ENVIRONMENTAL SCIENCE

Course Code : 18 CE M01

UNIT-3
BIODIVERSITY

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SYLLABUS

- Genetic, Species and Ecosystem biodiversity
- Bio-geographical classification of India
- India as a Mega diversity nation
- Values of biodiversity
- Hot-spots of biodiversity
- Threats to biodiversity
- Endangered and endemic species of India
- Methods of conservation of biodiversity.


IS OUR LIFE

Biodiversity

- Diversity = variety
- Bio= living
- Thus, variability among living organisms from all sources including inter alia, terrestrial, marine & other aquatic ecosystems and ecological complexes of which they are part of.

Biodiversity

- The existence of a large number of different kinds of animals and plants which make a balanced environment" (or) " *the totality of all species and ecosystems in a region" is called as biodiversity.*
- Biodiversity deals with a large variety of flora and fauna on this earth.
- For eg: a wide variety of plants and animals are found in a part of forest. The plant life range from **a small herb to a large tree** and the animal life vary from a **tiny insect to a large mammal** in addition to micro-organisms (algae, bacteria, fungi etc) .

Levels of Biodiversity….

Genetic

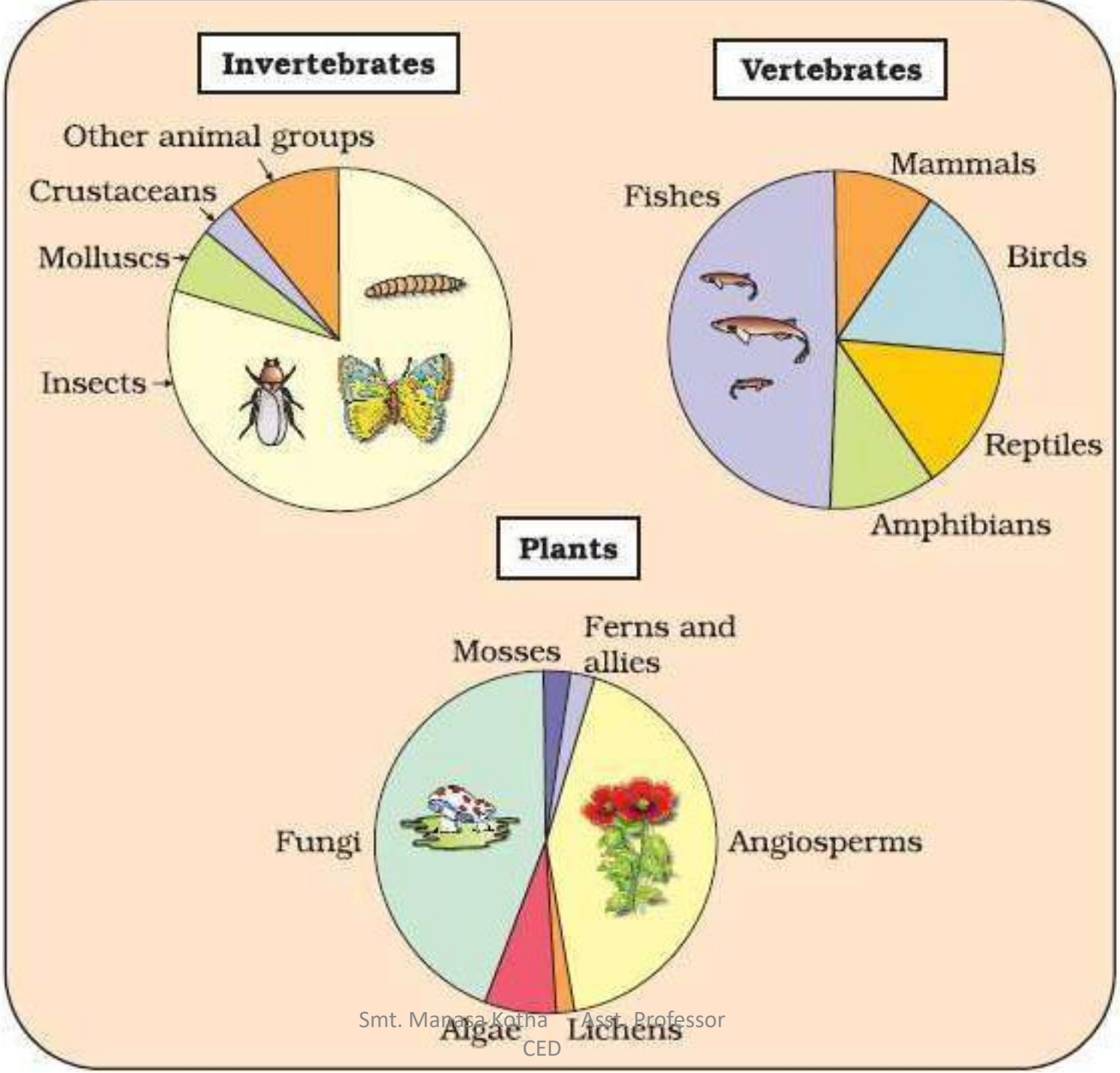
- Genes within same species show variation
- E.g. Colour & sizes of Rose

Species

- Represents species richness & abundance in a community
- No. of plants, animals, birds in an area.

Ecosystem

- Diversity in complex systems in physical, ecological, food web, nutrient cycling
- Diversity in forest


Invertebrates
Other animal groups
Crustaceans
Molluscs
Insects
Vertebrates
Mammals
Fishes
Birds
Reptiles
Amphibians
Plants
Mosses
Ferns and allies
Fungi
Angiosperms
Algae
Lichens

Levels of Biodiversity

1. Alpha Biodiversity:

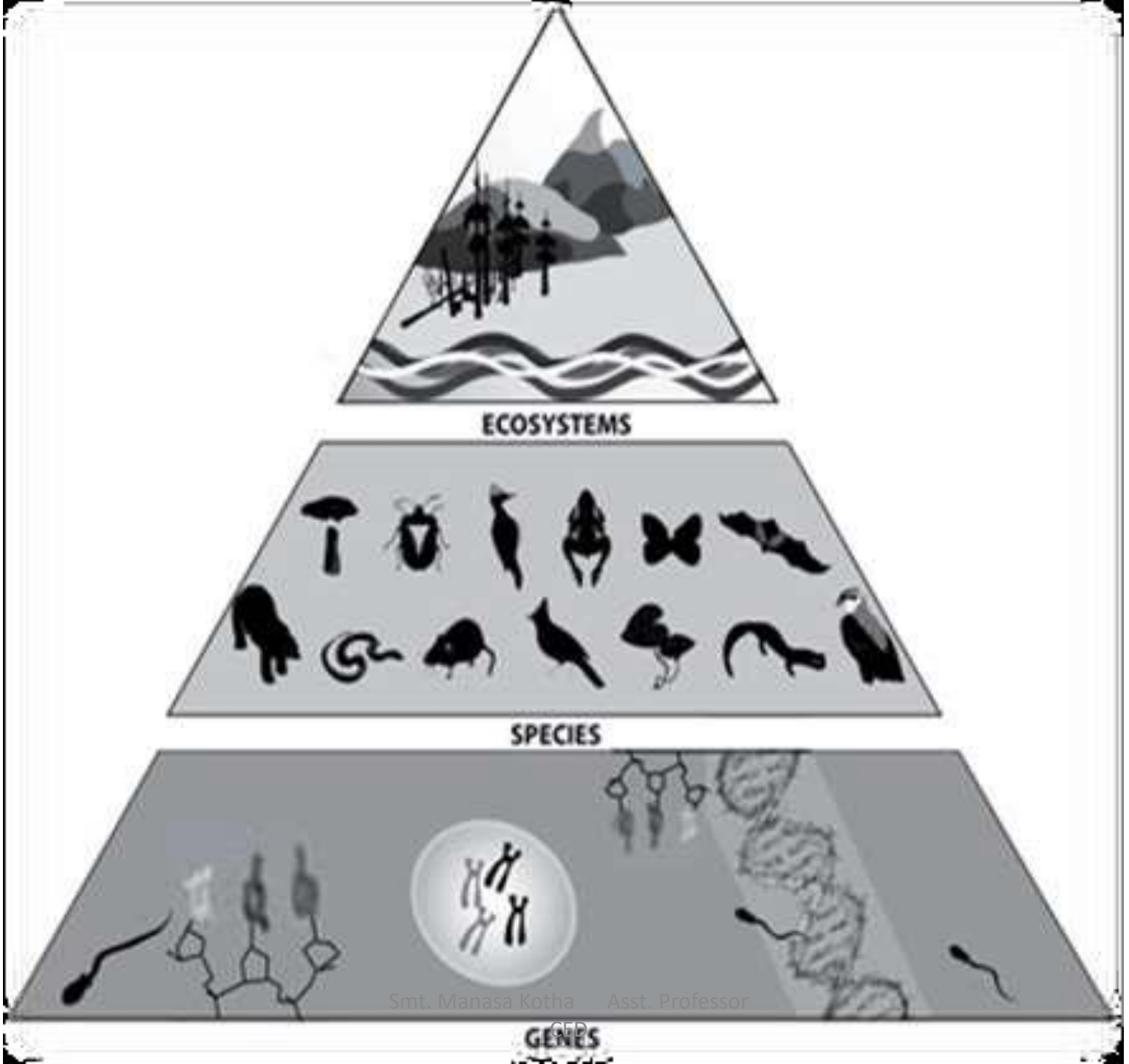
- Diversity within particular area, community or ecosystem, measured by counting number.

