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UPSC-CSE

PRELIMS+MAINS

ENGLISH MEDIUM

General Study Paper–3

Part -4

ENVIRONMENT, ECOLOGY AND BIODIVERSITY

PREFACE

Dear Aspirants, The Presented Notes "**UPSC – CSE (PRE + MAINS)**" have been prepared by a team of teachers, colleagues and Infusion Notes members who are expert in various subjects. These notes will help the Aspirants to the fullest extent possible in the examination of Civil Services conducted by the **UNION PUBLIC SERVICE COMMISSION (UPSC).**

Finally, despite careful efforts, there may be chances of some shortcomings and errors in the notes, So your suggestions are cordially invited in Infusion notes.

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CHAPTER - 1

ENVIRONMENT AND ECOLOGY

Ecology 'oikos' meaning home or place to live in and **'logos'** meaning study. Literally it is the study of the home of nature. Ecology is defined as a scientific study of the relationship of the living organisms with each other and with their environment. It deals with the way in which organisms are moulded by their environment, how they make use of environmental resources including energy flow and mineral cycling.

History of Ecology

The roots of Ecology lie in natural history, which is as old as human civilization itself. Since early history, man has indulged in Ecology in a practical sort of way, knowingly and unknowingly. In primitive societies every individual was required to have an intimate knowledge of his environment for their survival. i.e about the forces of nature and of plants and animals around him/her. Our ancient Indian texts have references to ecological principles.The classical texts of the Vedic period such as the Vedas, the Samhitas, the Brahmanas and the Aranyakas-Upanishads contain many references to ecological concepts. The Indian treatise on medicine, the Charaka-Samhita and the surgical text Sushruta-Samhita, show that people during this period had a good understanding of plant and animal ecology. These texts contain classification of animals on the basis of habit and habitat, land in terms of nature of soil, climate and vegetation; and description of plants typical to various localities. Charaka- Samhita contains information that air, land, water and seasons were indispensable for life and polluted air and water were injurious to health.

ENVIRONMENT AND ITS COMPONENT

Everything that surrounds or affects an organism during its lifetime is collectively known as its environment.The environment is defined as 'the sum total of living, non-living components; influences and events, surrounding an organism. All organisms (from virus to man) are obligatorily dependent on the other organism and environment for food, energy, water, oxygen, shelter and for other needs.

The relationship and interaction between organisms and the environment are highly complex. It comprises both living (biotic) and non-living (abiotic) components.

The environment is not static. Both biotic and abiotic factors are in a flux and keep changing continuously.

Components of Environment

1.Abiotic

- Energy
- Radiation
- Temperature & heat flow
- Water
- Atmospheric gases and wind
- Fire
- Gravity
- Topography
- Soil
- Geologic substratum

2.Biotic

- Green plants
- Non-green plants
- Decomposers
- Parasites
- Symbionts
- Animal
- Man

External environment of fish

Its environment consists of abiotic components such as light, temperature, including the water in which nutrients, oxygen, other gases and organic matter are dissolved.

The biotic environment consists of microscopic organisms called plankton which it assumes as well as aquatic plants, animals and decomposers.

Internal environment of fish

- It is enclosed by the outer body surface.
- The internal environment is relatively stable as compared to the external environment.
- However, it is not absolutely constant. Injury, illness or excessive stress upsets the internal environment.
- For example, if a marine fish is transferred to a freshwater environment, it will not be able to survive.

What is Ecology and Environment?-

Everything that a man needs comes from his surrounding environment viz. food, fuel, water, shelter, energy, etc. It is the same for other living beings. But Man, over the periods to quench his thirst, exploited nature so much that now the environment is not able to reach its homeostasis.

- Homeostasis is the tendency of organisms to auto-regulate and maintain its internal environment in a stable state.

There is widespread degradation of the environment, extinction of animals and plant species, loss of forests, pollution of air, water, and sound. All this had been done without the proper assessment of the consequences of the acts of humans on the environment.

Thus, it is important to understand the environment before we do further damage to the earth which is our Home.

The study of ecology helps in the following way:-

- **Environmental Conservation**: By studying ecology, the emphasis is put on how each species needs the other for peaceful coexistence. Lack of understanding of ecology has led to degradation of land and environment which is home to other species thus leading to extinction and endangerment of species because of lack of knowledge e.g. dinosaurs, mammoths, white shark, black rhinos, sperm whales, etc.
- **Resource allocation**: All the plants and animals need to share limited natural resources such as air, minerals, space, and environment. Lack of ecological know-how has led to deprivation and looting of these natural resources leading to scarcity as well as exploitation and competition.
- **Energy Conservation**: All species require energy whether light, radiation, nutrition, etc. Poor understanding of ecology is seeing the destruction of the energy resources e.g. non-renewable sources like oil, coal, natural gas, and also pollution and destruction of the Ozone layer.
- **Eco-Friendliness**: Ecology helps to appreciate harmonious living among the species; this will ensure the natural order of things is followed.

What `Ecology' Really Is?

- **'Ecology may be defined as the scientific study of the relationship of living organisms with each other and with their environment.'**
- The term ecology was first coined in 1869 by the German biologist Ernst Haeckel. It has been derived from two Greek words, 'Oikos', meaning home or estate, and 'logos' meaning study.
- **The emphasis is on relationships between organisms and the components of the environment namely abiotic (non-living) and biotic (living).**
- It deals with the ways in which organisms are molded by their environment, how they make use of environmental resources including energy flow and mineral cycling.

When and how did the ecology start?

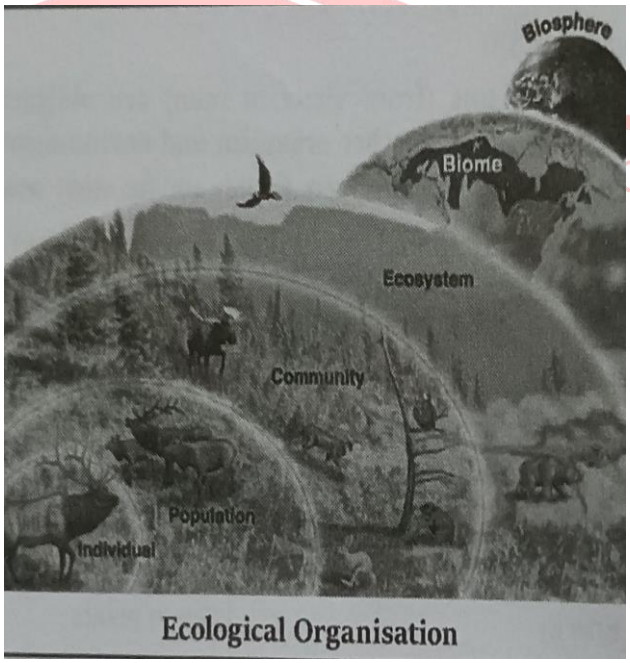
- **The genesis ecology is as old as human civilization. In primitive societies, every individual was required to have an intimate knowledge of his environment for their survival, i.e., about the forces of nature and of plants and animals around him.**
- The Indian classical ancient texts have references to the principles of ecology. The ancient Vedas, the Samhitas, the Brahmanas, and the Aranyakas-Upanishads contain many references to ecological concepts.
- The Indian treatise on medicine, the Charaka Samhita, and the surgical text SusrutaSamhita show that people during this period had a good understanding and knowledge of plant and animal ecology.
- **We came to know that ecology is the 'scientific study of the relationship of living organisms with each other and their environment'.**

What is the Environment?

