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ENVIRONMENT MANAGEMENT

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PROGRAMME EDUCATIONAL OBJECTIVES: PEO

- Will be recognized as a creative and an enterprising team leader.
- Will be a flexible, adaptable and an ethical individual.
- Will have a holistic approach to problem solving in the dynamic business environment.

3T2 – Environnement Management

Course Outcomes

- CO1-Ability to explain the need and importance of sustainable development and design& utilize a calendar of environmental activities to create public awareness.
- CO2-Ability to analyse the problems associated with non renewable resources and proposes solutions for conservation of these resources.
- CO3-Ability to define the types of ecosystems and justify the importance of conservation of biodiversity.
- CO4-Ability to assess the impact of different types of pollution (Air, Soil, Water, Noise, Thermal & Nuclear Pollution) on health, environment and industry.
- CO5-Ability to predict the harmful effects of climate change and examine the roles of various (Central, State & Local) bodies in pollution control.
- CO6-Ability to determine the problems associated with human population explosion and social issues in environment protection. Recommend possible solutions to these problems.

UNIT II

- **Unit II: Ecosystem & Biodiversity** - Concept of an Ecosystem , ecosystem degradation, resource utilization; Structure & functions of an ecosystem-producers, consumers and decomposers; Ecological succession; food chains, food webs and ecological pyramids; Ecosystem types – characteristics features, structure and functions of forest, grassland, desert and aquatic ecosystems Introduction biodiversity at genetic, species and ecosystem levels; Bio-geographic classification of India; Value of diversity– Consumption use value, Productive use value, Social, Ethical, Moral, aesthetic and optional value if diversity; India as mega-diversity nation



UNIT II

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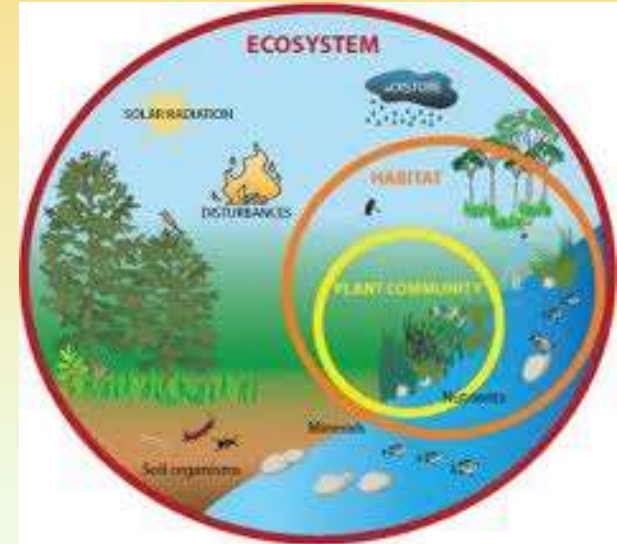


Ecosystem and Biodiversity

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Concept of an Ecosystem

- ▶ An 'Ecosystem' is a region with a **specific and recognizable landscape** form such as **forest, grassland, desert, wetland or coastal area**
- ▶ The nature of ecosystem is based on geographical features such as hills, mountains, plains, rivers, lakes, coastal areas or islands
- ▶ **Definition:** The living community of plants and animals in any area together with the non-living components of the environment such as soil, air and water, constitute the ecosystem



Understanding Ecosystems

Natural ecosystems include the forests, grasslands, deserts, and aquatic ecosystems such as ponds, rivers, lakes, and the sea

Man modified ecosystems include agricultural land and urban or industrial land use patterns

Each ecosystem has a set of common features:

- What does the ecosystem look like?
- What is its structure?
- What is the composition of its plant and animal species?
- How does the ecosystem work?

Ecosystem Degradation

- ▶ Ecosystems are frequently disrupted by human actions which lead to extinction of species of plants and animals
- ▶ Some species if eliminated seriously affect the ecosystem
- ▶ Extinction occurs due to changes in land use
- ▶ Pollution from industry and urban waste can also lead to extinction
- ▶ Increasing extraction of resources is at the cost of natural ecosystems



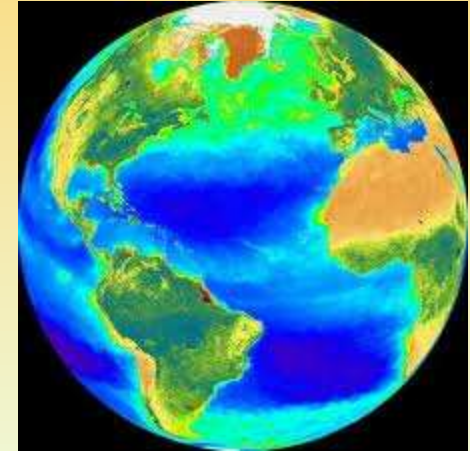
Resource Utilisation

- ▶ In recent times the proportion of 'rich' people in affluent societies, grew rapidly
- ▶ The economically better off began to use greater amounts of forest products, while those who lived in the forest became increasingly poor
- ▶ Irrigation projects led to wealth in areas with canals, while those who remain dependent on supply from the river, found difficult to survive
- ▶ A more even sharing of resources within the community can reduce these pressures on natural ecosystems



Structural Aspects of an Ecosystem

- ▶ Inorganic aspects – C, N, CO₂, H₂O.
- ▶ Organic compounds – Protein, Carbohydrates,
- ▶ Climatic regimes – Temperature, Moisture, Light & Topography.
- ▶ Producers – Plants.
- ▶ Macro consumers – Phagotrophs – Large animals.
- ▶ Micro consumers – Saprotrophs, absorbers – fungi.



Functional Aspects of an Ecosystem

Energy cycles.

