BIODIVERSITY

Dr. Kaustubh A. Bondre

SCOPE OF DISCUSSION

- Meaning and concept of biodiversity
- Types of biodiversity
- Benefits of biodiversity
- Causes of the loss of biodiversity and
- Conservation of biodiversity

CONCEPT

- Biodiversity simply means variety of living species of organisms of both plant & animal communities in an ecosystem having certain specific environmental conditions & larger spatial scale

- Contraction of the term ‘Biological Diversity’

- Term first coined & used by Walter G. Rosen (1986)

Genetic variation

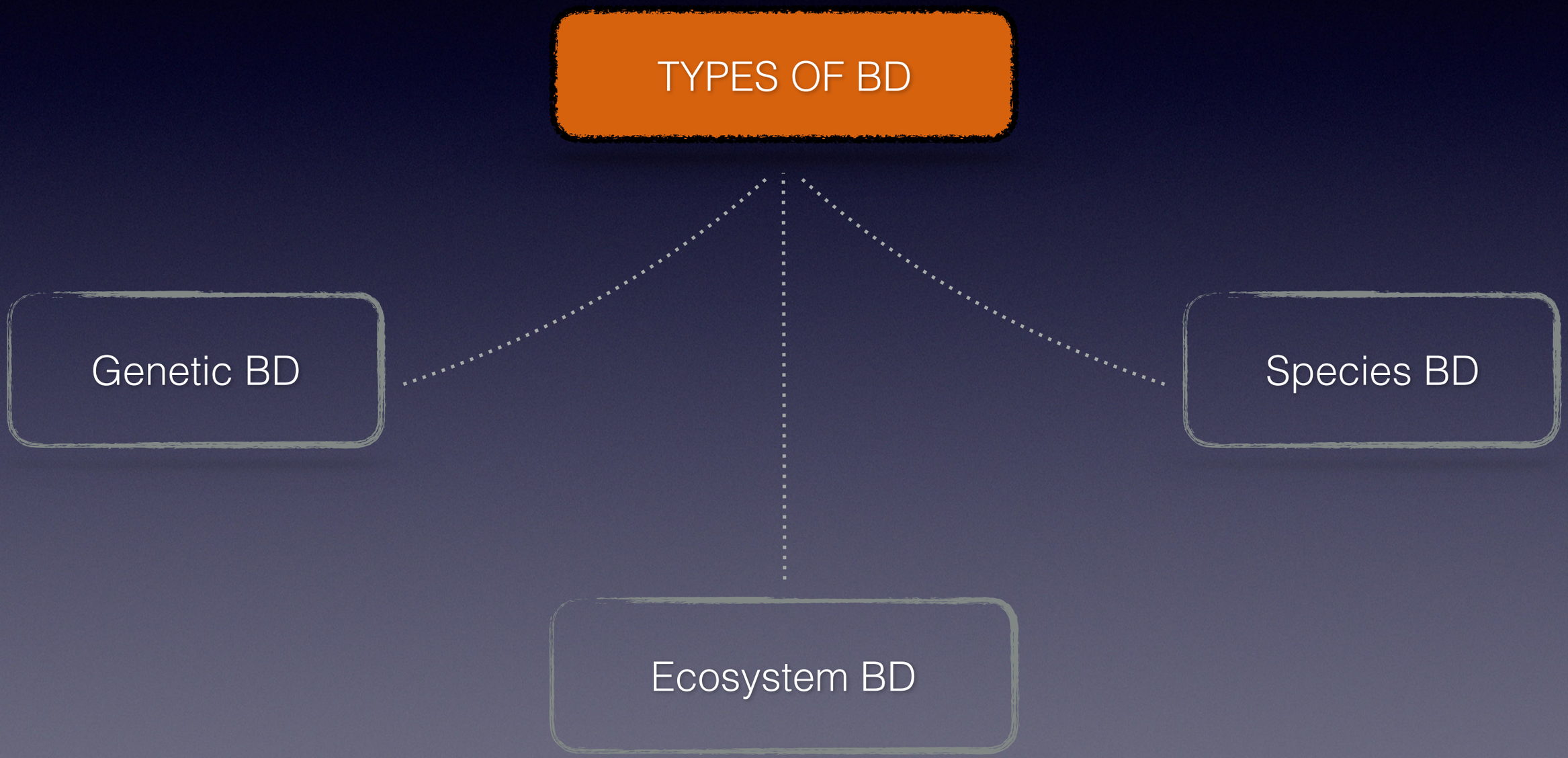
Species variation

ELEMENTS

Ecosystem variation

Temporal variation

BASED ON THE ELEMENTS



GENETIC BIODIVERSITY

- Variations & differences at the level of genes in the species of plants and animals

- Translates as greater variability & adaptability of individuals to environmental conditions