- **Everything that surrounds or affects an organism during its lifetime is collectively known as its environment which comprises both living (biotic) and nonliving (abiotic) components.**
- **All organisms (from virus to man) are obligatorily dependent on the environment for food, energy, water, oxygen, shelter, and other needs.**

- The environment is defined as 'the sum total of living, non-living components; influences and events surrounding an organism'.
- And we can say that this environment constitutes two components viz. **abiotic and biotic components.** These both are not static but are in flux and keep on changing continuously.
- **Biotic components are living. Example plants, animals, parasites, decomposers, Man, etc.**
- **Abiotic components are non-living. Example energy, radiation, heat flow, water, soil, air, etc.**
- The relationship and interaction between organisms and the environment are highly complex. No organism can live alone without interacting with other organisms. So, each organism has other organisms as a part of its environment. Each and everything with which we interact or which we need for our sustenance forms our environment

Levels of organization in ecology –



Ecological Organisation

Levels of organization in ecology

Ecology is a science that studies the interdependent, mutually reactive and interconnected relationship between the organisms and their physical environment on the one hand and among the organisms on the other hand. Ecology not only deals with the study of the relationship of individual organisms with their environment, but also with the study of populations, communities, ecosystems, biomes, and biosphere as a whole.

The main levels of organization in ecology are six and are as follows.

- Individual
- Population
- community
- Ecosystem
- Biome
- Biosphere

Individual

The organism is an individual living being that has the ability to act or function independently. It may be a plant, animal, bacterium, fungi, etc.It is a body made up of organs, organelles, or other parts that work together to carry out the various processes of life.

Population

A population is a group of organisms usually of the same species, occupying a defined area during a specific time.Population growth rate is the percentage variation between the number of individuals in a population at two different times. Therefore the population growth rate can be positive or negative. The main factors that make the population increase are birth and immigration. The main limiting factors for the growth of a population are **abiotic and biotic components.**

Community

In ecology, the term community, or more appropriately 'biotic community', refers to the populations of different kinds of organisms living together and sharing the same habitat.

For eg: Animals require plants for food and trees for shelter. Plants require animals for pollination, seed dispersal, and soil microorganism to facilitate nutrient supply.

The characteristic pattern of the community is termed as the structure of the community and is determined by:

- the roles played by its various populations
- the range of its various populations
- the type of area that is inhabited by the populations of the community
- the diversity of species in the community

- the interactions between various populations of the community inhabiting the area.

Members of a community also actively interact with their environment. In a community, only those plants and animals survive which are adapted to a particular environment. The climate determines the type of environment, hence, the type of organisms in a community.

For example, it is the climate of the area which determines whether a given area becomes a desert or a forest.

Communities created by humans such as lawns or crop communities are such man-made communication that crop communities are relatively simple and consist of only one species as opposed to a natural community characterized by a large number of species.

Do you know?

The skies over North India are seasonally filled with a thick soup of aerosol particles all along the southern edge of the Himalayas, Bangladesh and the Bay of Bengal-NASA research findings.

Man-made communities are very unstable and require a great deal of care and constant manipulation and maintenance.

Types of Community

On the basis of size and degree of relative independence communities may be divided into two types:

Major Community:

These are large-sized, well organized and relatively independent. They depend only on the sun's energy from outside and are independent of the inputs and outputs from adjacent communities.

Example: **tropical evergreen forest in the North-East.**

Minor Communities:

These are dependent on neighboring communities and are often called societies. They are secondary aggregations within a major community and are not therefore completely independent units as far as energy and nutrient dynamics are concerned.

Example: **A mat of lichen on a cow dung pad.**

Structure of a community

In a community the number of species and size of their population vary greatly. A community may have one or several species. The environmental factors determine the characteristics of the community as well as the pattern of organisation of the members in the community. The characteristic pattern of the community is termed as structure which is reflected in the roles played by various populations, their range, the type of area they inhabit, the diversity of species in the community and the spectrum of Interactions between them.

Ecosystem

An ecosystem is defined as a structural and functional unit of biosphere consisting of a community of living beings and the physical environment, both interacting and exchanging materials between them. The term 'ecosystem 'was coined by A.G. Tansley in 1935. An ecosystem is a functional unit of nature encompassing complex interaction between its biotic (living) and abiotic (nonliving) components. For example- **a pond is a good example of an ecosystem.**

Ecosystems vary greatly in size and elements, but each is a functioning unit of nature. Everything that lives in an ecosystem is dependent on the other species and elements that are also part of that ecological community. If one part of an ecosystem is damaged or disappears, it has an impact on everything else. The ecosystem can be as small as a single tree or as large as the entire forest.

Components of an Ecosystem

They are broadly grouped into:

- Abiotic components
- Biotic components

Abiotic Components (Nonliving):

Abiotic components are the inorganic and nonliving parts of the world.

The abiotic component can be grouped into the following three categories:

Physical factors: Sunlight, temperature, rainfall, humidity, and pressure. They sustain

2.BOREAL FOREST (TAIGA)

- Dense evergreen needle-leafed forest.
- Typical plants include white spruce, black spruce, and jack pine.
- Typical animals include moose, black bears, wolves, and migrant birds.
- Cold winters with deep snow, but longer growing season than the tundra. The warm-month average temperature is greater than 100 C. Periodic fires are common.

3. TEMPERATE FOREST

- Dense forest with thin, broad, deciduous leaves; or rainforests typically dominated by conifers. Tall trees with single boles creating deep shade. Understories are often sparse.
- Typical plants include maples, oaks, elms (deciduous) spruce or araucaria (rainforest).
- Typical animals include deer and squirrels.
- Freezing winters and warm, wet summers and a longer growing season than the boreal forest.

4. GRASSLANDS (STEPPE)

- Treeless vegetation less than 1 m high.
- Typical plants include grasses and members of the sunflower family. Woody plants predominate in steppes.
- Typical animals include large grazing ungulates such as horses, buffalo, and rhinoceros.
- Cold or warm winters with growing seasons moisture too dry for trees; fires every 1- 5 years.

5. DESERT

- Sparse drought-resistant vegetation, typically spiny and with tiny leaves and photosynthetic bark.
- Typical plants include cactuses, acacias, and short-lived annuals.
- Typical animals include reptiles and ground-dwelling rodents.
- Precipitation is low (less than 250 mm/yr) and evapotranspiration high (more than 250 mm/yr). Temperature is generally high. Fires generally are rare due to low biomass.

6. TROPICAL DECIDUOUS FOREST AND SAVANNAH

- Thorny forest, woodlands, or scattered trees, many of which loose leaves during the dry season.
- Typical plants include acacias and grasses.
- Typical animals include giraffes and elephants.
- Warm frost-free winters, hot usually-wet summers, and a pronounced dry season. Fire and grazing are important vegetation-forming processes.

7. TROPICAL RAINFOREST

- Dense tall evergreen forest.
- Typical plants include strangler figs and tree ferns.
- Typical animals include snakes and birds.
- Mild frost-free winters and summers with year-round rain.

AQUATIC ZONES

Aquatic systems are not called biomes; however, they are divided into distinct life zones, with regions of relatively distinct plant and animal life. The major differences between the various aquatic zones are due to salinity, levels of dissolved nutrients; water temperature, depth of sunlight penetration.

Types of Aquatic Ecosystem:

- **Fresh Water Ecosystem**- The freshwater ecosystem is classified as lotic (moving water) or lentic (still or stagnant water). The lotic water system includes freshwater streams, springs, rivulets, creeks, brooks,
- and rivers. Lentic water bodies include pools, ponds, some swamps, bogs, and lakes. They vary considerably in physical, chemical, and biological characteristics.
- **Marine Ecosystem** – Nearly three-quarters of the earth's surface is covered by the ocean with an average depth of 3,750 m and with salinity 35 ppt, (parts per thousand), about 90 percent of which is sodium chloride.
- **Estuaries** – Coastal bays, river mouths, and tidal marshes from the estuaries. In estuaries, freshwater from rivers meets ocean water and the two are mixed by the action of tides. Estuaries are highly productive as compared to the adjacent river or sea.

Biosphere

The biosphere is a part of the earth where life can exist. The biosphere represents a highly integrated and interacting zone comprising the atmosphere (air), hydrosphere (water) and lithosphere (land). It is a narrow layer around

the surface of the earth. If we visualize the earth to be the size of an apple the biosphere would be as thick as its skin.

The biosphere is absent at extremes of the North and South poles, the highest mountains and the deepest oceans since existing hostile conditions there do not support life. Occasionally spores of fungi and bacteria do occur at a great height beyond 8,000 meters, but they are not metabolically active, and hence represent only dormant life. Living organisms are not uniformly distributed throughout the biosphere. Only a few organisms live in the Polar Regions, while the tropical rain forests have an exceedingly rich diversity of plants and animals.

