Andamans and 2,700 sq.km. in Nicobar.
- Some of the endemic fauna of Andaman & Nicobar islands include **Narcondam hornbill, South Andaman krait** etc. Dolphin, Alligator and Molluscs are other species.

Week 2
Lecture 4

Anamika

The Value of Biodiversity

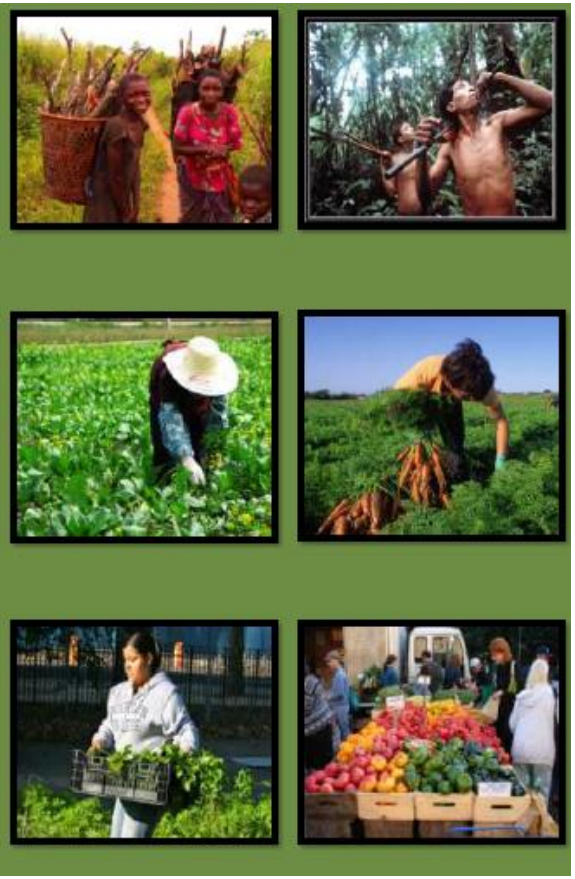
Ecosystems and species provide an enormous range of goods and other services - immediate as well as long term, material as well as spiritual and psychological - which are vital to our well-being. The values of the earth's biological resources can broadly be classified into-


Value of Biodiversity
Consumptive and productive uses.
Food Resources
Grains, vegetables, fruits, nuts, condiments, tea-coffee, tobacco, liquor, oil from plant resources; and meat, fish, egg, milk (and milk products), honey, etc. from animal resources.
Other Resources
Medicine, fuel, timber, household accessories, fodder, fiber, fertilizer, wool, leather, paint, resin, wax, thatch. Ornamental plants, rubber, creams, silk, feathers, decorative items, etc.
A. Direct Values
B. Indirect Values
Carbon fixing through photosynthesis, which provides the support system for species.
Pollination, gene flow, etc.
Maintaining water cycles, recharging ground water, protecting watersheds.
Buffering from climatic extreme conditions such as flood and drought;
Soil production and protection from erosion;
Maintaining essential nutrient cycles, e.g. carbon, nitrogen, and oxygen and others.
Absorbing and decomposing pollutants, organic wastes, pesticides, air and water pollutants;
Regulating climate at both macro and micro levels;
Preserving recreational, aesthetic, socio-cultural, scientific, educational, ethical and historical values of natural environments.

Value of Biodiversity

- Biodiversity provides a variety of environmental services from its species and ecosystems that are essential at global, regional and local levels .
- Loss of biodiversity contributes to climatic change.
- Forest converts carbon dioxide into carbon and oxygen.
- Loss of forest cover due to release of carbon dioxide and other gases due to industrialization which contributes to 'Green House Effect'.
- Green house leads to Global warming which results in raise in sea-level submerging the low-lying areas in the world and causing atmospheric changes.

- Biological diversity is also essential for preserving ecological processes.
- Tribal communities who directly gather resources from the forest or fisher folk who catch fish in marine or freshwater ecosystems are directly or indirectly linked to the biological variety present in the biosphere.
- For others, such as agricultural communities, biodiversity is used to grow their crops to suit the environment.
- Urban communities generally use the greatest amount of goods and services, which are all indirectly drawn from natural ecosystems.
- Preservation of biological resources is essential for the well-being and long-term survival of mankind.