Food chains.

Diversity-interlinkages between organisms.

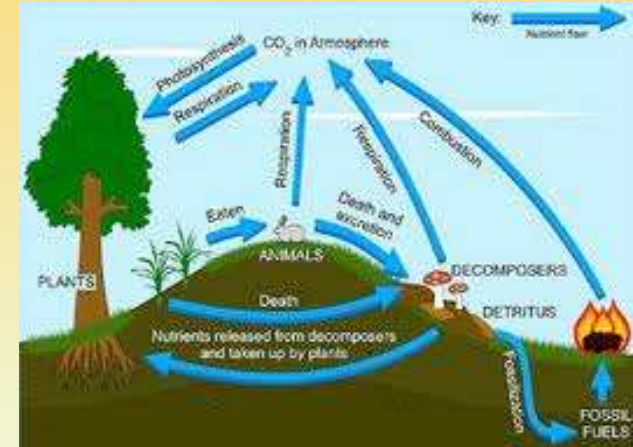
Nutrient cycles-biogeochemical cycles.

Evolution.



Producers, Consumers and Decomposers

- ▶ Plants are the ‘**producers**’ in the ecosystem as they manufacture their food by using energy from the sun
- ▶ The **herbivorous** animals are **primary consumers** as they live on the producers
- ▶ The herbivorous animals include for example hare, deer and elephants that live on plant life.



Producers, Consumers and Decomposers

- ▶ **Carnivorous** animals, or **secondary consumers**, which live on herbivorous animals : E.g. tigers, foxes etc.
- ▶ **Decomposers** or **detrivores** are a organisms consisting of small animals like worms, insects, bacteria and fungi, which break down dead organic material into smaller simpler substances that are used by plants as nutrition
- ▶ Decomposition is a vital function, without this, all nutrients would end up in dead matter and no new life can be produced

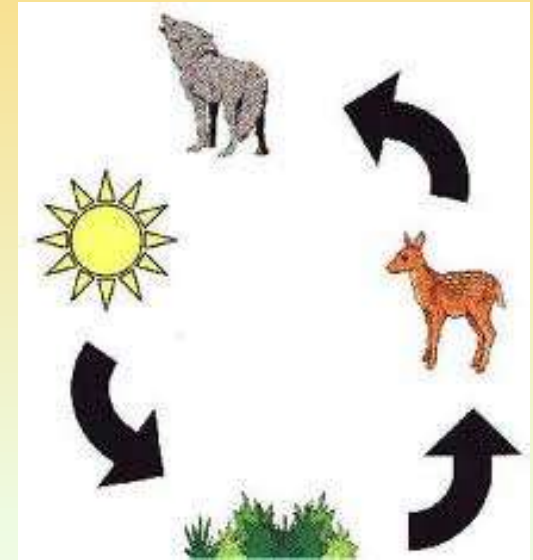
Ecological Succession

- ▶ Ecological succession is a process through **which ecosystems tend to change over a period of time**
- ▶ If a forest is cleared, it is initially colonized by a certain group of species of plants and animals, which gradually change through an **orderly process of community development**
- ▶ An opened up area will gradually be converted into a grassland, a shrubland and finally a forest if there is **no human interference**
- ▶ There is a tendency for succession to produce a more or less **stable state** at the end of the succession stages



Food Chains

- ▶ In nature energy must pass from one living organism to another
- ▶ When herbivorous animals feed on plants, energy is transferred from plants to animals
- ▶ In an ecosystem, some of the animals feed on other living organisms, while some feed on dead organic matter
- ▶ At each linkage in the chain, a major part of the energy from the food is lost for daily activities.
- ▶ Each chain usually has only four to five such links.