Functions of an ecosystem & Ecological Succession:

Ecosystem is defined as the interaction between Biotic and Abiotic components, OR interaction of the organism with the surrounding environment.

Functions of an ecosystem

The functional attributes of the ecosystem keep the components running together. Ecosystem functions are natural processes or exchange of energy that takes place in various plant and animal communities of different biomes of the world.

It can be studied under the following three heads-

- Energy flow
- Nutrient cycling (biogeochemical cycles)
- Ecological succession or ecosystem development

Energy flow

Energy is the basic force responsible for all metabolic activities. The flow of energy from producer to top consumers is called unidirectional energy flow.

The study of Trophic level interaction in an ecosystem gives an idea about the energy flow through the ecosystem.

Trophic level interaction

Trophic level interaction deals with how the members of an ecosystem are connected based on nutritional needs.

Following trophic levels can be identified in a food chain.

- **Autotrophs**: They are the producers of food for all other organisms of the ecosystem. They are largely green plants and convert inorganic material in the presence of solar energy by the process of photosynthesis into chemical energy (food). The total rate at which the radiant energy is stored by the process of photosynthesis in the green plants is called Gross Primary Production (GPP). This is also known as total photosynthesis or total assimilation. From the gross primary productivity, a part is utilized by the plants for their metabolism. The remaining amount is stored by the plant as Net Primary Production (NPP) which is available to consumers.
- **Herbivores**: The animals which eat the plants directly are called primary consumers or herbivores e.g. insects, birds, rodents and ruminants.
- **Carnivores**: They are secondary consumers if they feed on herbivores and tertiary consumers if they use carnivores as their food. e.g. frog, dog, cat and tiger.
- **Omnivores**: Animals that eat both plant and animals e.g. pig, bear and man
- **Decomposers**: They take care of the dead remains of organisms at each trophic level and help in recycling the nutrients e.g. bacteria and fungi. Energy flows through the trophic levels from producers to subsequent trophic levels. This energy always flows from lower {producer) to higher (herbivore, carnivore, etc.) trophic level. It never flows in the reverse direction that is from carnivores to herbivores to producers.

There is a loss of some energy in the form of unusable heat at each trophic level so that energy level decreases from the first trophic level upw

The trophic level interaction involves three concepts namely:

- Food Chain
- Food Web
- Ecological Pyramid

Food Chain

Transfer of food energy from green plants (producers) through a series of organisms with repeated eating and being eaten is called a food chain. e.g.

Grasses → Grasshopper → Frog → Snake → Hawk/Eagle

Each step in the food chain is called a trophic level. In the above example grasses are 1st, and the eagle represents the 5th trophic level.

Types of Food Chains

In nature, two main types of food chains have been distinguished:

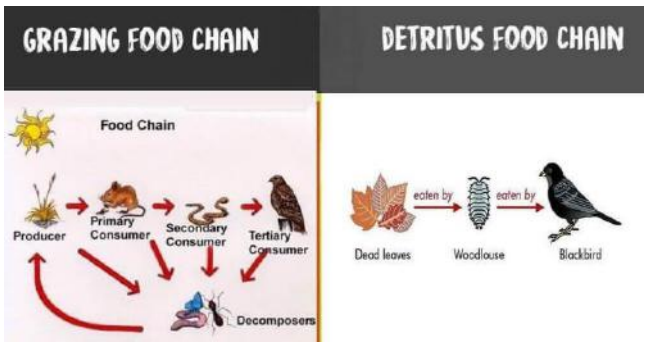
- Grazing food chain
- Detritus food chain

Grazing food chain

The consumers who start the food chain, utilizing the plant or plant part as their food, constitute the grazing food chain. This food chain begins from green plants at the base and the primary consumer is an herbivore. For example, in the terrestrial ecosystem, the grass is eaten up by caterpillars, which are eaten by lizards and lizards are eaten by snakes. In the Aquatic ecosystem phytoplankton's (primary producers) are eaten by zooplanktons which are eaten by fishes and fishes are eaten by pelicans.

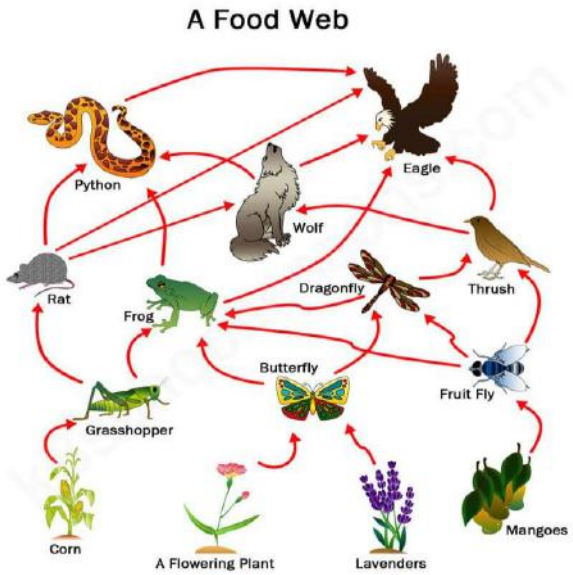
Detritus food chain

The food chain starts from dead organic matter of decaying animals and plant bodies to the microorganism and then to detritus feeding organisms called detritivores or decomposers and to other predators. The distinction between these two food chains is the source of energy for the first level consumers. In the grazing food chain, the primary source of energy is living plant biomass while in the detritus food chain the source of energy is dead organic matter or detritus.



Food Web

Trophic levels in an ecosystem are not linear rather they are interconnected and make a food web. Thus, the food web is a network interconnected food chains existing in an ecosystem. One animal may be a member of several different food chains. Food webs are more realistic models of energy flow through an ecosystem.



The flow of energy in an ecosystem is always unidirectional. The quantity of energy flowing through the successive trophic levels decreases as shown by the reduced sizes of boxes in figure (see below diagram). At every step in a food chain or web the energy received by the organism is used to sustain itself and the leftover is passed on to the next trophic level.

Ecological Pyramid

Ecological pyramids are the graphic representations of trophic levels in an ecosystem. They are pyramidal and they are of three types: The producers make the base of the pyramid and the subsequent tiers of the pyramid represent herbivore, carnivore and top carnivore levels.

The pyramid consists of several horizontal bars depicting specific trophic levels which are arranged sequentially from primary producer level through herbivore, carnivore onwards. The length of each bar represents the total number of individuals at each trophic level in an ecosystem. The number, biomass and energy of organisms gradually decrease with each step from the producer level to the consumer level and the

CHAPTER - 13

BIOSPHERE RESERVES IN INDIA

There are living organisms all around us and we must make a conscious effort to preserve as well as conserve this biodiversity in our environment. Simply put, **Biosphere Reserves can be defined as widespread areas of biodiversity wherein fauna and flora are protected.**

'Biosphere' refers to water, land, and atmosphere that supply life on our planet. The word 'reserve' symbolizes that it is a special area designated for creating a balance between conservation and sustainable use. You must not misinterpret the word 'reserve' to be a place that is set aside from human use and development. A biosphere reserve program also aims at studying human interaction with a particular area. Biosphere reserves are a great example of community-based initiatives aimed towards the protection of our natural environment while also ensuring consistent healthy growth of the local economy. It can include one or **more National Parks or sanctuaries**. Protection is granted to all the living organisms flourishing inside the boundaries of the reserve, including flora, fauna as well as the human communities who inhabit those regions.

Biosphere Reserves

The biosphere reserve network was **launched in 1971 by UNESCO, two years after the initiation of MAB- Man and the biosphere program.**

As per the law, these regions of environmental protection are related to the International Union for Conservation of Nature (IUCN) Category V Protected areas.