Consumptive Use Value

- A straightforward example is the direct utilization of timber, food, fuel wood and fodder by local communities.
- The biodiversity contained in the ecosystem provides forest dwellers with all their daily needs, food, building material, fodder, medicines and a variety of other products.
- They are well-known about the qualities and different uses of wood from different species of trees, and collect a large number of local fruits, roots and plant material that they use as food, construction material or medicines.
- Fisher folks are completely dependent on fish and know where and how to catch fish and other edible aquatic animals and plants.

Productive use value

- This category comprises of marketable goods.
- The biotechnologist uses bio-rich areas to 'prospect' and search for potential genetic properties in plants or animals that can be used to develop better varieties of crops .
- For the pharmacist, biological diversity is the raw material from which new drugs can be identified from plant or animal products.
- For industrialists , biodiversity is a rich storehouse to develop new products.
- For the agricultural scientist, the biodiversity is the basis for developing better crops.

Continued...

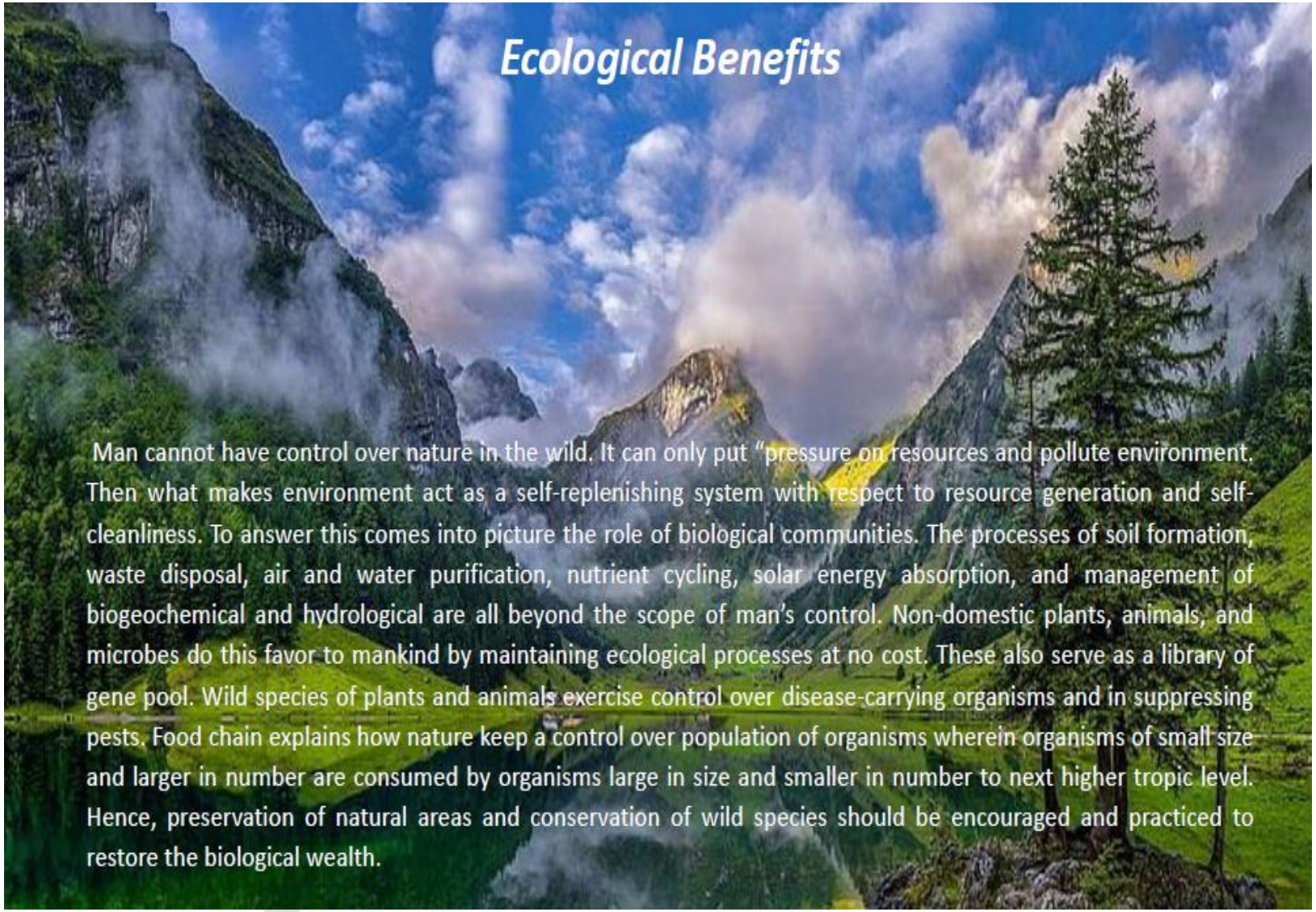
- Genetic diversity enables scientists and farmers to selectively develop better crops and domestic animals through careful breeding programs.
- New crop varieties (cultivars) are being developed using the genetic material found in wild relatives of crop plants through biotechnology.