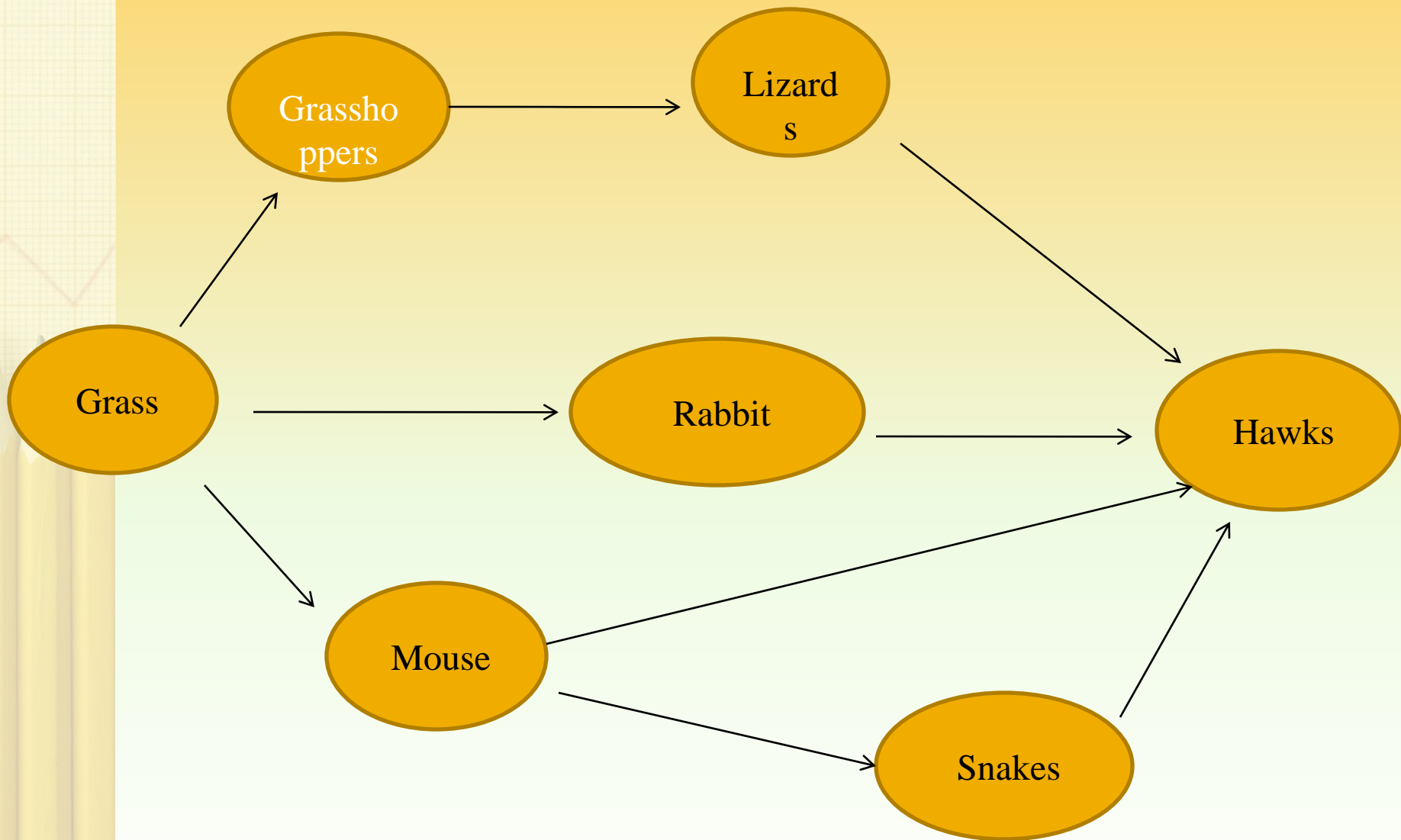


Food Webs

- ▶ In an ecosystem there are a very large number of interlinked chains. This forms a food web.
- ▶ If the linkages in the chains that make up the web of life are disrupted by human activities that lead to extinction of species, the web breaks down.



Example of food web



Case Study: Effects Of Tiger Poaching

- ▶ The tiger is at **the top of the food chain**
- ▶ Their only direct threat is man.
- ▶ Predators like the tiger **feed on deer**
- ▶ Tigers prevent deer populations growing to the point where vegetation would be overused; this would lead to a break-down of the land.
- ▶ If tigers become extinct the population of herbivores are not kept under control which leads to **over-consumption of grasslands** and vegetation.
- ▶ The lack of vegetation would in turn lead to an array of **negative effects** because plants and vegetation are the original source of energy for all animals in the food chain