- Biosphere Reserve (BR) is an international designation by the United Nations Educational, Scientific and Cultural Organization (UNESCO) for representative parts of natural and cultural landscapes extending over large areas of terrestrial or coastal/marine ecosystems or a combination of both.
- Biosphere Reserves tries to balance economic and social development and maintenance of associated cultural values along with the preservation of nature.
- Biosphere Reserves are thus special environments for both people and nature and are living examples of how human beings and nature can co-exist while respecting each others' needs.
- **Biosphere Reserve (BR) is not covered under any law.**

  The first biosphere reserve of the world was established in 1979. There are 701 Biosphere reserves across **124 countries** in the world which also include 21 transboundary sites.

Criteria for Designation of Biosphere Reserve

- A site must contain a protected and minimally disturbed core area of value of nature conservation.
- **Core area** must be a bio-geographical unit and should be large enough to sustain a viable population representing all trophic levels.
- The involvement of local communities and use of their knowledge in biodiversity preservation.
- Areas potential for preservation of traditional tribal or rural modes of living for harmonious use of the environment.

Structure of Biosphere Reserve

- **Core Areas:**
- It is the most protected area of a biosphere reserve. It may contain endemic plants and animals.
- They conserve the wild relatives of economic species and also represent important genetic reservoirs having exceptional scientific interest.
- A core zone is a protected region, like a National Park or Sanctuary/protected/regulated mostly under the Wildlife (Protection) Act, 1972. It is kept free from human interference.
- **Buffer Zone**:
- The buffer zone surrounds the core zone and its activities are managed in this area in the ways that help in the protection of the core zone in its natural condition.
- It includes restoration, limited tourism, fishing, grazing, etc; which are permitted to reduce its effect on the core zone.
- Research and educational activities are to be encouraged.

- **Transition Zone:**
- It is the outermost part of the biosphere reserve. It is the zone of cooperation where human ventures and conservation are done in harmony.
- It includes settlements, croplands, managed forests, and areas for intensive recreation and other economic uses characteristics of the region.

Functions of Biosphere Reserve

- **Conservation:**
- Managing Biosphere Reserve's genetic resources, endemic species, ecosystems, and landscapes.
- It may prevent man-animal conflict eg. death of tiger Avni who was shot dead when she turned man-eater
- Along with the wildlife, culture and customs of tribals are also protected
- **Development:**
- Promoting economic and human growth that is sustainable on a sociocultural and ecological level. It seeks to strengthen the three pillars of sustainable development: social, economic, and protection of the environment.
- **Logistic support:**
- Promoting research activities, environmental education, training, and monitoring in the context of local, national, and international conservation and sustainable development.

UNESCO Protected Biosphere Reserves.

The World Network of Biosphere Reserves (WNBR) covers globally chosen protected areas. It consists of a vibrant and interactive network of sites of distinction. It promotes the harmonious assimilation of people and nature for sustainable development in different ways. If one country declares one area as a biosphere reserve, it can nominate the same under the UNESCO's Man and Biosphere (MAB) Programme. If UNESCO accepts the proposal of the government, the biosphere reserve will enter into the World Network of Biosphere Reserves (WNBR). UNESCO has introduced the designation 'Biosphere Reserve' for natural areas to minimize conflict between development and conservation. Biosphere Reserves are nominated by the national government which meets a minimal set of criteria under the Man and Biosphere Reserve Program of UNESCO.

Man and Biosphere Programme

- Launched in 1971, UNESCO's Man and the Biosphere Programme (MAB) is an intergovernmental scientific program that aims to establish a scientific basis for the improvement of relationships between people and their environments.
- MAB combines natural and social sciences, economics, and education to improve human livelihoods and the equitable sharing of benefits, and to safeguard natural and managed ecosystems, thus promoting innovative approaches to economic development that are socially and culturally appropriate, and environmentally sustainable.

There are total 12 biosphere reserves of India which have been recognized internationally under Man and Biosphere Reserve program:

- Nilgiri (First to be included)
- Gulf of Mannar
- Sunderban
- Nanda Devi
- Nokrek
- Pachmarhi
- Similipal
- Achanakmar – Amarkantak
- Great Nicobar
- Agasthyamala
- Khangchendzonga
- Panna National Park

YEAR	NAME	STATES
2001	Sundarbans Biosphere Reserve	West Bengal
2009	Simlipal Biosphere Reserve	Odisha
2009	Pachmarhi Biosphere Reserve	Madhya Pradesh
2009	Nokrek Biosphere Reserve	Meghalaya
2000	Nilgiri Biosphere Reserve	Tamil Nadu
2004	Nanda Devi	Uttarakhand

	Biosphere Reserve	
2001	Gulf of Mannar Biosphere Reserve	Tamil Nadu
2013	Great Nicobar Biosphere Reserve	Great Nicobar
2012	Achanakmar-Amarkantak Biosphere Reserve	Chhattisgarh
2016	Agasthyamala Biosphere Reserve	Kerala and Tamil Nadu
2018	Kanchenjunga Biosphere Reserve	Part of North and West Sikkim districts
2020	Panna National Park	Madhya Pradesh

Biosphere Reserves in India

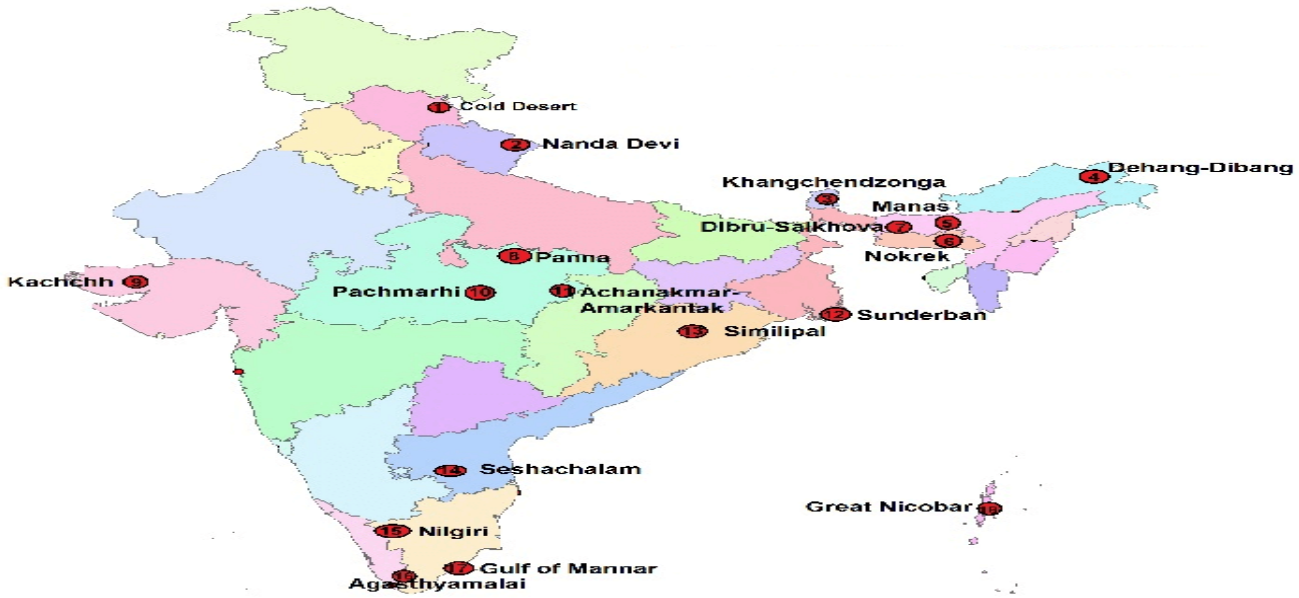
Biosphere reserves are announced by the state or central governments by notification. The Governments can nominate them under the UNESCO's Man and Biosphere (MAB) Programme after its establishment as a biosphere reserve.

There are 18 biosphere reserves in India:

- Cold Desert, Himachal Pradesh
- Nanda Devi, Uttrakhand
- Khangchendzonga, Sikkim
- Dehang-Debang, Arunachal Pradesh
- Manas, Assam
- Dibru-Saikhowa, Assam
- Nokrek, Meghalaya
- Panna, Madhya Pradesh (Smallest Area)
- Pachmarhi, Madhya Pradesh
- Achanakmar-Amarkantak, Madhya Pradesh-Chhattisgarh
- Kachchh, Gujarat (Largest Area)
- Similipal, Odisha
- Sundarban, West Bengal
- Seshachalam, Andhra Pradesh
- Agasthyamalai, Tamil Nadu-Kerala
- Nilgiri, Tamil Nadu-Kerala (First to be Included)
- Gulf of Mannar, Tamil Nadu
- Great Nicobar, Andaman & Nicobar Island.

