BIODIVERSITY AND ITS CONSERVATION

INTRODUCTION

- Biodiversity (Bios- Life, diversity- forms)
- Occurrence of difference species of organisms with the whole range of their variants (Biotypes) & genes adapted to different climates, environments along with their interactions & processes.

WHAT IS BIODIVERSITY ?

- Refers to the numbers, variety and variability of living organisms and ecosystem.
- Includes all terrestrial, marine and other aquatic organisms.
- Covers diversity within species, between species as well as variations among ecosystems.

BIODIVERSITY

- The term biodiversity refers to the variety of life on earth at all its levels from genes to ecosystems and the ecological and evolutionary process that sustain it.
- It includes not only species we consider rare, threatened or endangered, but every living thing.
- Totality of genes, species and ecosystems of a given region.
- Biodiversity includes diversity within species, between species and of ecosystems.

FACTORS DETERMINING DEGREE OF DIVERSITY

- Habitat stress
- Geographical isolation
- Dominance by one species
- Availability of ecological niches
- Edge effect
- Geological history

LEVELS OF BIODIVERSITY

There are three levels of biodiversity

- Genetic diversity
- Species diversity
- Community and ecosystem diversity

- Genetic diversity - Diversity of genes within a species. i.e. genetic variability among the populations and the individuals of the same species.

- Species diversity- Diversity among species in an ecosystem. “Biodiversity hotspots” are excellent examples of species diversity.

- Ecosystem diversity- Diversity at a higher level of organization, the ecosystem. To do with the variety of ecosystems on Earth.

GENETIC DIVERSITY

- It is the total genetic information contained in the genes of all the species. It also refers to variation of genetic information between species and variation between individuals of the same species.
- Genetic diversity is the total number of genetic characteristics in the genetic makeup of a species.

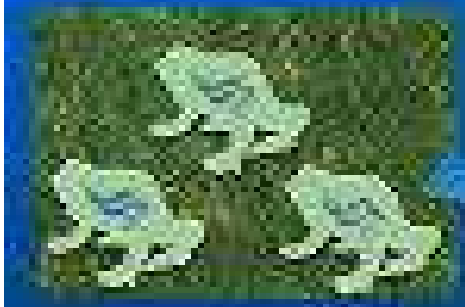
SPECIES DIVERSITY

- Species diversity is defined as the number of species and abundance of each species that live in a particular location.
- Each species is distinct from other species in form & character such as cow & goat.
- Species diversity is the most common level to describe biodiversity of any area.

ECOSYSTEM DIVERSITY

- Ecosystem diversity deals with the variations in ecosystems within a geographical location and its overall impact on human existence and the environment.
- EX. deserts, forests, grasslands, wetlands and oceans. Ecological diversity is the largest scale of biodiversity, and within each ecosystem, there is a great deal of both species and genetic diversity