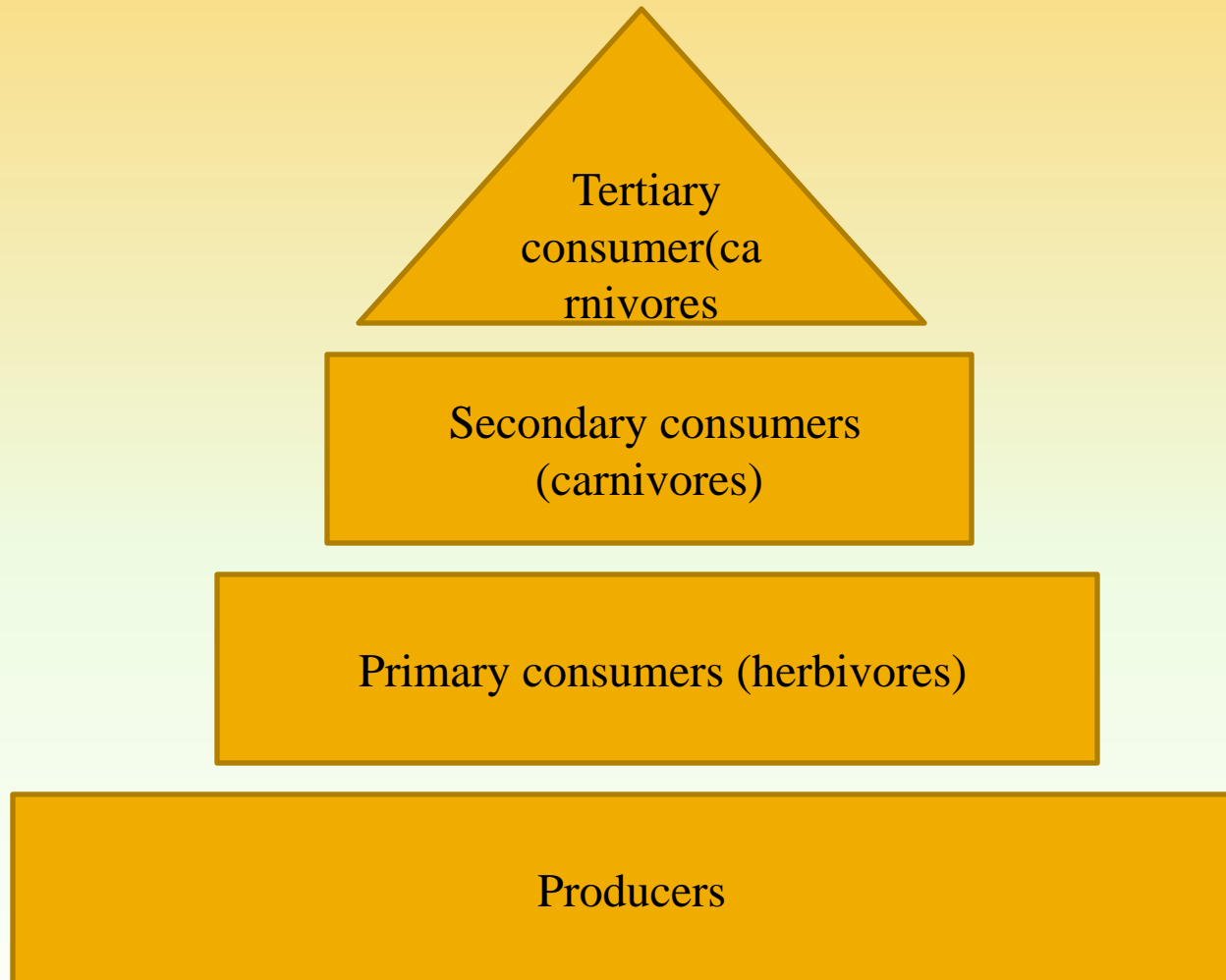


Ecological Pyramids

- ▶ In an ecosystem, green plants – the producers, utilize energy directly from sunlight and convert it into matter
- ▶ A large number of these organisms form the most basic, or first '**trophic level**' of the food pyramid
- ▶ The herbivorous animals that eat plants are at the **second trophic level** and are called primary consumers
- ▶ The predators that feed on them form the **third trophic level** and are known as secondary consumers.



ECOLOGICAL PYRAMID



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Ecological Succession : The New Island Example

- ▶ A **new island** arises from volcanic activity in the ocean.
- ▶ This is a piece of land that has **never supported life** (basically a solid chunk of rock).
- ▶ The first things to colonize the island are things like **bacteria, fungi, moss,** and lichen (things that are wind dispersed or wash up on shore from the ocean).
- ▶ As these things die, they slowly build up an **organic soil layer.**
- ▶ Once soil is form, **vascular plants** can begin to establish.
- ▶ These plants can now support **insects and other animals.**
- ▶ Eventually **woody plants,** like shrubs and then trees will become dominant.
- ▶ The final stage of succession is a **forest!**



Types of Ecosystems

▶ Terrestrial Ecosystems

- Forest
- Grassland
- Deserts
- Mountains
- Islands

▶ Aquatic Ecosystems

- Pond
- Lake
- Wetland
- River
- Delta
- Marine



Forest Ecosystem

- ▶ Forests are formed by a community of plants which is predominantly structurally defined by its trees, shrubs, climbers and ground cover
- ▶ Natural vegetation looks vastly different from a group of planted trees, which are in orderly rows
- ▶ The forest ecosystem has two parts:
 - non-living or abiotic aspects of the forest
 - living or biotic aspects of the forest



Forest Types in India

- ▶ Forests in India can be broadly divided into **Coniferous forests** and **Broadleaved forest**
- ▶ They can also be classified according to the nature of their tree species – evergreen, deciduous, xerophytic or thorn trees, mangroves
- ▶ They can also be classified according to the most abundant species of trees such as Sal or Teak forests.



Coniferous Tree

Forest Types in India

▶ **Coniferous forests:**

- ▶ Grow in the Himalayan mountain region
- ▶ These forests have tall trees with needle like leaves and downward sloping branches so that the snow can slip off the branches.



▶ **Broadleaved forests:**

- ▶ Have large leaves of various shapes
- ▶ Classified into evergreen forests, deciduous forests, thorn forests, and mangrove forests

Forest Types in India

- ▶ **Evergreen forests** grow in the high rainfall areas of the Western Ghats, North Eastern India and the Andaman and Nicobar Islands
- ▶ **Deciduous forests** are found in regions with a moderate amount of seasonal rainfall that lasts for only a few months. Eg Teak
- ▶ **Thorn forests** are found in the semi- arid regions of India. The trees, which are sparsely distributed, are surrounded by open grassy areas
- ▶ **Mangrove forests** grow along the coast especially in the river deltas. Eg. Sundarban

Direct uses of forest products

- ▶ Fruits – mango, jamun, amla
- ▶ Medicine – Gloriosa, Foxglove
- ▶ Fuelwood – many species of trees and shrubs
- ▶ Small timber for building huts and houses
- ▶ Wood for farm implements
- ▶ Bamboo and cane for baskets
- ▶ Grass for grazing and stall feeding livestock



Indirect uses of Forest Products

- ▶ Building material for construction and furniture for the urban sector
- ▶ Medicinal products collected and processed into drugs
- ▶ Gums processed into a variety of products
- ▶ Raw material for industrial products and chemicals
- ▶ Paper from bamboo and softwoods



Grassland Ecosystem

- ▶ Grasslands cover areas where rainfall is usually low and/or the soil depth and quality is poor.
- ▶ Low rainfall prevents growth of a large number of trees and shrubs, but is sufficient to support the growth of grass cover during monsoon
- ▶ Grasses and small herbs dry up and the part above the ground dies during the summer.
- ▶ In next monsoon the grass cover grows back from the root stock and the seeds of previous year.



Grassland Types in India

- ▶ **Himalayan pasture belt** extends up to the snowline. Grasslands at a lower level form patches along with coniferous or broadleaved forests.
- ▶ **Terai** consists of patches of tall grasslands interspersed with a Sal ecosystem. Patches of 5m tall elephant grass are located in the low-lying waterlogged areas.
- ▶ **Semi-arid plains** of Western India, Central India and the Deccan are covered by grassland tracts with patches of thorn forest
- ▶ **Shola grasslands** consist of patches on hillslopes along with the Shola forests on the Western Ghats, Nilgiri and Annamalai ranges



How are Grasslands used?