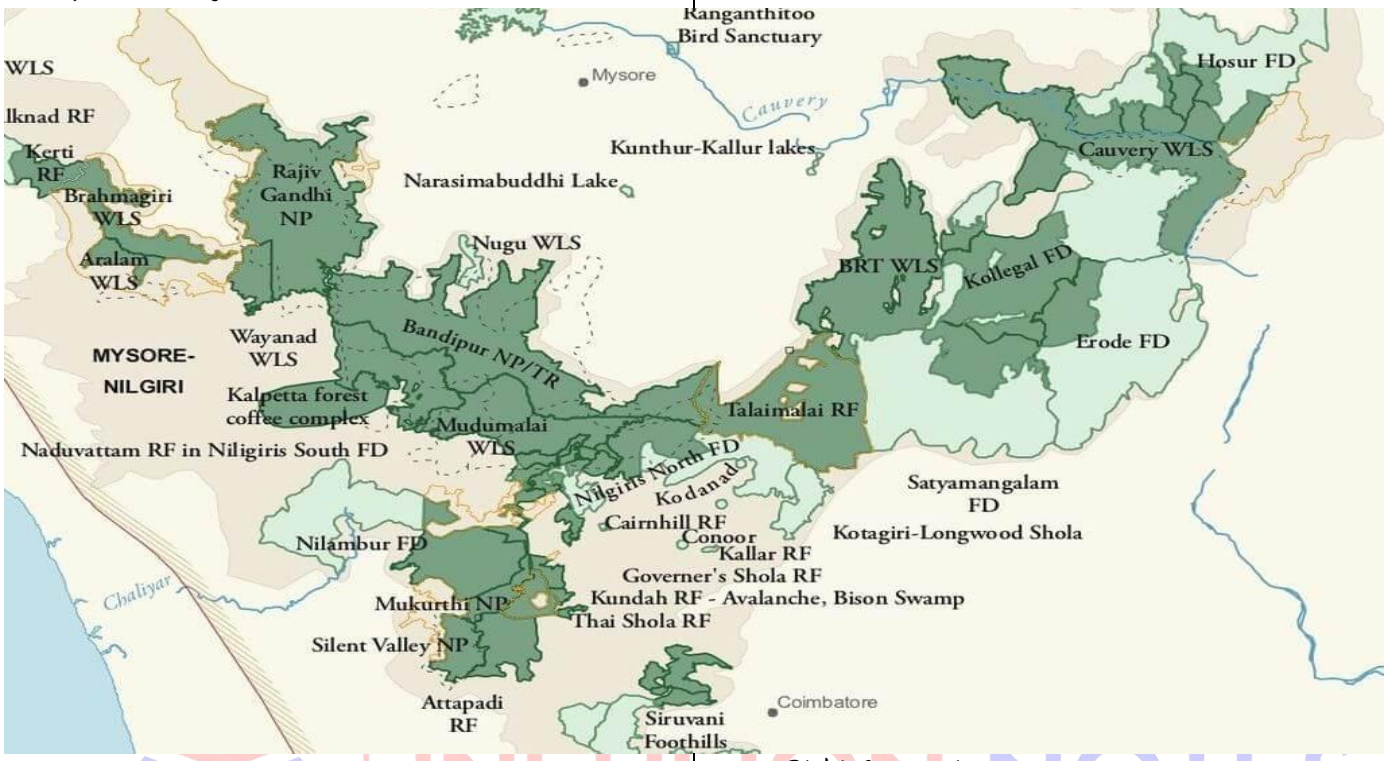
Biosphere Conservation:

- A scheme called Biosphere Reserve has been implemented by the Government of India since 1986, in which financial assistance is given in 90:10 ratio to the North Eastern Region States and three Himalayan states and in the ratio of 60:40 to other states for maintenance, improvement, and development of certain items.
- The State Government prepares the Management Action Plan which is approved and monitored by the Central MAB Committee.



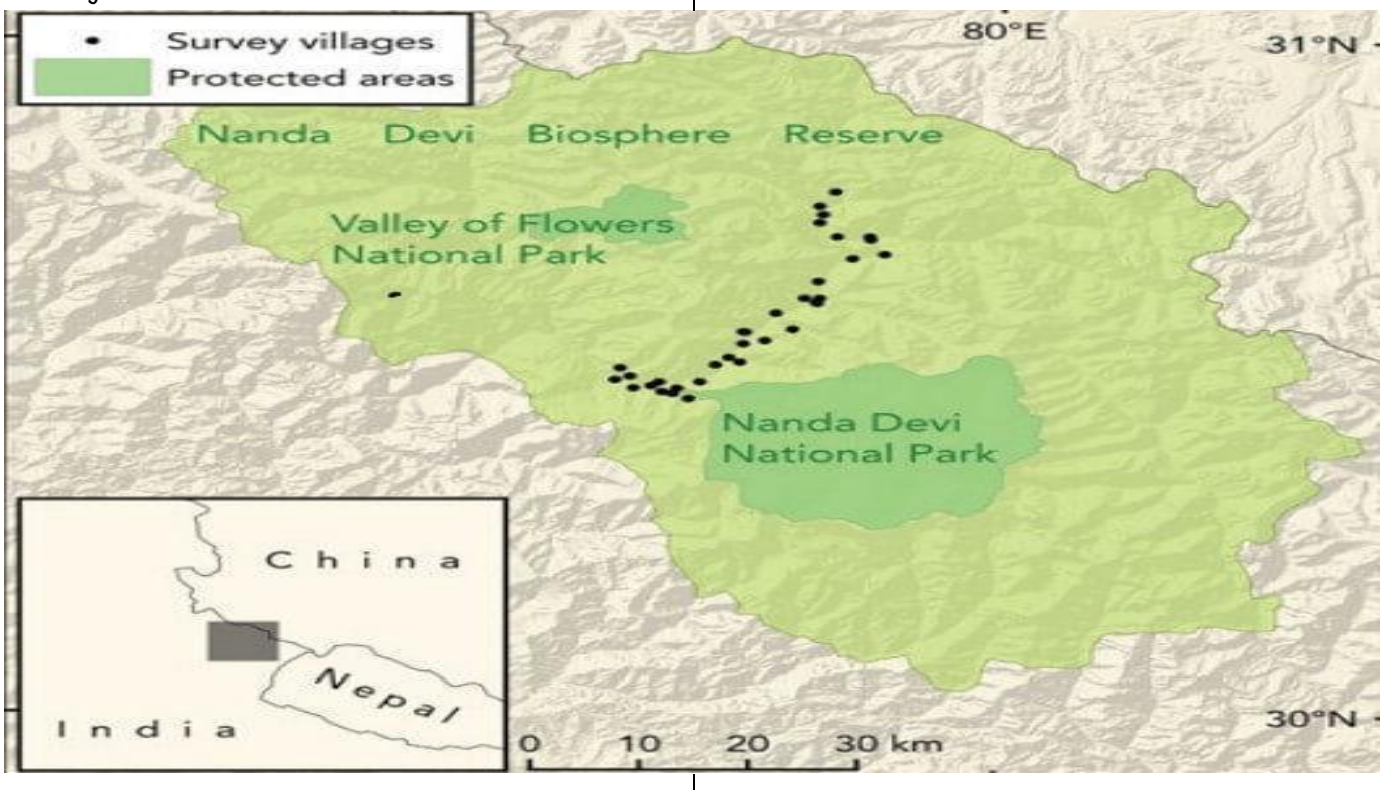
1. Nilgiri

- *Designated as a biosphere reserve in 1986, Nilgiri falls within the state boundaries of Karnataka, Kerala, and Tamil Nadu, along the western ghats.*
- *The key fauna of the Nilgiris is the Lion-tailed Macaque and Nilgiri Tahr.*
- *It includes the **Aralam, Mudumalai, Mukurthi, Nagarhole, Bandipur, and Silent Valley national parks, as well as the Wayanad and Sathyamangalam wildlife sanctuaries.***



2. Nanda Devi

- *Designated as a biosphere reserve in the year 1988, Nanda Devi falls within the state boundaries of Uttarakhand, along the western Himalayas.*
- *Rishi Ganga river*
- *UNESCO World Heritage Site*
- *Himalayan Musk Deer, Mainland Serow, Himalayan Tahr.*



Difference between Biosphere Reserves, National Park and WildLife SaSanctuaries.