Types of Biodiversity



Genetic diversity: Differences in DNA among individuals

Species diversity: Variety of species in a given area

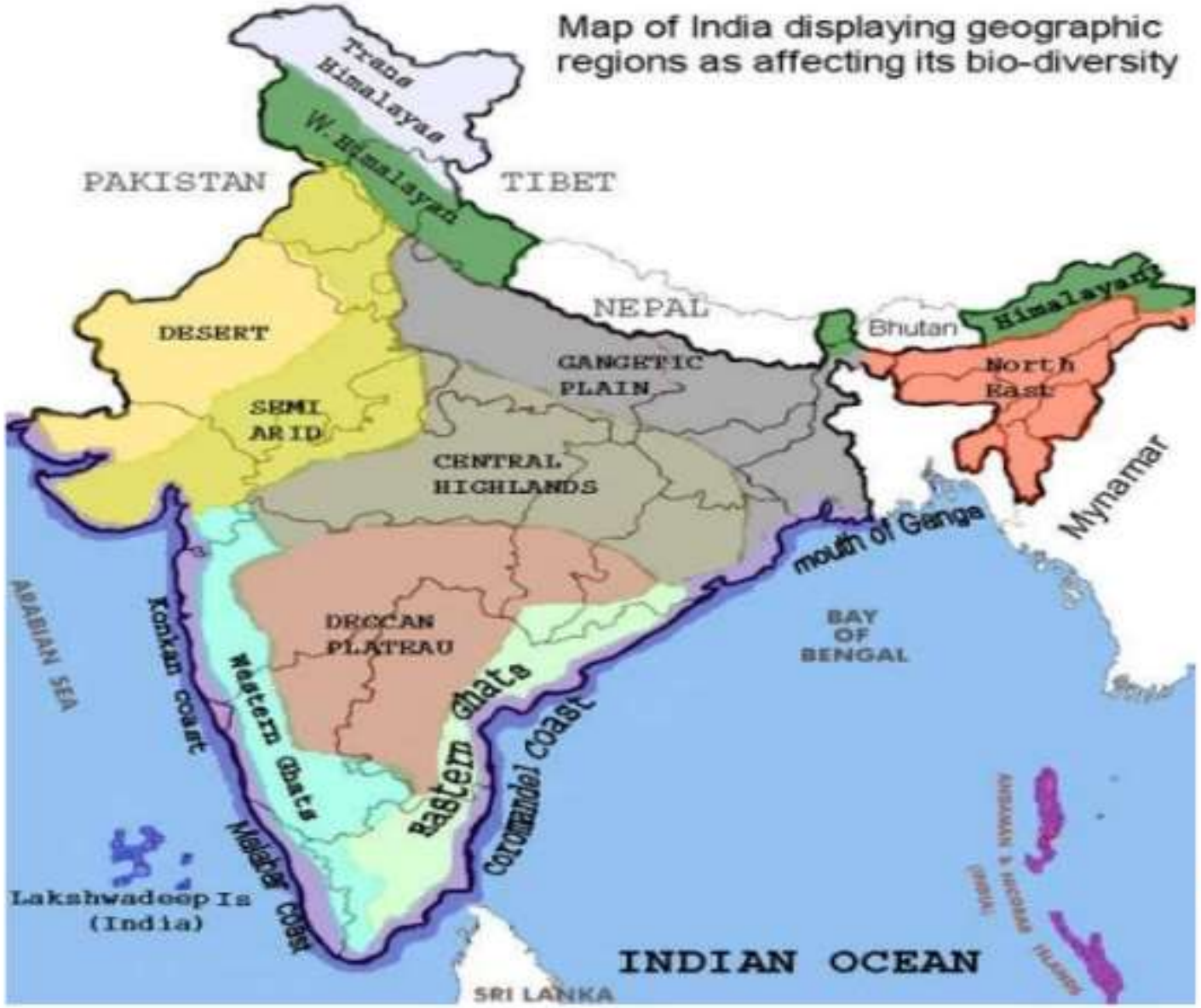
Ecosystem diversity: Variety of habitats, ecosystems, communities

BIO-GEOGRAPHICAL CLASSIFICATION

- Biogeography includes the area, soil, water, climate as well as plants and animals of particular geographical region.

- There are ten biogeography zones in India.

1. Trans Himalayan zone.
2. Himalayan zone
3. Desert zone.
4. Semiarid zone.
5. Western ghat zone.
6. Deccan plateau zone.
7. Gangetic plain zone.
8. North east zone.
9. Coastal zone.
10. Islands


Map of India displaying geographic regions as affecting its bio-diversity
Trans Himalayas
W. Himalayan
PAKISTAN
TIBET
NEPAL
Bhutan
Himalayan
North East
DESERT
SEMI ARID
GANGETIC PLAIN
CENTRAL HIGHLANDS
DECCAN PLATEAU
Mynamar
mouth of Ganga
BAY OF BENGAL
ARABIAN SEA
Konkan coast
Western Ghats
Malabar Coast
Eastern Ghats
Coromandel coast
Lakshwadeep Is (India)
INDIAN OCEAN
SRI LANKA

IMPORTANCE OF BIODIVERSITY.

- Biodiversity has contributed in many ways to the development of human culture, and in turn, human communities have played a major role in shaping the diversity of nature at the genetic, species, and ecological levels.

VALUES OF BIODIVERSITY

1. Consumptive value
2. Productive
3. Social Value
4. Ethical Value
5. Aesthetic Value
6. Option Value

1. CONSUMPTIVE VALUE

- Every species has potential value.
- The most important point of consumptive use is that some rural communities closer to the forests or other natural areas can prosper through the sustainable harvesting of wildlife species.
- Food, medicines, fiber, fodder requirements, Hunting, Direct consumption-herbs, plants, mushrooms are all consumptive uses.