- ▶ Grazing areas of many rural communities
- ▶ Fodder is collected and stored to feed cattle when there is no grass left in summer
- ▶ Grass is used to thatch houses and farm sheds
- ▶ Thorny bushes and branches are used as fuelwood
- ▶ Small carnivorous animals help control insect pests in adjoining agricultural lands.



Desert Ecosystem

- ▶ Deserts and semi arid areas are located in Western India and the Deccan Plateau
- ▶ The climate in these vast tracts is extremely dry
- ▶ There are also cold deserts such as in Ladakh, in the high plateaus of Himalayas
- ▶ Typical desert landscape that is seen in Rajasthan is the Thar Desert
- ▶ Rann of Kutch is highly specialised arid ecosystems



How are Desert Ecosystems used?

- ▶ Used for camel, cattle and goat grazing in Rajasthan and Gujarat, and for sheep grazing in the Deccan Plateau
- ▶ Areas that have a little moisture, such as along the watercourses, have been used for growing crops such as jowar, and bajra
- ▶ The natural grasses and local varieties of crops have adapted to growing at very low moisture levels.



Aquatic Ecosystem

- ▶ In aquatic ecosystems, plants and animals live in water
- ▶ These species are adapted to live in different types of aquatic habitats
- ▶ These ecosystems provide human beings with a wealth of natural resources : Eg food such as fish
- ▶ If aquatic ecosystems are misused, their ability to provide resources suffers in the long term.
- ▶ Over-fishing leads to a fall in the fish catch.



Types of Aquatic Ecosystems

Aquatic ecosystems may be classified as being **stagnant ecosystems**, or **running water ecosystems**

The aquatic ecosystems are classified into **freshwater**, **brackish** and **marine ecosystems**, which are based on the salinity levels.



Types of Aquatic Ecosystems

▶ **Pond ecosystem**

- ▶ Simplest aquatic ecosystem to observe.
- ▶ Most ponds become dry after the rains are over and are covered by terrestrial plants for the rest of the year

▶ **Lake ecosystem**

- ▶ Functions like a giant permanent pond.
- ▶ Most plants are algae, which derives energy from the sun.
- ▶ This is transferred to the microscopic animals, which feed on the algae.
- ▶ Herbivorous fish are dependent on algae and aquatic weeds.
- ▶ Small animals as snails are used as food by small carnivorous fish, which in turn are eaten by larger carnivorous fish

Types of Aquatic Ecosystems

- ▶ **Stream and River Ecosystems**
- ▶ Flowing water ecosystems in which all the living forms are specially adapted to different rates of flow.
- ▶ Some plants and animals such as snails and other burrowing animals can withstand the rapid flow of the hill streams.
- ▶ Other species of plants and animals such as water beetles and skaters can live only in slower moving water.



Types of Aquatic Ecosystems

- ▶ **Marine ecosystems**
- ▶ The Indian Ocean, the Arabian Sea and the Bay of Bengal constitute the marine ecosystems
- ▶ Producers vary from microscopic algae to large seaweeds.
- ▶ The shallow areas near Kutch and around the Andamans are some of the most incredible coral reefs in the world
- ▶ The marine ecosystem is used by coastal fisherfolk for fishing which forms their livelihood



Andaman
Corals

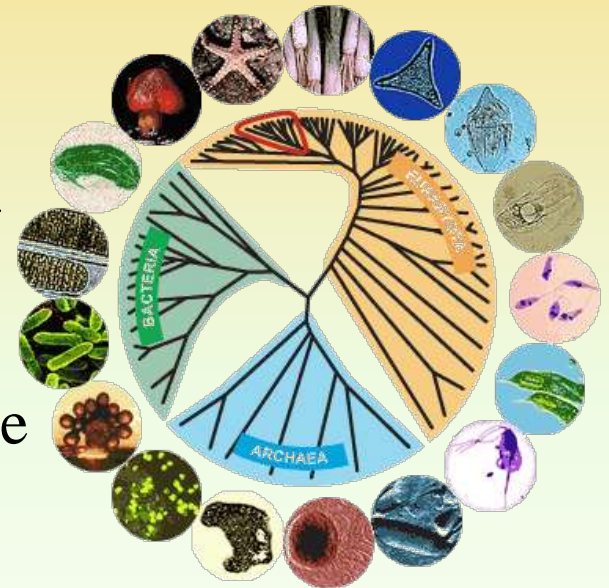
Biodiversity




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What is Biodiversity?

- ▶ **Definition:**
- ▶ ‘Biological diversity’ or biodiversity is that part of nature which includes the **differences in genes** among the individuals of a species, **the variety and richness** of all the plant and animal species at **different scales in space**, locally, in a region, in the country and the world, and various types of ecosystems, both terrestrial and aquatic, **within a defined area**





It refers to the numbers, variety, and variability of living organisms and ecosystems

Biodiversity

Biodiversity: The degree of nature's variety in the biosphere.

This variety can be observed at three levels:

- the **genetic variability** within a species
- the **variety of species** within a community,
- the **organisation of species** in an area into distinctive plant and animal communities



Genetic diversity

- ▶ Each member of any animal or plant species differs widely from other individuals in its genetic makeup because of the **large number of combinations** possible in the genes
- ▶ This genetic variability is essential for a healthy breeding population of a species
- ▶ If number of breeding individuals is reduced, the dissimilarity of genetic makeup is reduced and in-breeding occurs.
- ▶ This can lead to the **extinction** of the species.
- ▶ Diversity in wild species forms the ‘**gene pool**’ **from which** our crops and domestic animals have been developed over thousands of years.