1.Biosphere Reserve

The International Coordinating Council (ICC) of UNESCO's designation of 'Biosphere reserve' for natural areas **became active in November 1971.**

- **Features of Biosphere Reserve**
- These are marked areas covering a larger area of land which includes multiple National Parks, Sanctuaries, and reserves as well
- These places are meant for the conservation of biodiversity of a specific area
- The **3 areas include Core, Buffer & Marginal. There's no outside Species allowed.**
- It is used for Conservation & research purpose.
- It is internationally recognized within the framework of UNESCO's Man and Biosphere (MAB) program and nominated by national governments.

Wildlife Sanctuary

- It is a declared area where endangered species are kept. It restricts any activity that would put the protected animals in any state of undue stress or harm.

Features of Wildlife Sanctuary

- It is a natural area declared/protected by a governmental or private agency for the conservation of particular species.
- It is strictly designated for the protection of wild fauna.
- Only fauna is conserved. No outside activities are allowed
- It comes under the category called "Protected Areas". The Protected Areas are declared under Wildlife (Protection) Act, 1972.
- The International Union for Conservation of Nature (IUCN) has defined its Category IV type of protected areas.

3.National Park

- National parks are home to multiple species of birds and animals which is marked by the Central And State Government for the purpose of conservation.

Features of National Park

- It is reserved land owned by the government.
- The area is protected from industrialization, human exploitation, and pollution.
- Cutting, Grazing, and Outside Species Is not Allowed
- It comes under the category called "Protected Areas". The Protected Areas are declared under Wildlife (Protection) Act, 1972.
- The International Union for Conservation of Nature (IUCN), and its World Commission on Protected Areas, has defined its Category II type of protected areas.

Natural World Heritage Sites

- Kaziranga National Park – Assam
- Manas Wildlife Sanctuary – Assam
- Nanda Devi National Park and Valley of Flowers– Uttarakhand
- Great Himalayan National Park – Himachal Pradesh
- Sunderbans National Park – West Bengal
- Western Ghats
- Keoladeo Ghana National Park – Rajasthan.

Potential sites

The following is a list of potential sites for Biosphere Reserves as selected by Ministry of Forests and Environment:

- **Abujmarh, Chhattisgarh**
- **Andaman and Nicobar, North Islands**
- **Chintapalli, Visakhapatnam Andhra Pradesh**
- **Kanha, Madhya Pradesh**
- **Kovalam, Kerala**
- **Lakshadweep Islands, Lakshadweep**
- **Little Rann of Kutch, Gujarat**
- **Phawngpui (Blue Mountain), Mizoram**
- **Namdapha, Arunachal Pradesh**
- **Singhbhum, Jharkhand**
- **Tawang and West Kameng, Arunachal Pradesh**
- **Thar Desert, Rajasthan**
- **Tadoba National Park and Sanjay Gandhi National Park, Maharashtra.**

- **BR: Biosphere Reserve**
- **NP: National Park**
- **TR: Tiger Reserve.**
- **WS/WLS: Wildlife Sanctuary**
- **BS: Bird Sanctuary**
- **PF: Protected Forest**
- **RF: Reserve Forest**
- **ER: Elephant Reserve**

1. Kamlang, Arunachal

Kamlang river

- *Lohit district*
- *Tropical, Subtropical*
- *Tiger, leopard, clouded leopard, snow leopard*
- *Mishmi, Digaru, Mizo tribes*
- *It is separated from Namdapha by the Lang River*

2. Namdapha, Arunachal

- *Changlang district*
- *Biodiversity hotspots in Eastern Himalayas*
- *The fourth-largest national park of India*
- *Mishmi and Patkai Bum hills*
- *Evergreen, tropical, semi-tropical, temperate, arctic*
- *Tiger, leopard, clouded leopard, snow leopard*
- *Palearctic and Indo-Malayan biogeographic areas*
- *Namdapha Flying Squirrel which is endemic and critically endangered*
- *Dhole, red panda, marbled cat, fishing cat, binturong, takin, Bharal, serow, capped langur*

3. Pakhui(Pakke), Arunachal

- *East Kameng District*
- *Hornbill is found*
- *Kameng River*
- *Nameri National Park of Assam is nearby.*

4. Kaziranga, Assam

- *Golaghat, Karbi Anglong and Nagaon districts*
- *Famous for Great One-horned rhinoceros*
- *Highest tiger density*
- *Elephants, wild water buffalo*
- *Brahmaputra river*
- *Elephant reserve, National park, Biodiversity hotspot*
- *It is not a biosphere reserve.*
- *Important bird area by Birdlife International*

5. Manas, Assam

- *TR, NP, BR, UNESCO World Heritage Site*
- *Royal Manas NP in Bhutan is contiguous*
- *Manas river flows through it which is a tributary of Brahmaputra river*

- Assam roofed turtle, hispid hare, golden langur, pygmy hog, wild water buffalo.

6. Nameri, Assam

- Sonitpur district of Assam
- Lies just south of Pakke Tiger Reserve of Arunachal Pradesh

7. Orang, Assam

- Brahmaputra river
- Darrang and Sonitpur district
- Indian Rhinoceros, Pygmy hog, Asian elephant, wild water buffalo, Bengal tiger
- It is the only stronghold of rhinoceros on the north bank of the Brahmaputra river.

8. Dampa, Mizoram

- Lushai Hills

9. Rajaji TR, Uttarakhand

- Shivaliks
- Named after C. Rajagopalchari
- Ganga and Song rivers
- Goral is found here
- Asian elephant, Bengal tiger, Leopard, Jungle cat, striped hyena, Goral.

10. Corbett , Uttarakhand

- Oldest NP of India, created in 1936
- Earlier called Hailey National Park
- Nainital and Pauli Garhwal districts
- Ramganga river
- The first national park of Asia
- Spotted deer, sambar deer, elephant, tawny fish owl, golden jackal.

11. Dudhawa, UP

- Billy Arjan Singh – famous for conservation of Tiger
- In the Terai belt of marshy grasslands of (Lakhimpur Kheri district) northern Uttar Pradesh.
- Swamp deer, Sambar deer, barking deer, spotted deer, hog deer, sloth beer, ratel, jackal, civets, jungle cats, fishing cat, leopard cat.
- It is the only place in the U.P. where both Tigers and Rhinos can be spotted together.
- It comprises of:

- Dudhwa National Park through which Suheli and Mohana streams flow,
- Kishanpur Wildlife Sanctuary through which Sharda River flows, and
- Katarniaghat Wildlife Sanctuary through which Geruwa River flows.
- All of these rivers are tributaries of the Ghagra River.

12. Pilibhit, UP

- Pilibhit, Lakhimpur Kheri, Bahraich districts
- In 2020, it bagged international award Tx2 for doubling up the number of tigers in the past four years.
- River Sharada(Mahakali), River Ghagra It forms part of Terai Arc Landscape in the upper Gangetic Plain.
- The northern edge of the reserve lies along the Indo-Nepal border while the southern boundary is marked by the river Sharada and Khakra.
- Wild animals include tiger, swamp deer, bengal florican, leopard, etc.
- It has high sal forests, plantations, and grasslands with several water bodies.