2. Beta Biodiversity:

- Diversity of species among various ecosystems..

3. Gamma Biodiversity:

- Measurement of overall diversity for different ecosystem within a region.


ECOSYSTEMS
SPECIES
GENES

Genetic biodiversity

- Genetic diversity means the variation of genes within the species.
- Ex.: in human species, genetic variation between an Indian and African and genetic variations within a population (eg: within the Indian population) can be seen.
- In simple terms, genetic matter dictates whether the persons have blue or brown eyes, brown or black hair and tall or short..
- Genetic diversity can be identified by using a variety of DNA based and other techniques. One estimate is that there are 1000 crores of different genes distributed across the worlds biota though they do not all make an identical contribution to overall genetic diversity.

Species Biodiversity

Species Biodiversity

- Species diversity means the richness of species in all ecosystems. It is measured on the basis of number of species in a region. So far 1.75 million species have been described world wide.
- Warmer areas tend to support more species than colder ones and wetter areas contain more species than drier ones.
- Topography and climate of the areas support and control the species of a region.

Ecosystem biodiversity

- Ecosystem diversity means the study of difference between ecosystem types. Ecosystem diversity is difficult to measure since the boundaries of various sub ecosystems are overlap each other.
- Ex. : Godavari – Delta ecosystem which consists of grassland ecosystem, river ecosystem, estuarine ecosystem, fresh water aquatic ecosystem, marine water aquatic ecosystem .

Importance of biodiversity

- Biodiversity performs a number of ecological series for human kind that have economic, and aesthetic values.
- Ex. : Contribution of biodiversity to human health is given below:

  One out of 125 plant species produce a major drug as per Herb Research Foundation. Of the 118 drugs in the US, 74% are based on plants; 18% on fungi; 5% on bacteria and 3% on vertebrates. 80% of the world population relies on traditional plant medicine.

Biodiversity at Regional or Local

- This type of biodiversity can be characterized in richness of four types based on their spatial distribution
  - Point Richness- species that are found at one single point
  - Alpha (α)- richness) – number of species found in small homogeneous area. Here Physical factor is strongly corealted.
  - Eg 100 species of tunicates in Arctic region, 400 species in temperate waters & 600 species in tropical seas
  - Beta (β)– richness) - refers to rate of change in species composition across different habitats. Cumulative no. of species increases in heterogeneous habitats.
  - The No. of Ant species in local area will be 10 but it will be more than 200 no of species in equatorial area, due to increase in habitats.
  - Gamma (γ)- Richness – refers to the rate of change across large composition gradients.

Group	No. of species in India	No. of species in world	a/b (%)
Mammals	350	4629	7.6
Birds	1224	9702	12.6
Reptiles	408	6550	6.2
Amphibians	197	4522	4.4
Fishes	2546	21730	11.7
Flowering Plants	15000	250000	6.0

Biodiversity at National Level

- India is one of the 12 mega diversity countries of the world.
- 2.4% of the land area, accounting for 7-8% of the species of the world.
- 10th among plant rich countries
- 11th in number of endemic species of higher vertebrates
- 6th in terms of centres of diversity

Ministry of Environment and Forests records (as of 2000)

- 47000 plants: 7% of global.
- 91000 species of mammals: 6.5% of global.
- Large numbers have ENDEMIC - ORIGINATED in India
- 5000 flowering plants..
- 340 corals

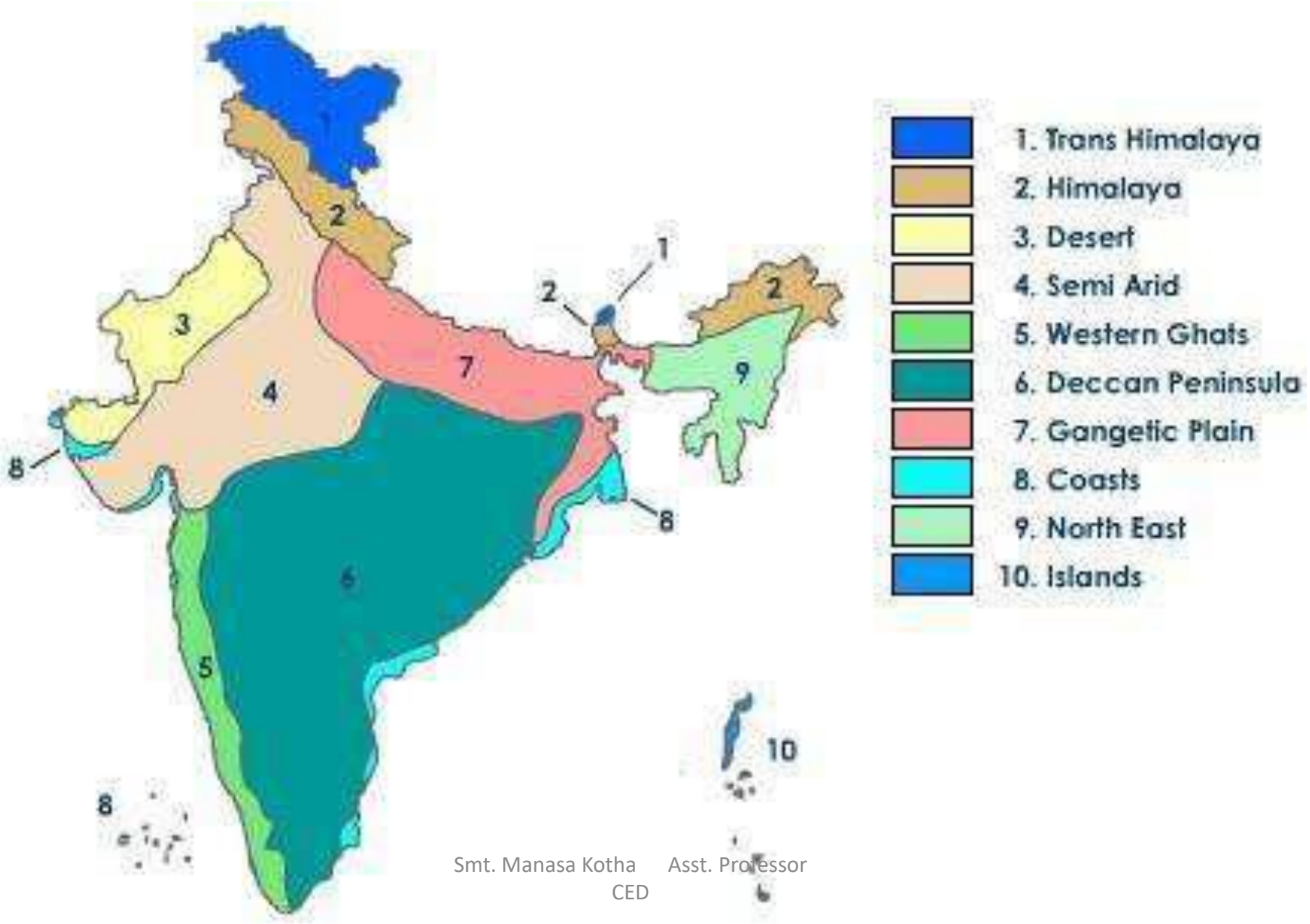
India – as a Mega-Diversity Nation

- Endemism- species which are restricted only to a particular area. Eg. 50% Lizards are endemic to India. Western Ghats are the site of maximum endemism.
- Center of origin: Nearly 5000 species of flowering plants, 166 species of cropping plants and 320 species of wild relatives of cultivated crops have their origin in India.
- Marine Diversity: India has 7500 Km long coastline having (mangroves, estuaries, coral reefs, black waters) rich biodiversity.
  - More than 340 species of corals are found in India
  - Rich in Mollusks, crustaceans, polychaetes, corals
  - 93 major wetlands, Large Forest Cover.