- New species of plants and animals are being constantly discovered in the wild. These wild species are the building blocks for the betterment of human life and their loss is a great economic loss to mankind.
- The preservation of biodiversity has now become essential for industrial growth and economic development. This is called 'biological prospecting'.

Social Use Value

- While traditional societies had valued and preserved their biodiversity and its resources, modern man has depleted it up to the extent leading to irrecoverable loss due to extinction of several species.
- 'Ecosystem people' value biodiversity as a part of their livelihood , as well as through cultural and religious sentiments.
- A great variety of crops have been cultivated in traditional agricultural system which spread widely and marketed throughout and acted as insurance against the failure of one crop*('today's 'monoculture').*
- In recent years , farmers have begun to receive incentives to grow cash crops for national/international markets, rather than to supply local needs which resulted in local food shortages, unemployment, landlessness, and increased vulnerability to drought and floods.


(i) Medicine:
Medicinal Value
Many medicinal and aromatic plants are being exploited in the wild to tap their potential for different ailment cure in the field of drug extraction e.g. *Hippophae rhamnoides, Ephedra Kerardiana. Dactylorrahiza hatageria* etc. Besides, they are being cultured in plantations and protected in wild to encourage in-situ and ex-situ conservation viz. Valley of flowers, Rohtang in Kullu, Lahu & Spiti Valley. Animal products are also sources of drugs, analgesics pharmaceuticals, antibiotics, heart regulators, anticancer and ant parasite drugs, blood pressure regulators, anticoagulants, enzymes, and hormones


Ecological Benefits
Man cannot have control over nature in the wild. It can only put "pressure on resources and pollute environment. Then what makes environment act as a self-replenishing system with respect to resource generation and self-cleanliness. To answer this comes into picture the role of biological communities. The processes of soil formation, waste disposal, air and water purification, nutrient cycling, solar energy absorption, and management of biogeochemical and hydrological are all beyond the scope of man's control. Non-domestic plants, animals, and microbes do this favor to mankind by maintaining ecological processes at no cost. These also serve as a library of gene pool. Wild species of plants and animals exercise control over disease-carrying organisms and in suppressing pests. Food chain explains how nature keep a control over population of organisms wherein organisms of small size and larger in number are consumed by organisms large in size and smaller in number to next higher tropic level. Hence, preservation of natural areas and conservation of wild species should be encouraged and practiced to restore the biological wealth.

Ethical and Moral Values

- Ethical values of biodiversity are based on the importance of protecting all form of life .
- Most religious and secular creeds believe that all form of life have the right to exist on Earth.
- Man is only a small part of the Earth's great family of species; plants and animals have an equal right to live and exist on our planet.
- There are several cultural, moral and ethical values, associated with the sanctity of all forms of life.
- Indian civilizations has, over several generations, preserved nature through local traditions.
- We have in our country a large number of sacred groves or *'deorais'* preserved by tribal people in several States. These sacred groves around ancient sacred sites and temples act as gene banks for wild plants.