2. PRODUCTIVE VALUE

- Biodiversity provides the necessary raw material for domestic and industrial use.
- Around 80% population from developing countries are dependent on traditional medicines, also many medicines are prepared using plants.
- Products are commercially harvested for exchange in formal markets.
- It is also essential for human survival in the future.
- Future food security depends on conservation of the wild strains of plants.

3. SOCIAL VALUE

- Large proportion of population depends on local biodiversity for their daily needs and survival.
- Loss in ecosystem will result in emigration and create excess pressure on cities.
- Social value of biodiversity refers to religious and cultural importance.
- Trees are worshiped as God.

  ex. Banyan tree, Peepal Tree.
- Flowers, Tulsi leaves are offerd during pooja.

4. ETHICAL VALUE

- Every religion depicts that “Each species is a unique creation of nature (God) and has every right to exist and is to be respected”
- ‘All life must be preserved’ based on ‘Live & let live’
- They have some existence value.

5. AESTHETIC VALUE

- It is related to the beauty of biodiversity.
- Each species and ecosystem adds to the richness of beauty of life on the earth.
- It becomes impossible to recreate extinct species.
- Aesthetic value is related to the level of material richness and quality of life.
- Concept of tourism, Eco- tourism & willingness to pay are gaining grounds, leading to monetary estimate for aesthetic value of biodiversity.

6. OPTION VALUE

- Biodiversity gives us immense options to meet our varied domestic and Industrial demands.
- But in the present scenario, many vital species will be reduced in future in quality as well as quantity.
- The option values of biodiversity suggests that any species may be proved to be a valuable after someday.
- At present the potentials/ uses/ values are unknown.

INDIA- MEGA DIVERSITY NATION

- India has rich heritage of species & genetic strains of flora & fauna.
- Overall 6% of world species are found in India.
- It is estimated that India is 10 th among the plant rich countries.
- The total number of living species identifies in India so far is 1,50,000.
- Out of 18 biodiversity hot spots in the world, India has 2,

  Western Ghats and North Eastern Himalayas.

- Total land area of India- 143 million. ha
- India occupies 2.47 % of the Worlds geographical area & has only 1 % of the forest.
- India has 16.1 % human population & 15.1 of cattle population.
- Forest cover in India- 23.57 %

- India is sharing 12.53 % of worlds biodiversity.
- India has 3.9 % of grassland. 2 % of hot deserts, 4.1 m. ha of wetland ecosystems.
- India is the 7 th largest country in the world & one among the 17 mega diversity centers.

- It is a world heritage sites and has number of national parks, wildlife sanctuaries and reserve forests, which are home to thousands of animal species, includes Tiger, Leopard, Indian bison and deer.

"Biodiversity is a common concern of humankind and an integral part of the development process"

- > 100,000 plant/animal species are lost in last 5 years
- Habitat loss is biggest current threat to biodiversity
- Deforestation and forest degradation has increased since the Rio Earth Summit

NUMBER OF PLANT SPECIES IN THE WORLD & INDIA

Type	No. of Species in India	No. of Species in In World	% in India
Flowering plant	17,000	2,50,000	6.80
Non- Flowering plant	28,000	67,50,000	4.15

Faunal species in the World & in India

	No. of Species in India	No. of Species in In World	% in India
Total Species	77,452	12,11,584	6.39