India – as a Mega-Diversity Nation

- India contains a great wealth of biodiversity in the forests, wet lands and marine areas. Hence biodiversity can be observed at all levels ie locally, nationally and globally .
- India, as a subcontinent representing a major part of South Asia is rich in flora and fauna and hence it is one of the world's "MEGADIVERSITY NATIONS" .
- It is estimated that over 75000 species of animals and over 45000 species of plants are found in India.

Bio-Geographical Classification of India



Endangered Species

- *Species whose numbers are reduced to the point to which they are in* immediate danger of extinction.
- The International Union Conservation of Nature (IUCN) classified the species of plants and animals as:

(a) Endangered species

(b) Vulnerable species means depleted species.

(c) Threatened species: Species (including animals, plants, fungi, etc.) which are vulnerable to endangerment in the near future)

(d) Rare species

Endangered Species (ctd..)

- Among the important endangered animal species, Indian wild ass; the Kashmir stag, the Golden Langur etc .. are considered highly endangered. There are also endangered bird species like Siberian crane; the great Indian Bustard; the florican etc..
- During the recent past, Vultures which were common have suddenly disappeared. Several species of Reptiles (lizard; snakes; star tortoise; crocodiles); Amphibians (frog); Invertebrates (crab, beetle; spider; snail) are also threatened due to human anthropogenic activities.

Endangered Species (ctd..)

- India contains some of Asia's rarest animals such as: The Bengal Fox; Asiatic Cheetah; Marbled Cat; Asiatic Lion; Indian Elephant; Asiatic wild Ass; Indian Rhinoceros; Markhor; Gaur; Wild Asiatic Water Buffalo etc…

Causes for species becoming endangered

Effects On Nature

- Disruption of food chains and food webs.
- Their absence hampers national wealth.
- Affects national biodiversity.
- Ecological Imbalance.

Critically endangered species

AMUR LEOPARD

HAWKSBILL TURTLE

LEATHERBACK TURTLE

Cross river gorilla

Sumatran Tiger

Javan Rhino

Sumatran orangutan

Vaquita

Saola

Endangered Species

Ganges River Dolphin

Amur Tiger

Royal Bengal Tiger

Black-footed Ferret

Blue Whale

Blue Fin Tuna

Giant Panda

Snow Leopard

CBIT

Vulnerable species

Dugong

Great White Shark

Red Panda

Whale shark

Polar Bear

Irrawaddy Dolphin

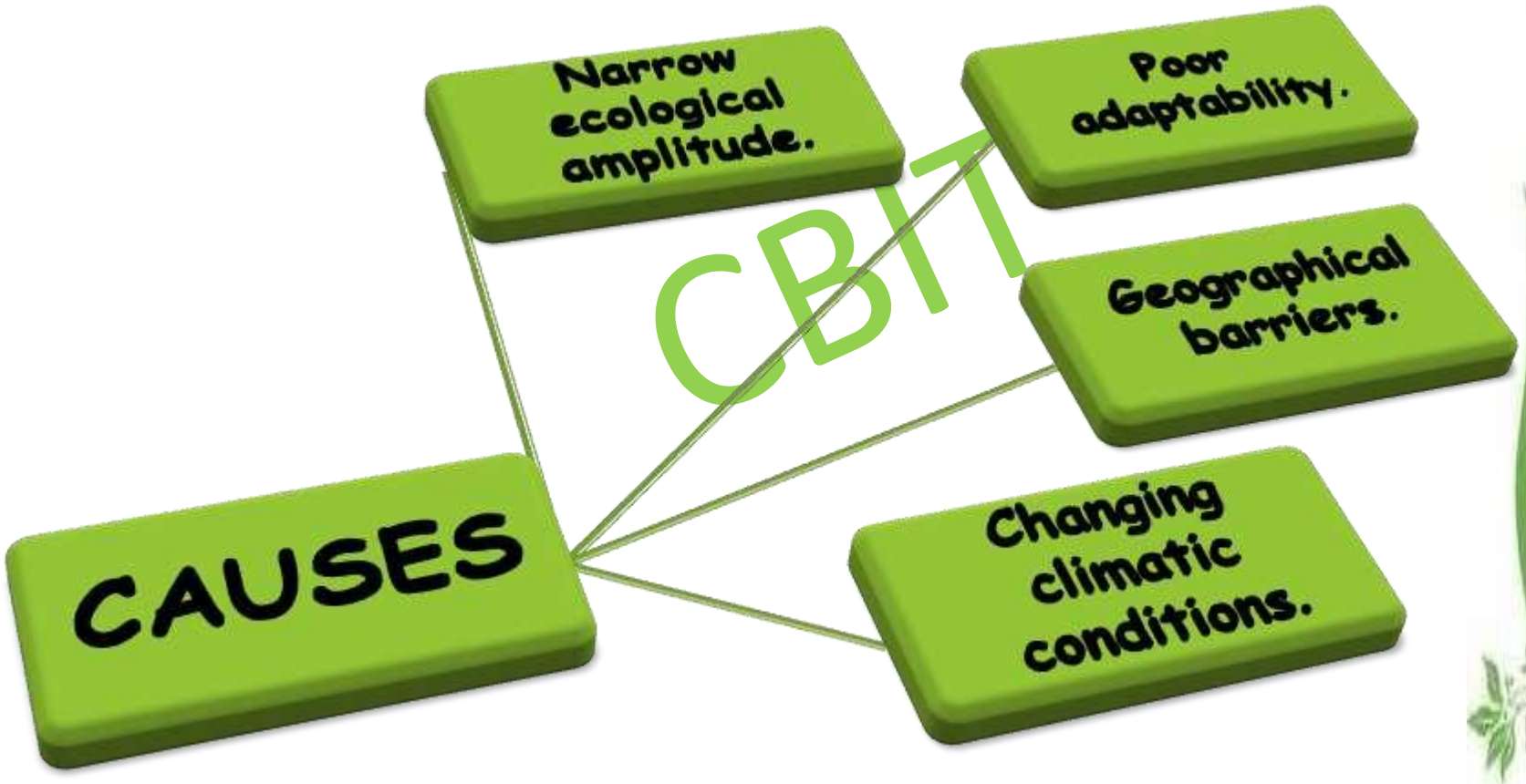
Endemic Species

- Endemic Species is a species that confined to a certain region and are restricted to particular areas. Eg: Penguins usually found on a single ice-land or glaciers. About 33% of the country's flora (plants) are endemic and are concentrated mainly in :
- NE part of India (Rhinoceros is restricted to Assam but was once found throughout the Gangetic plain) Western Ghats (Lion – tailed macaque & Nilgiri leaf monkey and bull frog; tree frog)

Endemic Species (ctd..)

- NW and Eastern Himalayas (Oak tree; Pine tree; Hangul deer of Kashmir ; snow leopard; jackal; wild dog; Himalayan wolf)
- Andaman and Nicobar islands and South India (Nilgiri Tahr is found in Nilgiri & Annamalai hills in south India)
- The Gangetic plains are generally poor in endemics while the Andaman & Nicobar islands are rich.