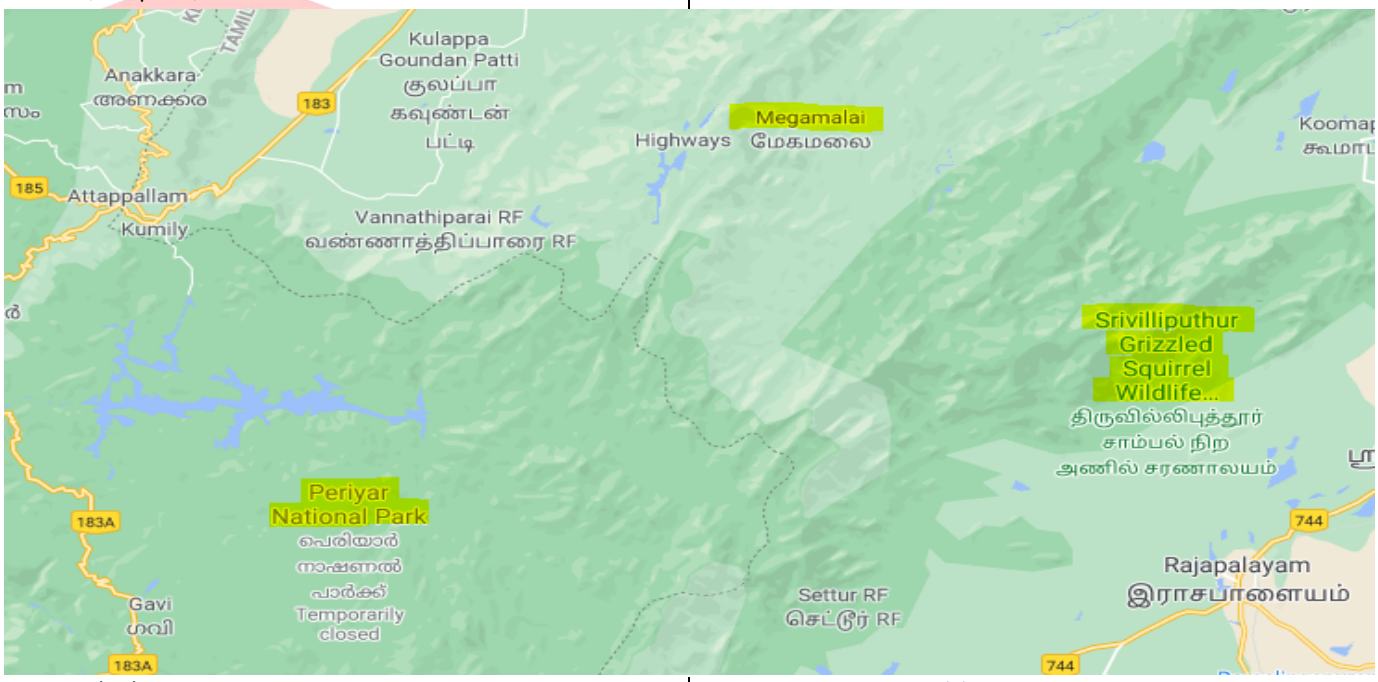
13. Valmiki , Bihar

- West Champaran district
- Royal Chitwan national park of Nepal is contiguous
- River Gandak
- Barking deer, spotted deer, hog deer, sambar, blue bull, spotted hyena, leopard cat, wild cat, fishing cat, flying squirrel, clouded leopard, Indian gaur, Mongoose

14. Palamu TR, Jharkhand

- Betla NP and Palamu WS
- Naxal affected
- One among the original 9 tiger reserves

- **North Koel river**



15. Sunderbans, WB

- NP, TR, BR
- Ganges river
- Mangrove-ecotone
- Sundarbans mangrove forest, one of the largest such forests in the world, lies across India and Bangladesh on the delta of the Ganges, Brahmaputra, and Meghna rivers on the Bay of Bengal.
- Saltwater crocodile
- Recently declared Ramsar site
- UNESCO World Heritage site
- It is home to many rare and globally threatened wildlife species such as the estuarine crocodile, Royal Bengal Tiger, Water monitor lizard, Gangetic dolphin, and olive ridley turtles.

16. Buxa, WB

- North part of WB
- Near Manas TR
- Asian elephant, gaur, sambar deer, clouded leopard, Indian leopard, Bengal tiger

- Fambong Lho WLS- Sikkim
- Kitam WLS (Bird)-Sikkim
- Kyongnosla Alpine WLS-Sikkim
- Maenam WLS -Sikkim
- Pangolakha WLS-Sikkim
- Shingba (Rhododendron) WLS-Sikkim
- Fakim WLS-Nagaland
- Puliebadze WLS-Nagaland
- Rangapahar WLS-Nagaland
- Baghmara Pitcher Plant WLS -Meghalaya
- Nongkhyllem WLS-Meghalaya
- Siju WLS-Meghalaya
- Narpuh WLS- Meghalaya
- Gumti WLS-Tripura
- Rowa WLS-Tripura
- Sepahijala WLS-Tripura
- Trishna WLS- Tripura

Nagarjuna Sagar-Srisailam WLS is calculated two times Andhra Pradesh & Telangana.

Gahirmatha Marine Sanctuary

- Gahirmatha is the mass nesting spot in the Indian Ocean region and the only turtle sanctuary in Odisha.
- It is the world's largest nesting beach of Olive Ridley Sea Turtles.
- Gahirmatha was declared a turtle sanctuary in 1997 by the Odisha government after considering its ecological importance and as part of efforts to save the sea turtles.
- It extends from the Dhamra River mouth in the north to the Brahmani river mouth in the south.
- The wetland is represented by 3 Protected Areas, the Bhitarkanika National Park, the Bhitarkanika Wildlife Sanctuary, and the Gahirmatha Marine Sanctuary.

Olive Ridley Turtle

- The Olive ridley turtles are the smallest and most abundant of all sea turtles found in the world, inhabiting warm waters of the Pacific, Atlantic and Indian oceans.
- These turtles are carnivores and get their name from their olive-colored carapace.
- They are best known for their unique mass nesting called Arribada, where thousands of females come together on the same beach to lay eggs.
- The olive ridley turtles turn up in millions for mass nesting along the Odisha coast every year, namely at three river mouths: Dhamara, Devi, and Rushikulya.
- The species is listed as Vulnerable in the IUCN Red List, Appendix I in CITES, and Schedule I in Wildlife Protection Act, 1972.
- **Five species of sea turtles are known to inhabit Indian coastal waters and islands.**
- Olive Ridley turtle
- Green turtle
- Hawksbill turtle
- Loggerhead turtle
- Leatherback turtle
- Except, the Loggerhead, the remaining four species nest along the Indian coast.

NESTING SITES OF OLIVE RIDLEY TURTLES

Indian Forest Act 1927 –

The Indian Forest Act, 1927 was largely based on previous Indian Forest Acts implemented under the British. The most famous one was the Indian Forest Act of 1878. Both the 1878 act and the 1927 act sought to consolidate and reserve the areas having forest cover, or significant wildlife, to regulate movement and transit of forest produce, and the duty leviable on timber and other forest produce. It also defines the procedure to be followed for declaring an area to be a Reserved Forest, a Protected Forest, or a Village Forest. It defines what is a forest offence, what are the acts prohibited inside a Reserved Forest, and penalties leviable on violation of the provisions of the Act.

Definition of forest

- **ECOLOGICAL** – Area dominated by trees
- **LEGAL** – Area notified under the Forest Act, 1927
- **SURVEY** – Area of more than 1-hectare having canopy density of more than 10 percent
- **JUDICIAL** – Godavarman Case
- The Supreme Court judgment expanded the definition of the forest to include lands that were already notified by the Centre as forests, that appear in government records as forests as well as those that fell in the "dictionary definition" of the forest.

Background

- Indian Forest Act of 1865: The Imperial Forest Department, set up in 1864, attempted to establish British control over forests, by various legislations
- It empowered the British government to declare any land covered with trees as a government forest and make rules to manage it.
- Indian Forest Act of 1878: By the Forest Act of 1878, the British Administration acquired the sovereignty of all wastelands which by definition included forests.
- This Act also enabled the administration to demarcate reserved and protected forests. The local rights were refused in the case of protected forests while some privileges which were given to the local people by the government which can be taken away are anytime.
- This Act classified the forests into three – reserved forests, protected forests and village forests. It attempted to regulate the collection of forest produced by forest dwellers and some activities declared as offences and imprisonment and fines were imposed in this policy to establish state control over forests.