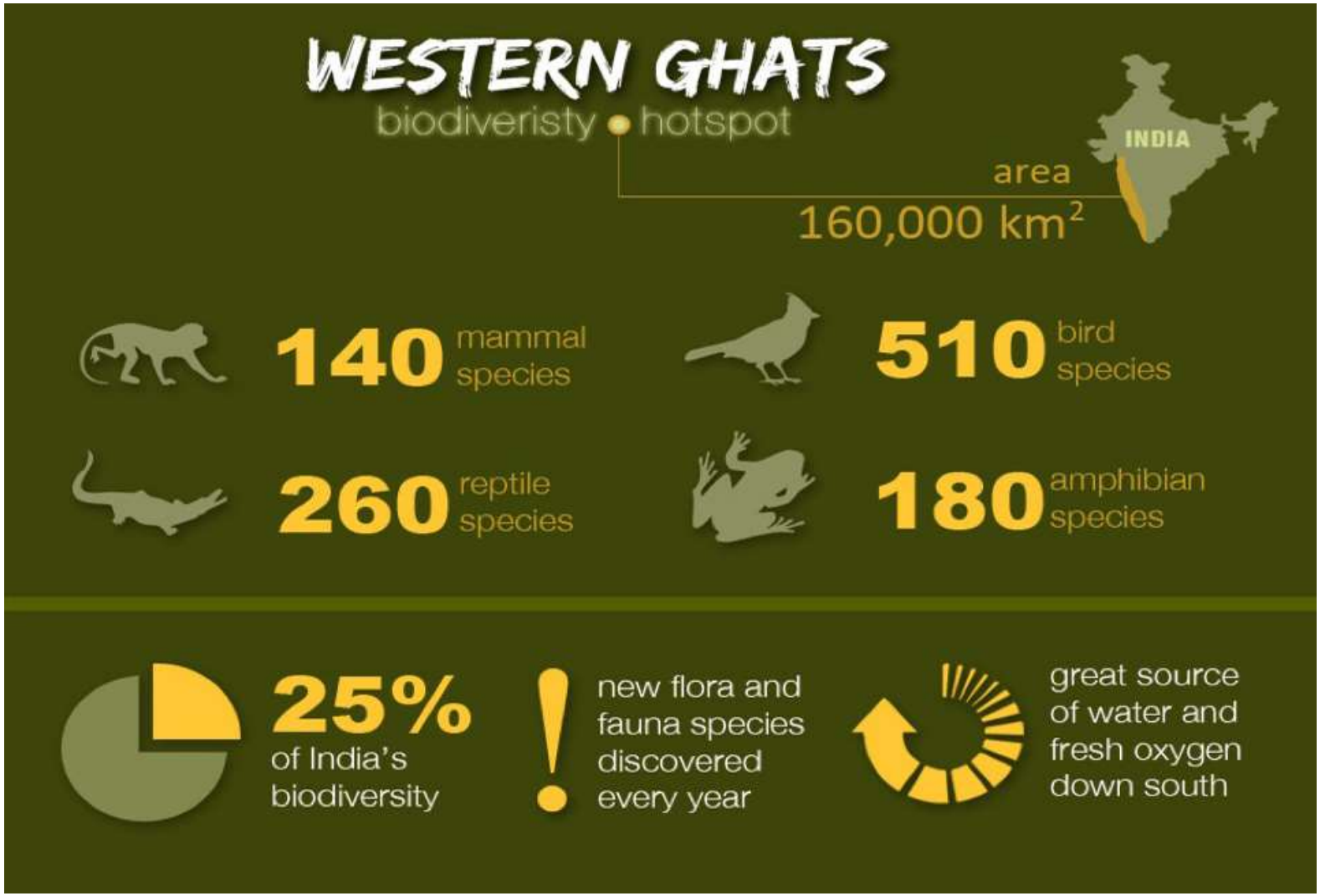
BENGAL TIGER

INDIAN LEOPARD

WESTERN GHATS

- Locally known as “Sahyadri”.
- Mountain range run to a full length of 1600 km.
- It starts from dhule district & ends at Kanyakumari
- Area1,60,000 sq.km & population 45 million
- It receives 2000-7000 mm of rainfall a year

- The ecological and environmental problems of the Western ghats area includes : increasing pressure of population on land and vegetation, submergence of forest areas under river valley projects, clear felling of forests, mining, soil erosion, landslides and declining wildlife population.


WESTERN GHATS
biodiveristy hotspot
INDIA
area
160,000 km²
140 mammal species
510 bird species
260 reptile species
180 amphibian species
25% of India's biodiversity
new flora and fauna species discovered every year
great source of water and fresh oxygen down south

BIODIVERSITY IN SAHYADRI

	Butterflies	Fishes	Amphibians	Reptiles	Birds	Mammals	Flora
Order	-	6	6	4	13	8	-
Family	-	14	6	15	47	24	76
Genera	55	38	13	46	186	54	285
Species	79	73	21	79	333	84	618

HOT SPOTS OF BIODIVERSITY

- The area with highest concentrations of flora and fauna.
- A **biodiversity hotspot** is a bio-geographic region that is both a significant reservoir of **biodiversity** and is threatened with destruction.
- The term **biodiversity hotspot** specifically refers to 25 biologically rich areas around the world that have lost at least 70 percent of their original habitat.
- The original 18 hotspots covered 11.8% of the land surface area of the Earth

- It provides a means of focusing on those areas where threats to biodiversity are most extreme and conservation efforts are urgently needed.
- Initially only high plant species were considered for identifying the hotspots but later birds, mammals, reptiles and amphibians were also considered.
- Two hotspots in India: one in Western ghats/Sahyadri and other in North Eastern Himalayas.