Causes for Endemism



Endemic species in India

Tiger

Dhole (Indian wild dog)

Snow leopard is an endangered species found along the Himalayas

Golden Langur

Black Buck

Asiatic lion

Indian peacock

Lion tailed macaque

Brown fish owl

Indian cobra

Clouded leopard

Indian elephant

Indian vulture

Red panda

Olive ridley turtles

Oplismenus thwaitesii

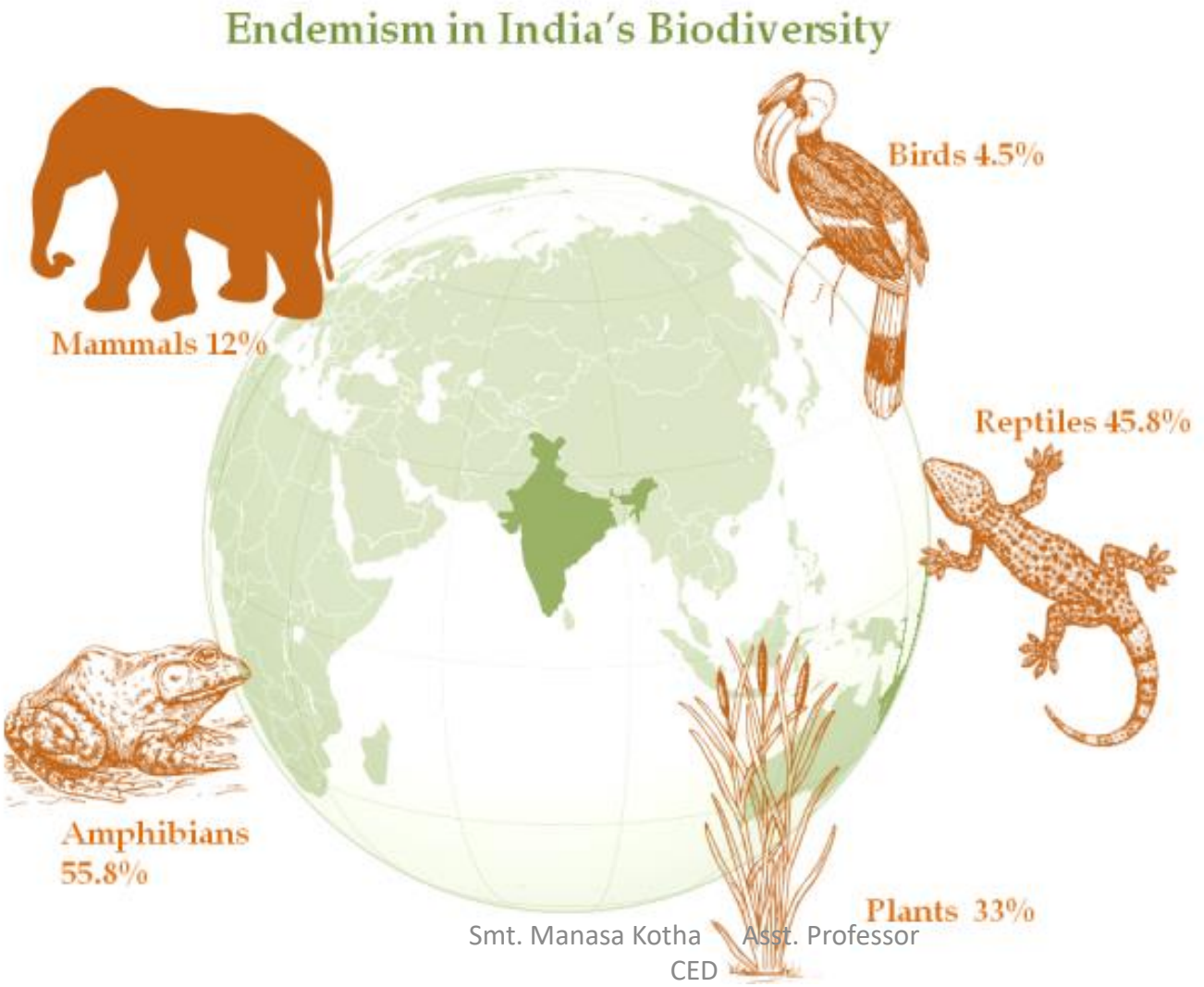
Gymnostachyum febrifugum

Impatiens sivarajanii

Ornithochilus cacharensis

Phalaenopsis speciosa

Endemism


Endemism in India's Biodiversity
Mammals 12%
Birds 4.5%
Reptiles 45.8%
Amphibians 55.8%
Plants 33%

PLANTS OF ENDEMIC SPECIES:

Of India's 45000 plant species, 1600 endemics are found in a 17000 sq kms in the Western Ghats. In Sikkim, in an area of 7298 sq kms, 4250 plant species are endemic while in Nepal, 500 species are believed to be endemic . Bhutan possesses an estimated species of 750 are considered to be endemic.

Ex: oak tree; pine tree etc..

ANIMALS OF ENDEMIC SPECIES:

Ex: Penguins . Rhinoceros (NE of India);

Lion – tailed macaque & Nilgiri leaf monkey and bull frog; tree frog (Western Ghats) Hangul deer of Kashmir ; snow leopard; jackal; wild dog; Himalayan wolf (NW and Eastern Himalayas); Nilgiri Tahr (Nilgiri & Annamalai hills in south India).

- India contains 172 species of animal are considered to be endangered; vulnerable; rare and threatened. These include :

TAXANOMIC GROUP	Endangered sp	Vulnerable species	Rare species	Threatened species	Un known	TOTAL
MAMMALS (Tiger; Leopard; Indian Lion; Golden cat; Desert cat; Sloth bear; Red fox; Indian wolf; golden monkey; Lion tailed Macaque)	13	20	2	5	13	53
BIRDS (Siberian white crane; Vultures; Great Indian Bustard; peacock; pelican)	6	20	25	13	5	69
REPTILES (Gharial; green sea turtle; star tortoise; python)	6	6	4	5	2	23
AMPHIBIANS	0	0	0	3	0	3
FISHES	0	0	2	0	0	2
INVERTIBRATES (crab; beetle; spider; snail)	1	3	12	2	4	22
	26	**49**	**45**	**28**	**24**	**172**