SPECIES BIODIVERSITY

- Refers to variety & variability of species of biological communities
- Includes plants, animals & microbes
- Generally referred to as a synonym for biodiversity
- Greater the diversity, longer the food chains —> in turn determine the degree of BD

ECOSYSTEM BIODIVERSITY

- Ecosystems determine the variety of habitats & niches for biological communities

- Different biological processes operate in different natural ecosystems

- Different ecosystems have different variety & number of species

Biodiversity hotspots

- Term coined by Norman Myers, a British ecologist, in 1998
- Defined biodiversity hotspots as those areas which have rich biological communities including plants, animals and microorganisms wherein endemic species predominate
- Endemic species are those species of plants and animals including microorganisms which are found in a specific area only and are not found in other areas

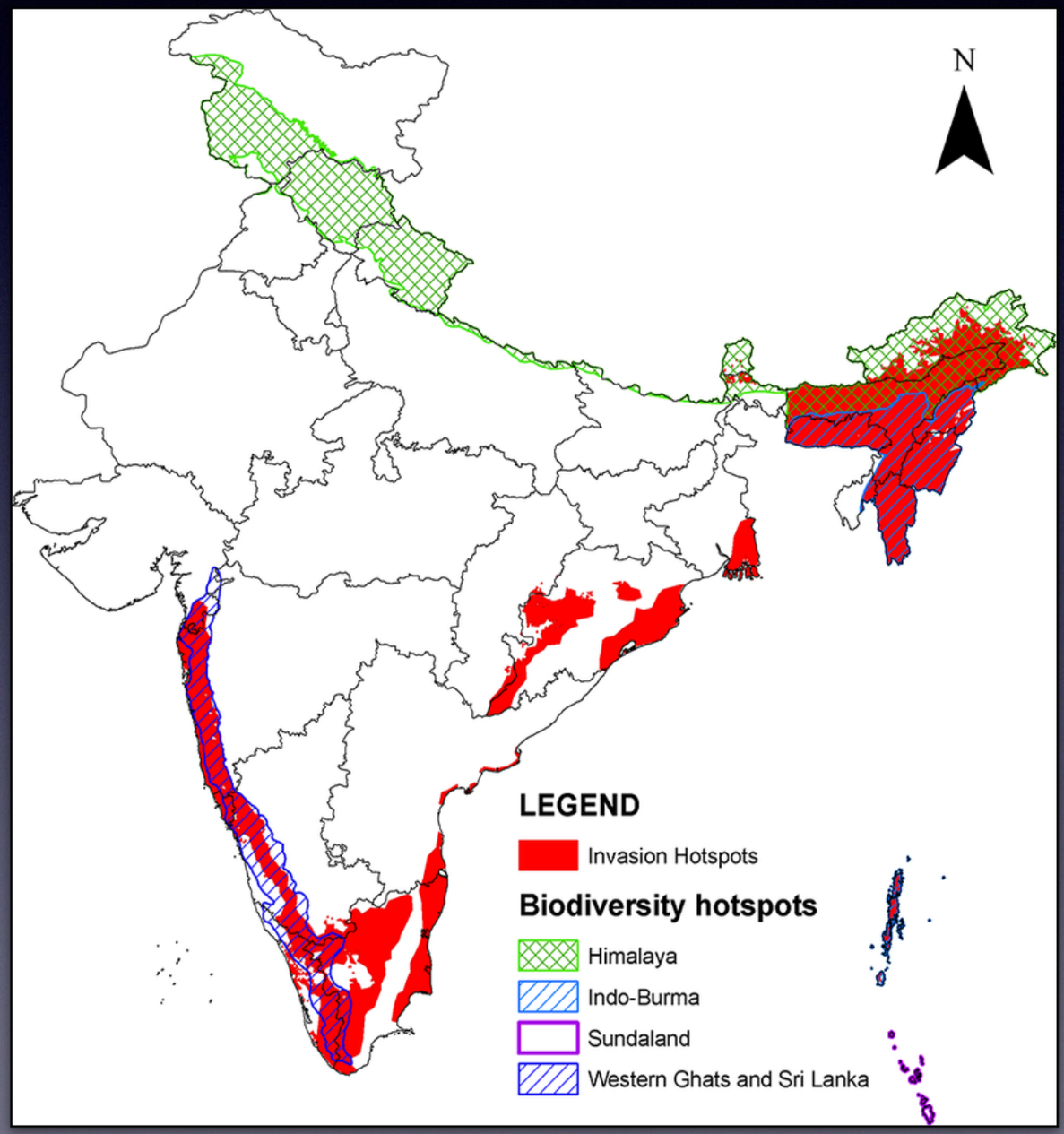
Criteria

- Currently, there are 36 recognised BD hotspots globally
- Only those rich biodiversity areas which have at least 1500 species of endemic vascular plants & have lost 70% of their original habitats are included
- The regions or areas having richest biodiversity are called ‘biodiversity hotspots’ or ‘mega-diversity regions or localities’