THREATS TO BIODIVERSITY

THREATS TO BIODIVERSITY

- Habitat destruction
- Global climate change
- Pollution
- Over-exploitation
- Disease

HABITAT LOSS

- Every animal in the animal kingdom has a niche, in their animal community & without their habitat they no longer have a niche.

REASONS

- Agriculture, farming
- Harvesting natural resources for personal use
- For industrial & urbanization development

- The impact upon Panda, ones found across the nation, Now its only found in fragmented & isolated regions in the south west of the country as a result of wide spread deforestation in the 20 th century

NATURAL CAUSES

- Habitat destruction through natural processes such as volcanism, fire & climate change is well documented in the fossil record. One study shows that fragmentation of tropical rainforest in millions of years ago lead to great loss of amphibian diversity.

WILDLIFE POACHING

- Poaching is the hunting & harvesting of wild plants or animals, such as through hunting, harvesting, fishing, or trapping.

WHY POACHING IS DONE?

- Poaching is done for large profit gained by the illegal sale or trade of animal parts, skin, horns, bones, organs and meat.
- Exists because there is a demand for these products, caused by a lack of education or disregard for the law amongst the buyers.
- Many cultures believe that certain animal parts have medicinal value.

HOW DOES POACHING AFFECT ENVIRONMENT?

- Poaching or illegal hunting causes animals endangered of being extinct. If more animals becomes extinct there's a disruption in the food chain, and that will cause major problems in our ecosystem, resulting eventually in new adoptions of animals, & or species beyond human control.

- Poaching results in animals being hunted too soon for them to have time to reproduce & repopulate.

MAN- WILD CONFLICT

Increase in man wildlife conflict is due to

1. Space 2. Food 3. Shelter

- It is due to increasing population of human beings, loss of forest, decrease in quality of forest & development activities.
- There are 661 protected areas in the country covering around 4.8 % geographical areas. There are 100 National parks, 514 wildlife Sanctuaries, 43 Conservation reserves & 4 Community reserves in the country.

- In INDIA wild elephants probably kill far more people than tiger, leopard or lion.
- Damage to agricultural crops and property, killing of livestock & human beings are some of the worst forms of man- animal conflict.
- Farmers sometimes poison & shoot wild animals as they damage their crops, but this can be prevented by talking certain measures.

ENDANGERED & ENDEMIC SPECIES

- Endangered Species- The endangered species are those living organisms which are almost on the verge of extinction.

- Endemic Species- When a species is found only in a particular geographical region because of its isolation , soil & climatic conditions, it is said to be endemic.

ENDANGERED SPECIES

- Indian Tiger
- Ganges Dolphin
- Gharial
- Indian Bustard
- Indian Rhinoceros
- Lion Tailed Macaque
- Nilgiri Tahr
- Sangai Deer
- Wild Water Buffalo
- Red Panda

Animals

- Acacia planifrons
- Thuthi
- Musli
- Malabar lily
- Jeemikanda
- Spider wort
- Milkwort

Plants

ENDEMIC SPECIES

- *Asiatic Lion- Gir Forest*
- *Sangai Deer- Loktak Lake*
- *Lion Tailed Macaque- Western Ghats*
- *Nilgiri Tahr- Nilgiri Hills*
- *Pygmy Hog- Assam*
- *Purple Frog- Western Ghats*

Animals

- Milkwort- Gujarat
- Assam catkin yew- Arunachal Pradesh
- Moa, skeleton- Karnataka
- Umbrella tree- Tamil Nadu

Plants

CONSERVATION

- Conservation is an ethic of resource use, allocation, & protection.
- Everyone benefits from biodiversity conservation.
- Its primary focus is upon maintaining the health of the natural world, its fisheries, habitats, & biological diversity.
- Secondary focus is on materials conservation & energy conservation, which are seen as important to protect the natural world.