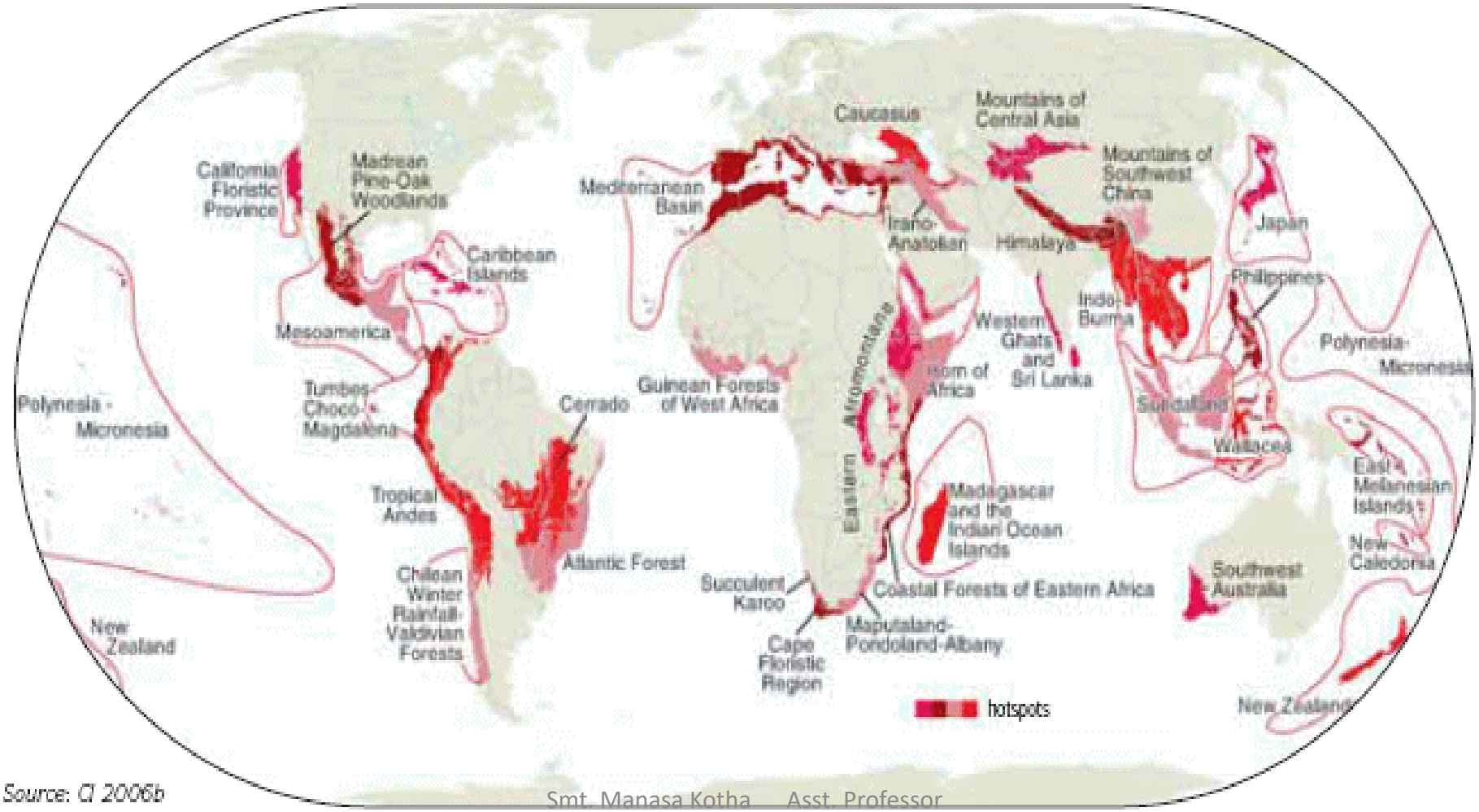
HOTSPOTS IN BIODIVERSITY

Biologically hot spots are areas that are extremely rich in endemic species of both plant and animals.

- The world is identified with 25 biodiversity hot spots containing 44% of all plant species and 35% of vertebrates & 21% of invertebrates and others of all animal species in land area.
- Hot spots in India: Among 25 hot spots of world two found in India extending into neighbouring countries viz., 1) The Western Ghats – Sri Lanka region and 2) The Indo – Burma region covering Eastern Himalayas (The Eastern Himalayas form a distinct region which comprises Nepal, Bhutan ; Sikkim and states of Northern India).

Biodiversity Hotspots

Figure 4: Biodiversity hotspots



Source: CI 2006b

Hotspots of Biodiversity

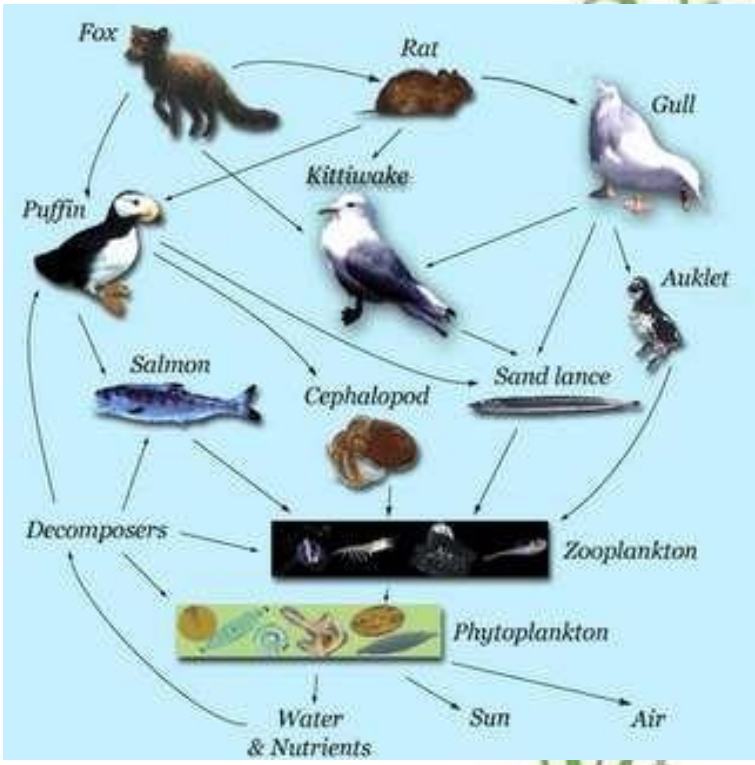
- A **biodiversity hotspot** is a biogeographic region with a significant reservoir of biodiversity that is under threat from humans.
- Areas which exhibit high species richness as well as endemism are termed as Hotspots of Biodiversity.
- Myers introduced this term, at that time 25 Hotspots were identified out of which 2 were in India. Later 9 were added more bringing a total to 34.
- About 40% terrestrial & 25 % vertebrate are endemic found in this hotspots
- After tropical rain forests the second highest number endemic species are found in Mediterranean
- These hotspots are threatened by human activities. More than 1 billion people most whom are desperately poor people, live in these areas.
- Measures protecting these areas should be planned.

Hot spots of biodiversity:

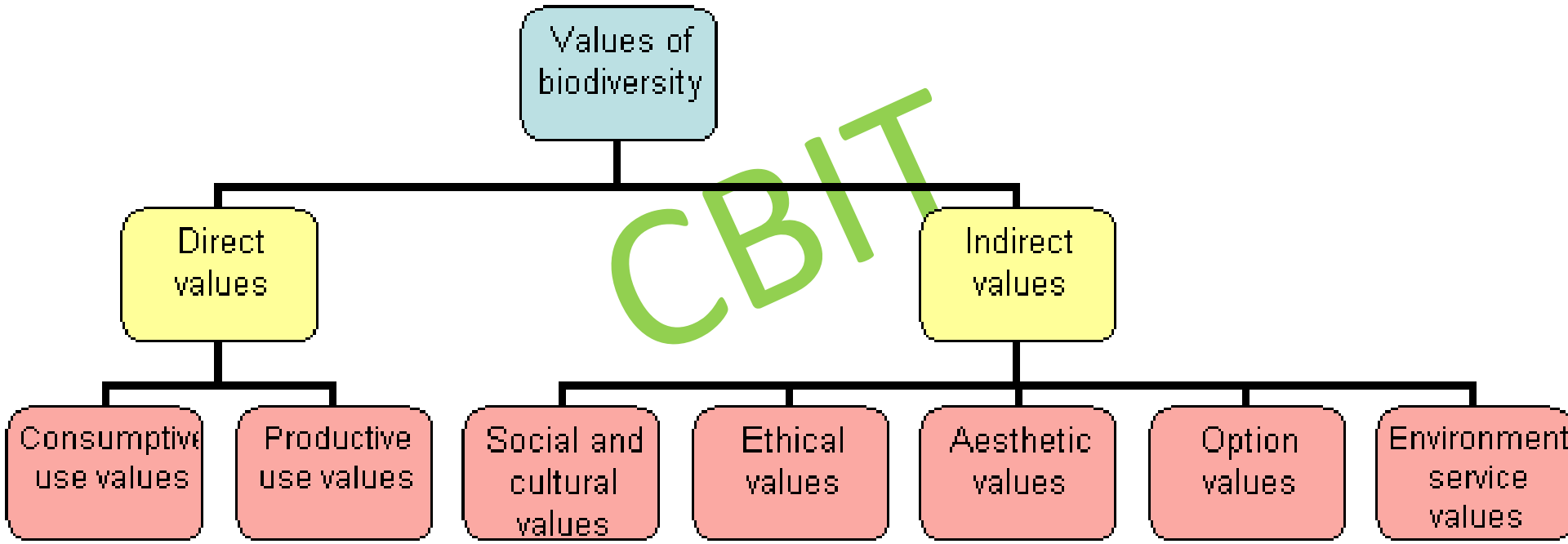
S No	Location	S No	Location
1	Tropical Andes (venezula; Columbia; peru; argentina)	14	Mediterranean Basin (surroundings of Europe, Asia; Africa; Algeria; Libya; Egypt)
2	Meso America (central Mexico)	15	Caucasus
3	Caribbean (West Indies)	16	Sunda land
4	Brazil forest	17	Wallacea
5	Western Ecudor (NW of S.America)	18	Philliphines
6	Brazil's Cerrado	19	Indo-Burma region
7	Central Chile	20	South Central China
8	California Province	21	Western ghats – Sri Lanka
9	Madagascar	22	SW Australia
10	Coastal Forest of Kenya (S Africa)	23	New Caledonia
11	Western African Forests	24	New Zealand
12	Cape Province (S. Africa)	25	Polynesia / Micronesia
13	Karoo (Australia)		

MAIN PURPOSE OF CONSERVATION OF BIODIVERSITY

1. To continue & sustain the eco system.
2. To sustain Variety of gene pool.
3. Development of Tourism.
4. To Maintain economic growth.
5. Conservation of food resources.
6. To save social values.
7. To save Ethical values.
8. To save optional values.
9. Medicinal use for the benefit of Human.
10. To save endangered species, rare species & Vulnerable species.