Species diversity

- ▶ The number of species of plants and animals present in a region constitutes its species diversity
- ▶ This diversity is seen both in natural and in agricultural ecosystems
- ▶ Natural undisturbed tropical forests have a much greater species richness than plantations developed by the Forest Department
- ▶ Thus the value of a natural forest, with all its species richness is much greater than a plantation



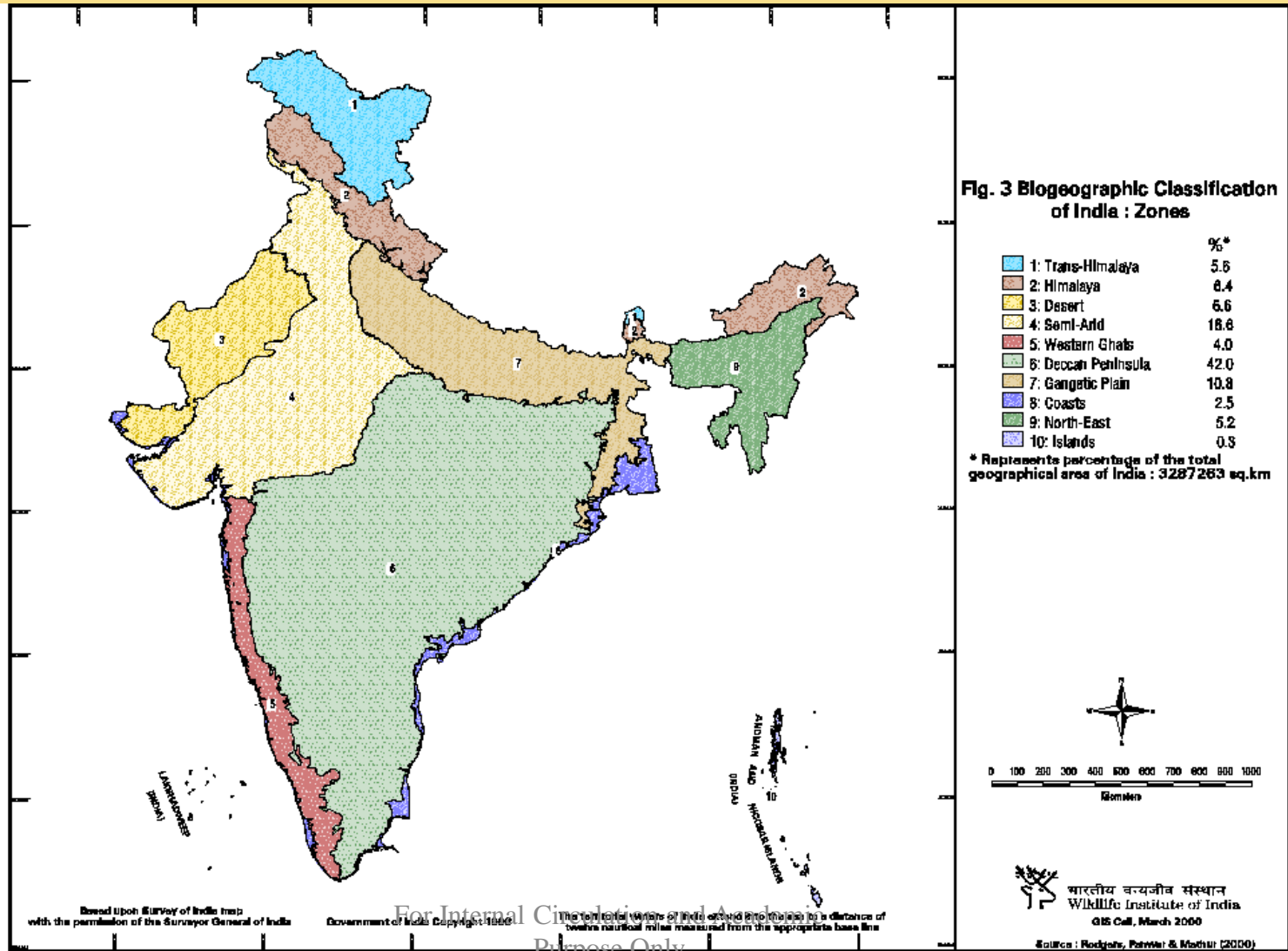
Species diversity

- Scientists have been able to identify and categorise about 1.8 million species on earth.
- Many new species are being identified, especially in the flowering plants and insects.
- Areas that are rich in species diversity are called ‘hotspots’ of diversity.
- India is among the world’s 15 nations that are exceptionally rich in species diversity

Ecosystem diversity

- ▶ Ecosystem diversity can be described for a specific geographical region, or a political entity such as a country, a State or a taluka
- ▶ Distinctive ecosystems include landscapes such as forests, grasslands, deserts, mountains, etc., as and aquatic ecosystems such as rivers, lakes, and the sea
- ▶ “Natural” ecosystem is when it is undisturbed by human activities, or ‘modified’ when it is changed to other types of uses, such as farmland or urban areas
- ▶ If natural ecosystems are misused their, productivity eventually decreases and they are then said to be degraded. E.g Orange crops around Nagpur

Bio-geographic classification of India



Bio-geographic classification of India

- ▶ Our country can be conveniently divided into ten major regions, based on the geography, climate, vegetation and animals in them:
- ▶ The cold mountainous snow covered **Trans Himalayan** region of Ladakh
- ▶ The **Himalayan ranges** and valleys of Kashmir, Himachal Pradesh, Uttarakhand, Assam and other North Eastern States
- ▶ The **Terai**, the lowland where the Himalayan rivers flow into the plains
- ▶ The Gangetic and Bhramaputra **plains**.