- Conservation is not about protecting genes, species or ecosystem, but it is protecting the process of life. i.e. conservation is based on the mandate to maintain the threats of life as they arrive from past abide in present & depart for future.

- Following questions should be asked in the context of biodiversity conservation:

  - Why conserve biodiversity?
  - Who benefits from over exploitation?
  - Who pays the costs of over exploitation?
  - Who earns the benefits from conserving biological diversity?
  - Who pays the opportunity costs of conserving biological diversity?

CONSERVATION OF BIODIVERSITY

- In- Situ conservation
- Ex- Situ conservation

IN- SITU CONSERVATION

- **In-situ conservation** is the conservation of flora and fauna, particularly wild, in their natural habitats.
- Traditional concepts in India like “Abhayaranya” (wildlife sanctuary) and “Devraai” (Sacred groves)
- On site conservation
- Protecting endangered animals in its natural habitat

India has over 720 national parks, wildlife sanctuaries and project tiger area

- **National parks** are granted high degree of protection and no human interference is allowed in the protected area.
- **Wildlife Sanctuaries** are accorded a lesser level of protection and activities such as grazing, habitation, private holding, fire wood collection, minor forest produce etc. are allowed for locals.

- **Biosphere reserve** is a vast area as reserve where wildlife would be protected when local communities would be allowed to continue to live and pursue their traditional activities within the reserve/ protected area. Industries and environment damaging commercial, developmental projects would not be allowed.
- **Project tiger** is another concept to conserve insitu the entire food chain of tiger along with the associated flora and fauna.

Insitu conservation

- Requires no Advanced technology
- Cost effective
- Scientific research
- Easy adaption & selection.

Wildlife Sanctuaries in India

- Ghana Bird sanctuaries – Rajasthan
- Hazaribag-Bihar, Sultanpur bird – Haryana
- Nal sarovar bird – Gujarat, Abohar wildlife – Punjab
- Mundalmalai wildlife - Tamilnadu

National Parks in India

- Ranthambore & Sariska – Rajasthan
- Kaziranga – Assam, Gir National park – Gujarat
- Bandipur – Karnataka, Periyar– Kerala
- Kanha- Madhya Pradesh

EX- SITU CONSERVATION

- The ex situ conservation of plants and animals is being carried out as a last alternative to insitu conservation.
- **Ex Situ Conservation** is the preservation of components of biological diversity outside their natural habitats.
- Off- Site conservation.
- The collection and preservation of genetic material of wild varieties of crops, domestic animals, economic and medicinal species, etc. is done in several national institutes and laboratories/ bureaus of genetic material for germ plasm.

- The idea of exsitu conservation is to protect the germ plasm of the endangered species or from an endangered habitat for reintroduction to another near natural suitable habitat.
- However in absence of such suitable habitats, eg. Asiatic lion or Cheetah, the exsitu conservation has limited success.

- Zoo
- Seed/ gene banks
- Aquaria
- National institutes/ laboratories
- Botanical gardens
- Nurseries

SUSTAINABLE GOALS OF BIODIVERSITY

- To use **biodiversity** in a **sustainable** manner means to use natural resources at a rate that the Earth can renew them. It's a way to ensure that we meet the needs of both present and future generations.
- The desired future is one where the entire landscape is being managed to conserve biodiversity and where biological resources are used sustainably for the benefit of the present and future generations.

ELEMENTS IN SUSTAINABLE FUTURE

- A well informed public, aware of the status and trends of ecosystems and conscious of the impact of their resource consumption on biological resources.
- A system of legislation, economic incentives and supporting regulations
- A collective relationship between governments, scientists, local communities and private sectors

- A well managed system of protected areas established in each country and
- A comprehensive data base on soils, climate, topography, geology and biodiversity to monitor status and trends of genes, species and ecosystems, and to predict the impact of future changes.

WHY BIODIVERSITY IS IMPORTANT?

- Generation of soils
- Maintenance of soil quality
- Maintenance of Air quality
- Maintenance of water quality
- Crop production
- Climate stabilization
- Provision of food security
- Provision of health care- medicines
- Income generation
- Spiritual and medicinal value