Values of Biodiversity



1. CONSUMPTIVE VALUE

- Biodiversity is an essential requirement for the maintenance of global food supply. The main sources of human food includes animals, fish and plant produces.
- A large number of plants are consumed by human beings as food. A few animal species are consumed by people which comes from cattle, pigs, sheep, goats, buffaloes, chickens, ducks, geese and turkey species.
- *Fish: Many fresh water fish can be grown in ponds. Israel and China already get* about half of their fish from aqua culture.

1. Consumptive Value (ctd..)

- ***Drugs & medicines:*** *About 75% of the worlds population depends upon plants or* plant extracts for medicines.
- *Tetracyclin*- from bacterium ,*Quinine* – from Cinchona Tree- medicine for Malaria, *Digitalin*- from foxglove- for Heart Ailments ,*vinblastin* & *vincristine* – Anti-Cancer Alkaloids, Penicillin from a fungus called ***Penicillium.***
- ***Fuel:*** *The fossil fuels like coal, petroleum products and natural gas are the* products of biodiversity.

1. Consumptive Value (ctd..)

- In the form of food, drugs, fibre pulp, fuel, wood fall under this group
- Food: 80,000 edible plants species are there.
  - About 90% of present day food crops have been domesticated from wild plants
  - A large number of wild animals are also source of food.
- Fuel: big source of fuel wood. Firewood collected by individuals are direct consumptive value

2. PRODUCTIVE VALUE

- *Some of the organisms* are commercially usable where the product is marketed and sold. The animal products like tusks of elephants; musk from deer; silk from silkworm; wool from sheep or goats; fur of many animals etc all of which are traded in the market.
- *Calabar bean* was traditionally used as a poison in West Africa.
- *Daisy plants* were first used as a lice remedy in the middle east and this led to the discovery of *Pyrethrum*. Mosquito coils made from Pyrethrum are sold in the market.
- The bacterium *Bacillus thuringiensis* produces toxic proteins that kill certain insects.

2. PRODUCTIVE VALUE (ctd..)

- The *neem tree* has been using in birth control such as parts of neem tree that cause abortion.
- These are commercially usable values where the product is marketed & sold
- Musk Deer- production of Musk , Silk Worm- Silk, wool from sheep, lac from insects.
- Many industries are dependent on these products, e.g. pulp & paper industry, silk industry, ivory work, pearl industry, leather industry.
- Problems--- trading of products from endangered species.
- Ex: smuggling of fur, horns, tusk, Snake Skin, cat skins.

3. SOCIAL VALUE

- These are the values associated with the social life, religion and spiritual aspects of the people. Many of the plants are considered to be sacred in our country like Tulasi, Mango leaves, Banana leaves, .
- The leaves, fruits, flowers of some of the plants are used in worship.
- Many animals like cow, snake, bull, peacock also have significant place in spiritual and thus hold special importance.

3. SOCIAL VALUE (ctd..)

- Thus, biodiversity has distinct social value, attached with different societies.
- Values associated with social life, customs, relifion and psycho-spiritual aspects of the people.
- Many plants are considered holy & scared. Ex: Tulsi, mango, peepal etc.,
- Social life, songs, dances, customs are woven with surrounding wildlife
  Cow, snake, owl, bull have special value in biodiversity.

4. ETHICAL VALUE

- The ethical value means that human beings may or may not use a certain species but knowing the very fact that this species exists in nature gives pleasure.
- For ex: a peculiar species of Pigeon, grey / white bird with short legs is no more on this earth. Similarly, Dodo species is also no more.
- Human beings are not deriving anything direct from Kangaroo, giraffe but strongly feel that these species should exist in nature.
- “All Life must be preserved” based on “Live and let live”.
- This means we don’t use the species directly or indirectly, but we feel sorry about the loss of a species.
- Ex: Passenger Pigeon or Dodo
- They have existence value

5. AESTHETIC VALUE

Every one of us would like to visit vast stretches of lands to enjoy the visible life.

- People from farther areas, spend a lot of time and money to visit wild life areas where they can enjoy the aesthetic value of biodiversity and this type of tourism is known as eco tourism.
- Eco-tourism is estimated to generate 12 billion dollars of revenue annually that roughly gives the aesthetic value of biodiversity.
- A study of the impact of environment on the psyche was undertaken and is found that being near nature relieved working stresses while people who worked in closed environment or human made structures experienced much more job stresses and illnesses.
- It is related to the beauty of Biodiversity
- The pleasure, excitement and visual peace of any area
- Concept of Eco-tourism and willingness to pay are gaining grounds, leading to monetary estimate for aesthetic value of biodiversity.

6. OPTION VALUE

- This includes the potentials of biodiversity that are presently unknown and need to be explored.
- This biological resources will be of importance in future if not today
- Eg. Marine animals – anti cancer drugs

Threats to Biodiversity

- **Habitat Destruction-** Important to protect habitat in order to protect biodiversity within it. Huge pressure from the World's rapidly increasing population.
- **Global Climate Change-** Change in a biotic elements of ecosystems leading to biotic change.
- **Habitat Fragmentation-** From human activity. Reduces ability of habitat to support species.
- **Pollution-** Introduction of pollutants such as nutrient overloading with nitrate fertilizer as well as more immediately harmful chemicals.
- **Over-Exploitation-** This includes the illegal wildlife trade as well as overfishing, logging of tropical hardwoods etc.
- **Alien Species-** Introduced by humans to regions where there are no natural predators.
- **Disease-** Reduction in habitat causing high population densities, encourages spread of diseases.

Threats to Biodiversity

Natural causes:

Narrow geographical area

Low breeding rate

Natural disasters

Anthropogenic causes:

Habitat modification

Overexploitation of selected species

Pollution ; Hunting ; Agriculture

Habitat Destruction

Threats posed by Exotic Species

Poaching of Wild life

Genetic Pollution

Climate change

LOSS OF BIODIVERSITY

1. Destruction of habitat or loss and fragmentation of habitat
2. Hunting for economic purpose
3. Over Exploitation
4. For the Purpose of Scientific research and zoo collection
5. Control of Paste and Predators.
6. Pollution
7. Introduction of exotic species
8. Climate change
9. Natural Calamities

HUNTING

RECKLESS FELLING OF TREES

FOREST FIRE

CONSTRUCTION OF DAM

CONSTRUCTION OF ROAD

Habitat loss


Adrian Dorst

Habitat loss

Habitat loss can be described when an animal loses their home. Every animal in the animal kingdom has a niche, a their in their animal community and without their habitat they no longer have a niche.

Reasons of habitat loss by humans:

- agriculture, farming
- harvesting natural resources for personal use
- for industrial and urbanization development

Habitat destruction is currently ranked as the primary causes of species extinction world wide…!!!

There are natural causes too..

Habitat destruction through natural processes such as volcanism, fire and climate change is well documented in the fossil record. One study shows that fragmentation of tropical rainforest in euro 3000 million years ago lead to a great loss of amphibian diversity.

Solutions for this..

~ Protecting remaining intact section of natural habitat.

~ Reduce human population and expansion of urbanisation and industries.

~ Educating the public about the importance of natural habitat and bio diversity.

~Solutions to habitat loss can include planting trees, planting home gardens so as to reduce need for man to need large lands for agricultural farms which lead to habitat loss.

Poaching

- **Poaching** is the hunting and harvesting taking of wild plants or animals, such as through hunting, harvesting, fishing, or trapping.
- History of poaching
- Millions of years ago, in the Stone Age
- Followed through the ages, to even the tribal natives
- But it was during the Late Middle Ages that poaching became a punishable offense

Why Poaching is done???