Bio-geographic classification of India

- The **Thar Desert** of Rajasthan.
- The **semi arid grassland** region of the Deccan plateau Gujarat, Maharashtra, Andra Pradesh, Karnataka and Tamil Nadu
- The **Northeast States** of India,
- The **Western Ghats** in Maharashtra, Karnataka and Kerala
- The **Andaman and Nicobar Islands**.
- The long western and **eastern coastal belt** with sandy beaches, forests and mangroves.

Value of Biodiversity

- ▶ Environmental services from species and ecosystems are essential at global, regional and local levels.
- ▶ Production of oxygen, reducing carbon dioxide, maintaining the water cycle, protecting soil are important services.
- ▶ The loss of biodiversity contributes to global climatic changes.
- ▶ Forests are the main mechanism for the conversion of carbon dioxide into carbon and oxygen.
- ▶ The loss of forest cover, and increasing release of carbon dioxide and other gases contributes to the '**greenhouse effect**'.
- ▶ **Global warming is melting ice caps**, resulting in a rise in the sea level
- ▶ It is causing major atmospheric changes, leading to increased temperatures, serious droughts or unexpected floods

Value of Biodiversity

- ▶ Essential for **preserving ecological processes**, such as fixing and recycling of nutrients, soil formation, circulation and cleansing of air and water
- ▶ **Food, clothing, housing, energy, medicines**, are all resources that are directly or indirectly linked to the biological variety
- ▶ For **agricultural communities**, biodiversity is used to grow their crops to suit the environment
- ▶ The preservation of ‘biodiversity’ is integral to any strategy that aims at improving quality of human life

Consumptive use value

- ▶ It is the direct utilisation of timber, food, fuelwood, fodder by local communities
- ▶ Provides forest dwellers with all their daily needs, food, building material, fodder, medicines and a variety of other products
- ▶ Fisherfolk are highly dependent on fish



Productive use value

- ▶ Marketable goods
- ▶ Biotechnologist uses biorich areas to ‘prospect’ and search for potential genetic properties in plants or animals that can be used to develop better varieties of crops
- ▶ Pharmacist: biodiversity is the raw material from which new drugs can be identified
- ▶ Industrialists: Biodiversity is a rich storehouse from which to develop new products.
- ▶ Agricultural scientist: biodiversity in the wild relatives of crop plants is the basis for developing better crops.



Social values

- ▶ Biodiversity has been **preserved by traditional societies** that valued it as a resource and appreciated that its depletion would be a great loss to their society
- ▶ The consumptive and productive value of biodiversity is closely linked to **social concerns in traditional communities**
- ▶ In recent years farmers receive **economic incentives** to grow cash crops for national or international markets, rather than to supply local needs



Ethical and moral values

- Ethical values related to biodiversity based on the importance of protecting all forms of life.
- All forms 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
- Indian civilization has over several generations preserved nature through local traditions

Aesthetic values

- Knowledge and appreciation of the presence of biodiversity for its own sake is another reason 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

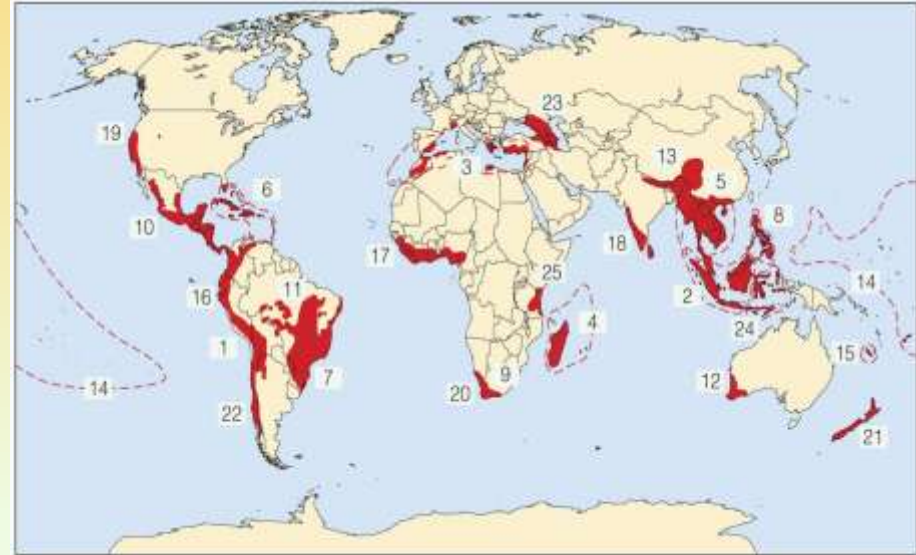


Option value

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

Hotspots of biodiversity

- ▶ There are over a thousand major ecoregions in the world.
- ▶ 200 are said to be the richest, rarest and most distinctive natural areas: referred to as the Global 200
- ▶ It has been estimated that 50,000 endemic plants which comprise 20% of global plant life, occur in only 18 'hot spots' in the world.
- ▶ Countries which have a relatively large proportion of these hot spots of diversity are 'megadiversity nations'



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Hotspots of biodiversity

- ▶ Our globally accepted national ‘hot spots’ are in the forests of the **North-East and the Western Ghats,**
- ▶ **The Andaman and Nicobar Islands** are extremely rich in species and subspecies of different animals and birds
- ▶ Andaman and Nicobar Islands have 2200 species of flowering plants and 120 species of ferns.
- ▶ Out of 135 genera of land mammals in India, 85 (63%) are found in the Northeast.
- ▶ The Northeast States have 1,500 endemic plant species.
- ▶ A major proportion of amphibian and reptile species, especially snakes, are concentrated in the Western Ghats, which is also a habitat for 1,500 endemic plant species.