Aesthetic Value

- The appreciation of the presence of biodiversity for its inherent value and beauty, as well as for the contribution it makes to our knowledge- our aesthetic, imagination and creativity- are some reasons to preserve it.
- Quite apart from killing wildlife for food, it is important as a tourist attraction.
- Biodiversity is a beautiful and wonderful aspect of nature. Sit in a forest and listen to the birds. Watch a spider weave its complex web. Observe a fish feeding. Its just magnificent and fascinating.
- In India, particularly , our history and culture is replete with plant and animal image.
- Symbols from wild species such as the lion of Hinduism, the elephant of Buddhism and the vehicles of several deities are animals, that have been venerated for thousands of year.
- The sacred Basil or the *'Tulsi'* has grown in the courtyards of each household for centuries.

Option Value

- Keeping future possibilities open for their use is called the option value.
- It is impossible to predict which of our species or traditional varieties of crops and domestic animals will be greatest use in the future.
- To improve cultivars and domestic livestock, we need to return to wild relatives of crop plants and animals.
- Thus, the preservation of biodiversity must also include traditionally-used strains, already in existence in crops and domestic animals.

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Hotspots of biodiversity

Biodiversity Hotspot

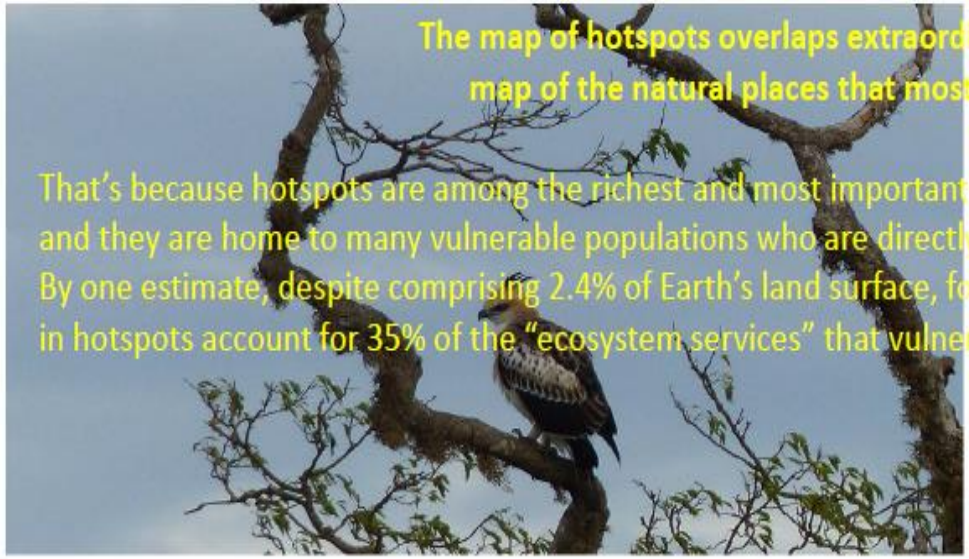
- A **biodiversity hotspot** is a biogeographic region with significant levels of biodiversity that is threatened with destruction.
- Concept was first introduced by **Norman Myers**, in a paper published in the journal *Nature*.
- The hotspots represent an opportunity to help conserve the diversity of life on earth.


To qualify as a biodiversity hotspot, a region must meet two strict criteria:
• It must have at least 1,500 vascular plants as endemics — which is to say, it must have a high percentage of plant life found nowhere else on the planet. A hotspot, in other words, is irreplaceable.
• It must have 30% or less of its original natural vegetation. In other words, it must be threatened.
Around the world, 36 areas qualify as hotspots. They represent just 2.4% of Earth's land surface, but they support more than half of the world's plant species as endemics — i.e., species found no place else — and nearly 43% of bird, mammal, reptile and amphibian species as endemics.

WHY DO BIODIVERSITY HOTSPOTS MATTER?

Biodiversity underpins all life on Earth.

Without species, there would be no air to breathe, no food to eat, no water to drink. There would be no human society at all. And as the places on Earth where the most biodiversity is under the most threat, hotspots are critical to human survival.



The map of hotspots overlaps extraordinarily well with the map of the natural places that most benefit people.

That's because hotspots are among the richest and most important ecosystems in the world — and they are home to many vulnerable populations who are directly dependent on nature to survive. By one estimate, despite comprising 2.4% of Earth's land surface, forests, wetlands and other ecosystems in hotspots account for 35% of the "ecosystem services" that vulnerable human populations depend on.