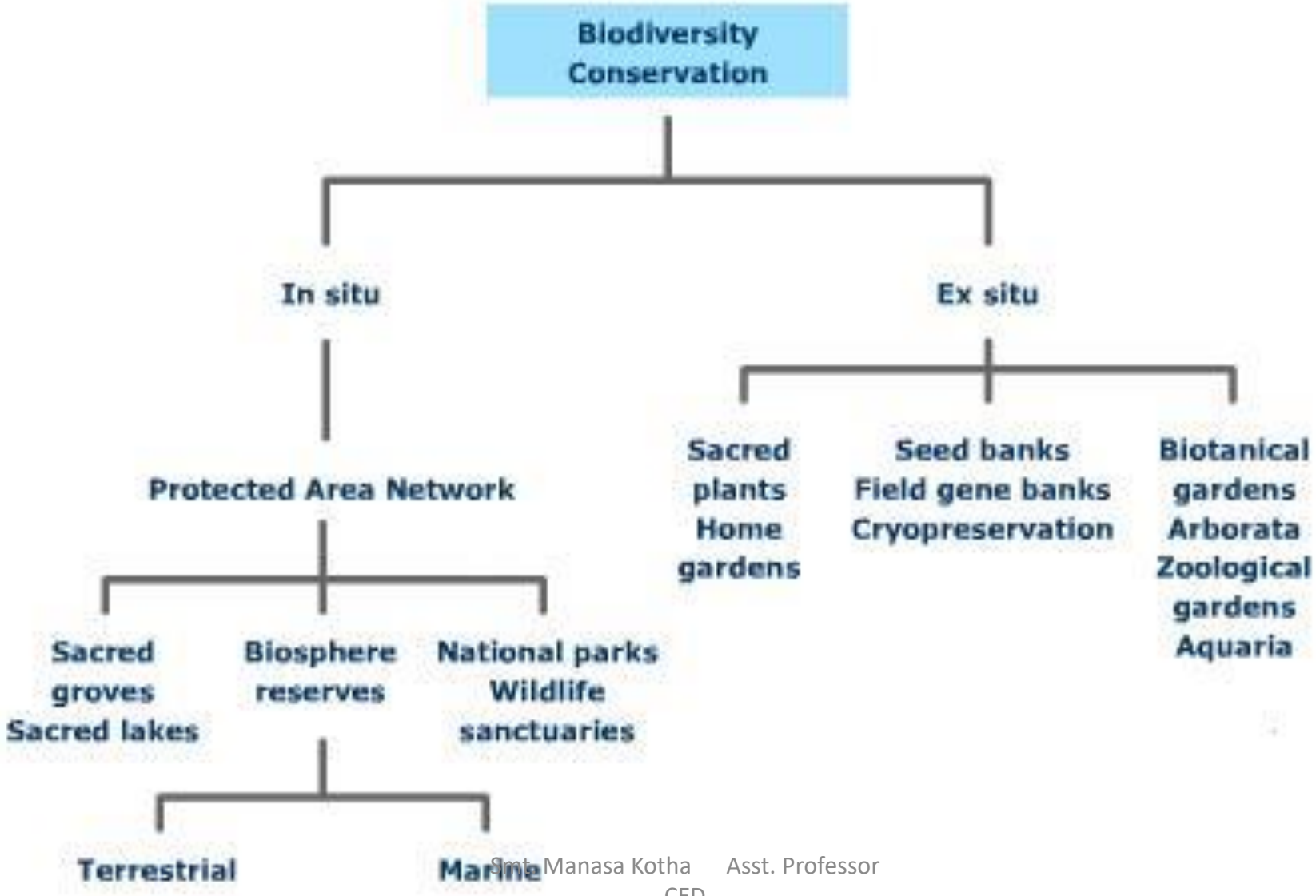
- Poaching is done for large profits gained by the illegal sale or trade of animal parts, meat and pelts.
- Exists because there is a demand for these products, caused by a lack of education or disregard for the law amongst the buyers.
- Many cultures believe that certain animal parts have medicinal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

How does poaching affect the 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 adaptations of animals, and or species beyond human control.

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

Conservation Measures



MAIN TECHNIQUES OF CONSERVATION OF BIO- DIVERSITY

In-situ Conservation:

- In situ conservation is the on-site conservation
- It is the process of protecting an endangered plant or animal species in its natural habitat, either by protecting or cleaning up the habitat itself, or by defending the species from predators

Ex-situ Conservation:

- Ex situ conservation literally means "off-site conservation".
- It is the process of protecting an endangered species of plant or animal outside its natural habitat.
- For example, by removing part of the population from a threatened habitat and placing it in a new location, which may be a wild area or within the care of humans

- In order to maintain and conserve biodiversity, the Ministry of Environment and Forests, Govt of India has already taken several steps to manage wildlife, the objectives of which are:

1. Maintenance of a number of species in protected areas such as National Parks, Sanctuaries..
2. To improve the biosphere reserves
3. Implement strict restrictions of export of rare plants and animals
4. Educate the public on these through the Govt agencies and NGO's.

IN-SITU CONSERVATION

1. National Park.
2. Sanctuary
3. Reserve forest.
4. Biosphere Reserve.
5. Bird Sanctuary.
6. Tiger project.
7. Crocodile project.
8. Conservation of water land.

KAZIRANGA NATIONAL PARK

HIMALAYAN CHITAH

TIGER PROJECT

PROTECTED AREAS

- Locations which receive protection because of their recognized natural, ecological and/or cultural values.
- “Protected area" also includes Marine Protected Areas, the boundaries of which will include some area of ocean, and Transboundary Protected Areas that overlap multiple countries which remove the borders inside the area for conservation and economic purposes.
- India has 668 PA’s with a total area of 1,61,221.57 sq.km i.e 4.9% of total geographical area

S.No	Category of PA	Total Number in India
1	National Park	102
2	Wildlife Sanctuaries	515
3	Conservation Reserves	47
4	Community Reserves	4
5	Tiger Reserves	39
6	Elephant Reserves	28-32
7	Biosphere Reserves	17

National Park

- A **National Park** is an area where the natural or historical objects of national significance are protected along with the wildlife therein, in such manner and by such means, as will leave them unimpaired for the enjoyment of future generations.
- Such protected areas are created by Central Legislation and enjoy highest level of legal protection.
- They usually form the focal area of the Project Tiger Reserves.
- The human activity is confined to management duties and controlled tourism, strictly enforced by law.


National Parks in India
Hemis High Altitude
Kishtwar
Great Himalayas
Valley of Flowers
Corbett
Sariska
Dudhwa
Desert N.P.
Ranthambore
Shivpuri
Little Rann of Kutch
Van Vihar Bhopal Zoo
Bandhawagarh
Velavadar
Pench
Sanjay
Gir
Satpura
Kanha
Nagzari
Vansda
Tadoba
Indravati
Sanjay Gandhi N.P.
Kankar Valley
Ikshawaka
Molen
Dandeli
Bannirgatta Safari
Nagarhole
Guindy
Bandipur
Silent Valley
LAKSHADWEEP
PAKISTAN
CHINA (TIBET)
NEPAL
BHUTAN
MYANMAR
BANGLADESH
ARABIAN SEA
BAY OF BENGAL
Khangchendzhonga
Nam Dapha
Kaziranga
Sirohi
Keibol Lamjao
Suddle Peak
Mt. Harriet
Button
N
National Park
Map not to Scale
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- A **Wildlife Sanctuary** is a place where some rare, wild, indigenous mammals, birds, reptiles and any other form of wildlife are found in good numbers and represents a region that needs protection together with the natural environment.
- The State Forest Department creates such protected areas.
- The Chief Wildlife Warden monitors human activities such as livestock grazing, collection of forest produce and tourism, within the sanctuary's precincts.