Threats to Biodiversity

▶ **Loss to Habitats**

- ▶ Man overuses or misuses most of natural ecosystems.
- ▶ Due to this ‘unsustainable’ resource-use, once productive forests and grasslands have been turned into deserts
- ▶ Wastelands have increased all over the world.
- ▶ Mangroves have been cleared for fuelwood and prawn farming, which has led to a decrease in the habitat essential for breeding of marine fish.
- ▶ Wetlands have been drained to increase agricultural land.

Threats to Biodiversity

- ▶ **Poaching**
- ▶ Specific threats to certain animals are related to large economic benefits.
- ▶ Skin and bones from tigers, ivory from elephants, horns from rhinos and the perfume from the musk deer are extensively used abroad.
- ▶ Bears are killed for their gall bladders.
- ▶ Corals and shells are also collected for export or sold on the beaches of Chennai and Kanyakumari.
- ▶ A variety of wild plants with real or at times dubious medicinal value are being over harvested



Common endangered and endemic species of India

- **Critically Endangered Animals:**
- Jenkin's Shrew
- Ganges Shark
- Himalayan Wolf
- Indian Vulture
- Namdapha Flying Squirrel
- Pygmy Hog
- Salim Ali's Fruit Bat



Common endangered and endemic species of India

▶ Endangered Animals:

- ▶ Asiatic Wild Dog
- ▶ Ganges River Dolphin
- ▶ Great Indian Rhinoceros
- ▶ Indian Elephant or Asian Elephant
- ▶ Indus River Dolphin
- ▶ Kashmir Stag
- ▶ Marsh Mongoose
- ▶ Snow Leopard



In-situ conservation

- ▶ Biodiversity can be best preserved insitu : by setting aside an adequate representation of wilderness as ‘Protected Areas’
- ▶ These should consist of a network of National Parks and Wildlife Sanctuaries with each distinctive ecosystem included in the network
- ▶ However species cannot be protected individually as they are all inter dependent on each other. Thus the whole ecosystem must be protected.



Wildlife Sanctuaries and National Parks of India

- ▶ 589 Protected Areas in India of which 89 are National Parks and 500 are Wildlife Sanctuaries
- ▶ **The Great Himalayan National Park is the largest sanctuary** in this ecosystem and is one of the last homes of the beautiful snow leopard.
- ▶ **Dachigam Sanctuary is the only place** where the rare Hangul or Kashmir stag is found.
- ▶ **Kaziranga National Park is the most famous** which has elephant, wild buffalo, gaur, wild boar, swamp deer, and hog deer, in large numbers,
- ▶ The **Manas Sanctuary**, includes golden langur and the very rare pygmy hog, the smallest wild boar in the world.

Wildlife Sanctuaries and National Parks of India

- ▶ **Kanha** offers a wonderful opportunity to observe wild tigers from elephant back
- ▶ **Bharatpur** is one of the most famous water bird sanctuaries in the world
- ▶ **Desert National Park** has black buck, neelgai and chinkara
- ▶ **Great and the Little Rann of Kutch** have protect the rare wild ass, the flamingo, the star tortoise and the desert fox
- ▶ **Gir Sanctuary** protects the last population of the majestic Asiatic lion

Ex-situ conservation

- ▶ Situations in which an **endangered species** is so close to extinction that unless alternate methods are instituted, the species may be rapidly driven to extinction.
- ▶ This strategy is known as ex-situ conservation, i.e. **outside its natural habitat** in a carefully controlled situation such as a **botanical garden** for plants or a **zoological park** for animals,
- ▶ These breeding programs for rare plants and animals are however **more expensive** than managing a Protected Area.



Ex-situ conservation

- There is also another form of preserving a plant by preserving its germ plasm in a gene bank so that it can be used if needed in future
- Modern breeding programs are done in zoos that provide for all the animal's needs, including enclosures that simulate their wild habitats
- Modern zoos include breeding of endangered species as a conservation measure

Environment legislation

- Topics covered
- Environmental (protection) Act,
- The water (prevention and control of Pollution); The wild life protection Act;
- Forest conservation Act; Issues involved in enforcement of environmental legislations; Environment Impact Assessment;
- Environmental Auditing;
- Clearance / Permission for establishing Industry.


Environmental legislation in India

- 1986 – The Environment (Protection) Act authorized the government to protect and improve environmental quality
- 1986 -The Environment (Protection) rule lay down procedure for setting standards of emission or discharge of environment pollutants
- 1989 – The manufacture, storage and import of Hazardous rule

- 1989 – The manufacture, use, import, export and storage of hazardous micro-organism genetically engineered organisms or cells
- 1991- the public liability insurance act
- 1995- the national environment tribunal act
- 1998 – the biomedical waste
- 1999 - the environment (siting for industrial projects) rules
- 2000- the municipal solid waste
- 2001 – the batteries (management and handling)
- 2002 – the biological diversity act

- FOREST AND WILDLIFE
- 1927- The Indian Forest Act
- 1972 – The wildlife protection act
- 1980 – The forest (conservation)act

- WATER
- 1882 - The easement act
- 1897- The Indian Fisheries act
- 1956 – The river boards act
- 1970 – The merchant shipping act

- 
- 1974 – The water (prevention and control of pollution) act
 - 1978 - The water (prevention and control of pollution) cess
 - 1991 – The costal regulation zone notification

Environment Impact Assessment

- EIA was made mandatory for certain types of projects
- the regulation require the project proponent to submit an EIA report, an environmental management plan, details of the public hearing, and a project report to MoEF.
- 30 categories of projects that require an EIA
- The Ministry's Impact Assessment Agency evaluates the report within 90 days of receipt.
- Valid for the period of five years from commencement of the project.