Indian Forest Act 1927

This Act impacted the life of forest-dependent communities. The penalties and procedures given in this Act aimed to extend the state's control over forests as well as diminishing the status of people's rights to forest use.

- The village communities were alienated from their age-old symbiotic association with forests. Further amendments were also made to restrain the local use of forests mainly by forest-dependent communities.
- It was enacted to make forest laws more effective and to improve the previous forest laws.

Objective

- To consolidate all the previous laws regarding forests.
- To give the Government the power to create different classes of forests for their effective usage for the colonial purpose.
- To regulate movement and transit of forest produce, and duty leviable on timber and other forest produce.
- To define the procedure to be followed for declaring an area as Reserved Forest, Protected Forest, or Village Forest.
- To define forest offenses acts prohibited inside the Reserved Forest, and penalties leviable on the violation.
- To make conservation of forests and wildlife more accountable.

Features

- Notification of forests in India is done under this act.
- The act also categorises forests in 3 types-
- Reserved Forest – Every activity is prohibited unless permitted.
- Protected Forest – Every activity is permitted unless prohibited.
- Village Forest – Very less restriction is there.
- The act has punishment for trade in timer, encroachment, etc.
- The act prescribes the creation of a state forest department to look after the forests.

Types of Forests

- **Reserved Forests**: Reserve forests are the most restricted forests and are constituted by the State Government on any forest land or wasteland which is the property of the Government.
- In reserved forests, local people are prohibited, unless specifically allowed by a Forest Officer in the course of the settlement.
- **Protected Forests**: The State Government is empowered to constitute any land other than reserved forests as protected forests over which the Government has proprietary rights and the

power to issue rules regarding the use of such forests.

- This power has been used to establish State control over trees, whose timber, fruit or other non-wood products have revenue-raising potential.
- **Village forest:** Village forests are the ones in which the State Government may assign to 'any village community the rights of Government to or over any land which has been constituted a reserved forest'.

Degree of protection

- **Reserved forests > Protected forests > Village forests Drawbacks**
- The government claimed that the act was aimed to protect the vegetation cover of India. However, a deep investigation of the act reveals that the real motive behind the act was to earn revenue from the cutting of the trees and from the forest produce.
- The act gave immense discretion and power to the forest bureaucracy which often led to the harassment of the forest dwellers.
- Moreover, it led to depriving the nomads and tribal people of their age-old rights and privileges to use the forests and forest produce.
- The revenue earning potential from timber overshadowed the other values like biodiversity, prevention of soil erosion, etc.

Criticism

- Forests were notified but tribal rights were not recognised. This made tribal unlawful settlers in the forest. This was the historic wrong done by the act. Finally, the historic wrong was corrected by the Forest Rights Act, 2006.

Current Issue

- Recently an amendment was made to declare bamboo as a minor forest produce only in non-forest areas.

Later Initiatives

- **Indian Forest Policy, 1952:** The Indian Forest Policy, 1952 was a simple extension of colonial forest policy. However, it became conscious about the need to increase the forest cover to one-third of the total land area.
- At that time maximum annual revenue from forests is a vital national need. The two World Wars, the need for defense, developmental projects such as river valley projects, industries like pulp, paper, and plywood, and communication heavily depended on forest produce for national interest. As a result, huge areas of forests were cleared to raise revenue for the State.
- **Forest Conservation Act, 1980:** The Forest Conservation Act, 1980 stipulated that central permission is necessary to practice sustainable agro-forestry in forest areas. Violation or lack of permit was treated as a criminal offense.
- It is targeted to limit deforestation, conserve biodiversity, and save wildlife. Though this Act provides greater hope towards forest conservation it was not successful in its target.
- **National Forest Policy, 1988:** The ultimate objective of the National Forest policy was to maintain environmental stability and ecological balance through the conservation of forests as a natural heritage.
- The National Forest Policy in 1988 made a very significant and categorical shift from commercial concerns to focus on the ecological role of the forests and participatory management.

Some of the other Acts related to forest conservation are :

- The Wildlife Protection Act of 1972, The Environment Protection Act of 1986, and The Biodiversity Protection Act of 2003.
- Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006: It has been enacted to recognize and vest the forest rights and occupation of forest land in forest-dwelling Scheduled Tribes and other traditional forest dwellers, who have been residing in such forests for generations.

Forest Conservation Act 1980

Forest (Conservation) Act was enacted for providing a higher level of protection to forests and to regulate the diversion of forest lands for non-forestry purposes.

Forest Conservation Act 1980

Alarmed at India's rapid deforestation and resulting environmental degradation, the **Centre**

प्रिय दोस्तों, अब तक हमारे नोट्स में से विभिन्न परीक्षाओं में आये हुए प्रश्नों के परिणाम देखने के लिए क्लिक करें - (Proof Video Link)

RAS PRE. 2021 - https://shorturl.at/qBJ18 (74 प्रश्न , 150 में से)

RAS Pre 2023 - https://shorturl.at/tGHRT (96 प्रश्न , 150 में से)

UP Police Constable 2024 - http://surl.li/rbfyn (98 प्रश्न , 150 में से)

Rajasthan CET Gradu. Level - https://youtu.be/gPqDNlc6UR0

Rajasthan CET 12th Level - https://youtu.be/oCa-CoTFu4A

RPSC EO / RO - https://youtu.be/b9PKjl4nSxE

VDO PRE. - https://www.youtube.com/watch?v=gXdAk8S6W18&t=202s

Patwari - https://www.youtube.com/watch?v=X6mKGdtXyu4&t=2s

PTI 3rd grade - https://www.youtube.com/watch?v=iA_MemKKgEk&t=5s

SSC GD - 2021 - https://youtu.be/2gzzfJyt6vI

EXAM (परीक्षा)	DATE	हमारे नोट्स में से आये हुए प्रश्नों की संख्या
MPPSC Prelims 2023	17 दिसम्बर	63 प्रश्न (100 में से)
RAS PRE. 2021	27 अक्तूबर	74 प्रश्न आये
RAS Mains 2021	October 2021	52% प्रश्न आये

FREE SAMPLE

RAS Pre. 2023	01 अक्टूबर 2023	96 प्रश्न (150 मेंसे)
SSC GD 2021	16 नवम्बर	68 (100 में से)
SSC GD 2021	08 दिसम्बर	67 (100 में से)
RPSC EO/RO	14 मई (1st Shift)	95 (120 में से)
राजस्थान S.I. 2021	14 सितम्बर	119 (200 में से)
राजस्थान S.I. 2021	15 सितम्बर	126 (200 में से)
RAJASTHAN PATWARI 2021	23 अक्तूबर (1st शिफ्ट)	79 (150 में से)
RAJASTHAN PATWARI 2021	23 अक्तूबर (2nd शिफ्ट)	103 (150 में से)
RAJASTHAN PATWARI 2021	24 अक्तूबर (2nd शिफ्ट)	91 (150 में से)
RAJASTHAN VDO 2021	27 दिसंबर (1st शिफ्ट)	59 (100 में से)
RAJASTHAN VDO 2021	27 दिसंबर (2nd शिफ्ट)	61 (100 में से)
RAJASTHAN VDO 2021	28 दिसंबर (2nd शिफ्ट)	57 (100 में से)
U.P. SI 2021	14 नवम्बर 2021 1st शिफ्ट	91 (160 में से)
U.P. SI 2021	21नवम्बर2021 (1st शिफ्ट)	89 (160 में से)
Raj. CET Graduation level	07 January 2023 (1st शिफ्ट)	96 (150 में से)
Raj. CET 12th level	04 February 2023 (1st शिफ्ट)	98 (150 में से)
UP Police Constable	17 February 2024 (1st शिफ्ट)	98 (150 में से)

& Many More Exams like UPSC, SSC, Bank Etc.

FREE SAMPLE