India-- Wildlife Sanctuaries


MELGHAT
TIGER
WELCOMES YOU
RESERVE
मेळघाट व्याघ्र
प्रकल्प
सिमा प्रारंभ

Important National parks , Sanctuaries

National Parks:

- Jim Corbett National park
- Kanha
- Ranthambore
- Bandhavgarh
- Periyar
- Tadoba
- Sariska
- Gir
- Kaziranga

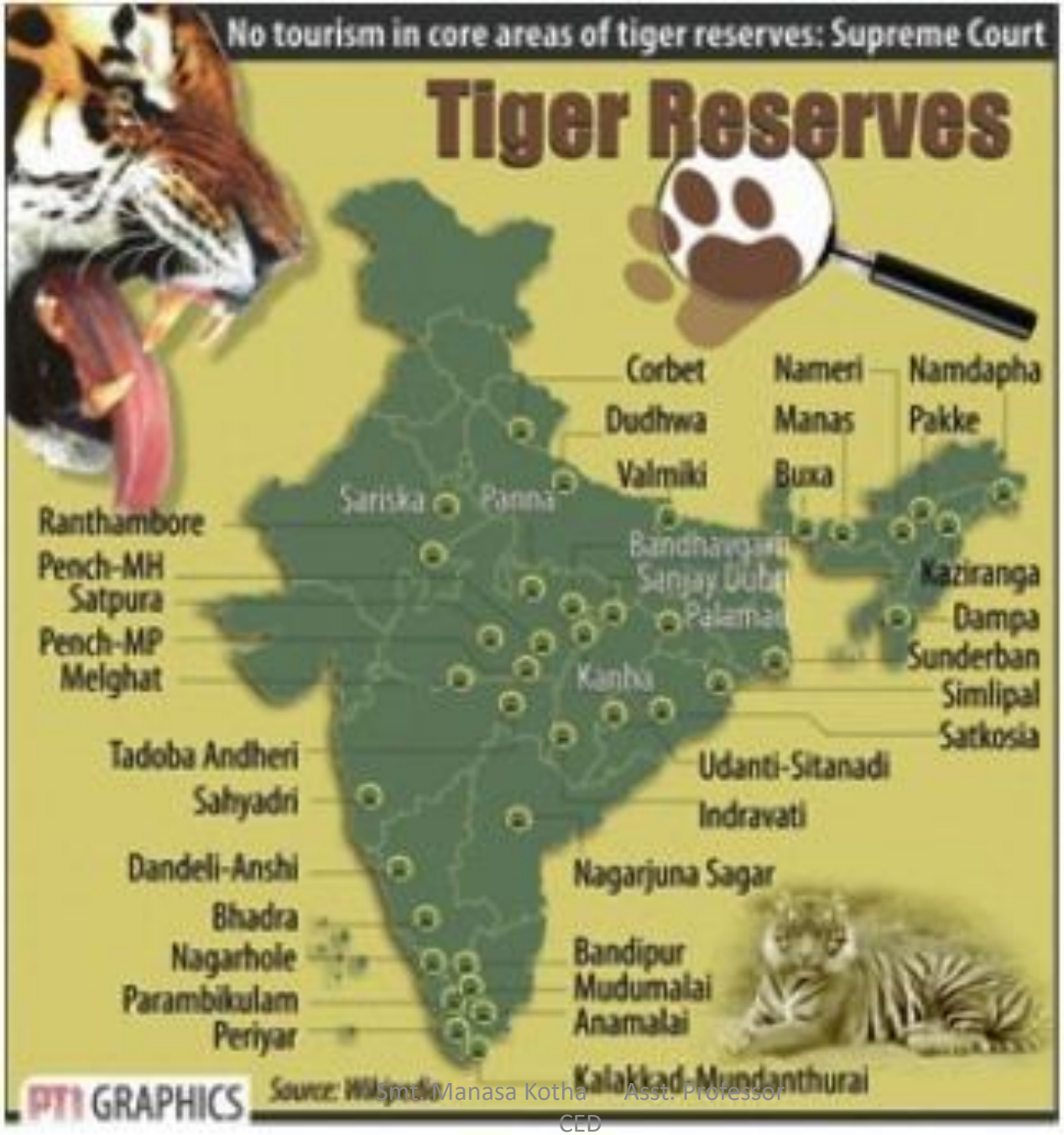
Sanctuaries:

- Bharatpur bird Sanctuary
- Karnala
- Ranganthittoo
- Wild Ass
- Jaldapara
- Nagzira
- Radhanagari
- Great Indian Bustard

- **Biosphere reserves** are areas of terrestrial and coastal ecosystems promoting solutions to reconcile the conservation of biodiversity with its sustainable use. They are internationally recognized, nominated by national governments and remain under sovereign jurisdiction of the states where they are located.

- Tiger reserves are operated by state forestry departments "to ensure maintenance of viable populations of the conservation dependent Bengal tigers in India.

- The tigers are maintained for their scientific, economic, aesthetic, cultural and ecological values and to preserve for all time areas of biological importance as a national heritage for the benefit, education and enjoyment of the people".


No tourism in core areas of tiger reserves: Supreme Court
Tiger Reserves
Corbet
Dudhwa
Valmiki
Sariska
Panna
Ranthambore
Pench-MH
Satpura
Pench-MP
Melghat
Tadoba Andheri
Sahyadri
Dandeli-Anshi
Bhadra
Nagarhole
Parambikulam
Periyar
Nameri
Manas
Buxa
Namdapha
Pakke
Kaziranga
Dampa
Sunderban
Simlipal
Satkosia
Kanha
Udanti-Sitanadi
Indravati
Nagarjuna Sagar
Bandipur
Mudumalai
Anamalai
Kalakkad-Mundanthurai
PTI GRAPHICS
Source: Wikipedia

Practiced Conservation Measures

- **Gir Sanctuary Project**
- **Project Tiger**
- **Himalayan Musk Deer Project**
- **Project Hangul**
- **Crocodile Breeding Project**


Crocodile Breeding Center

Protection by law and
Work by Organizations, NGO's

- **Indian Wildlife Protection Act, 1972**
- **Biological Diversity Act, 2002**
- **CITES :** The Convention on International Trade in Endangered Species of wild fauna and flora.
- **World Conservation Union (formerly IUCN)**

  The International Union for the Conservation of Nature
- Indian Wildlife Board (IBWL)
- WWF: Worldwide Fund for Nature
- BNHS: Bombay Natural History Society

EX-SITU CONSERVATION

1. Gene Bank.
2. Sperm Bank.
3. Ova Bank.
4. Seed Bank.

GENE BANK

SEED BANK

Ex situ conservation Institutes

- 196 zoos, 34 botanical gardens
- Gene bank/ seed bank Facilities:
- National Bureau of Plant Genetic Research (NBPGR)
- National Bureau of Animal Genetic Research (NBAGR)
- National Facility for Plant Tissue Culture Repository(NFPTCR)

OTHER MODES OF CONSERVATION

- Strict Legal action against poaching.
- Proper Implementation of Acts to save Bio-Diversity.
- Awareness programme.

THE STEPS OR EFFORTS TAKEN IN INDIA TO SAVE BIO- DIVERSITY

1. Establishment of Ministry of environment & forest 1980.
2. Establishment of Protected area:
   Sanctuary – 500
   National Park 92
   Reserve forest Botanical gardens
3. Establishment of forest survey of India 1981
   Botanical survey of India 1890(Cal). Zoological survey of India.
4. Establishment of medicinal plant conservation area(MPCA).

5.Establishment Plant development area(MPDA).

6.Establishment of national Plants gene bank

7.Establishment of WWF India.

8.Establishment of Bombay Natural History society 1983.

9.Establishment of TRAFFIC INDIA 1991.

10.Announcement of 13 Biosphere reserve.

11.Membership of convention on International trade in endangered s of world flora & fauna.

IN CASE OF EX-SITU CONSERVATION:

1. Establishment of NBAGR (National Bureau of animal genetic resources.
2. NFPTCR (National facility for plant tissue culture repository) conservation of plant variety through tissue culture.
3. NBPGR (National Bureau of plant genetic resources) New Delhi, for Cryogenic preservation of seed.

PROTECTION ACTS

1. Madras wildlife Acts 1873.
2. All India elephant preservation Act 1879
3. The wild Birds and animals Protection Act 1912.
4. Bengal Rhinoceros preservation Act 1932.
5. Assam Rhinoceros preservation Act 1954.
6. All India wildlife protection Act 1972 amended in 1983,1986,1991.
7. Environment protection Act 1996.
8. Bio-Diversity Act 2002.