Global distribution

Hotspots in india

- The Himalayan Biodiversity Hotspot Region
- The Indo-Burma Biodiversity Hotspot Region
- The Western Ghats Biodiversity Hotspot Region
- The Sundaland Biodiversity Hotspot Region



Himalayan bd hotspot

- Covers Uttarakhand, Sikkim, AP & Sub-Himalayan WB of India; Nepal, Bhutan and Yunnan province in China

- About 32% of total plant species are endemic

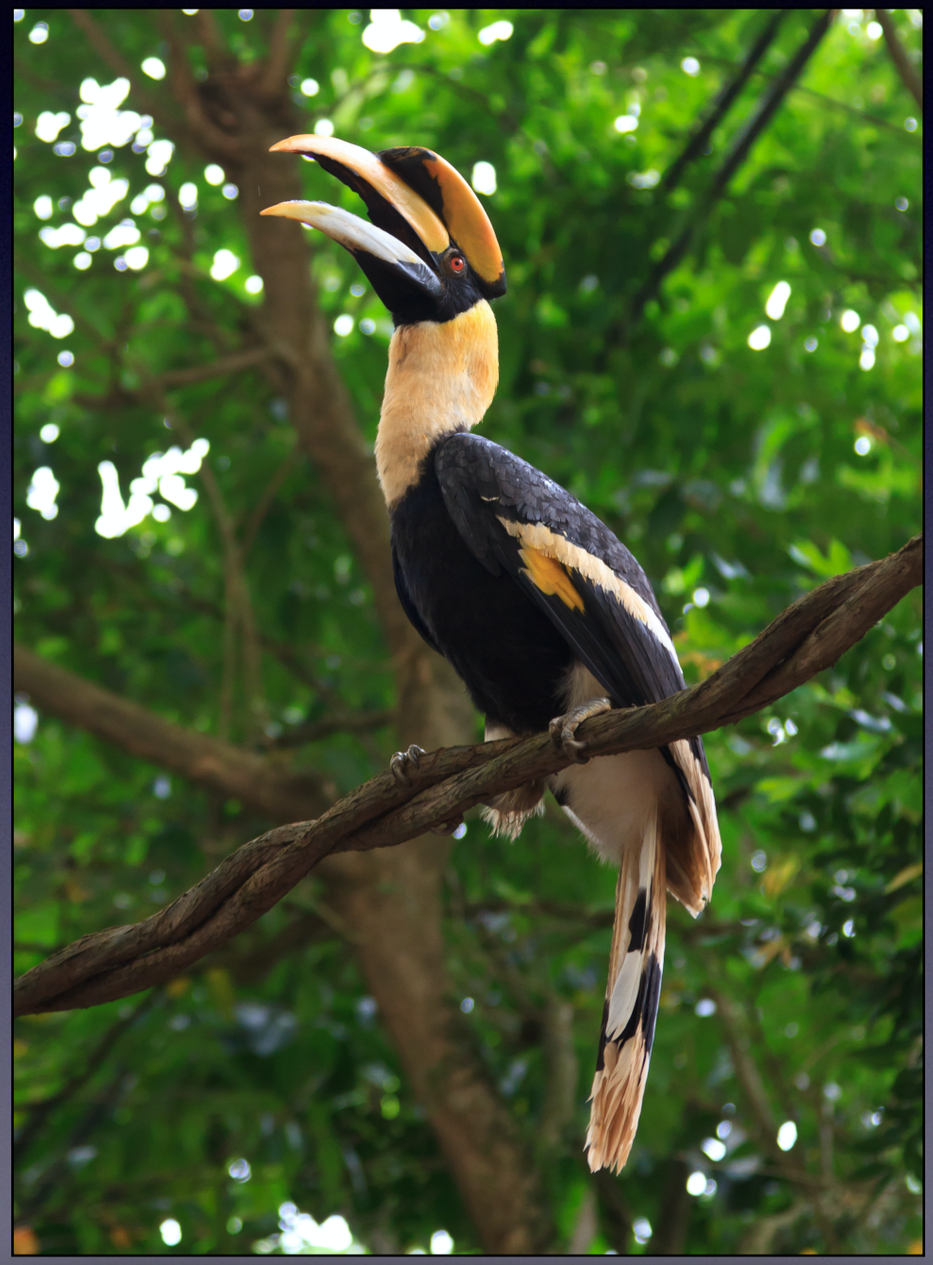
- The average number of plant species is about 10000 species

indo-burma bd hotspot

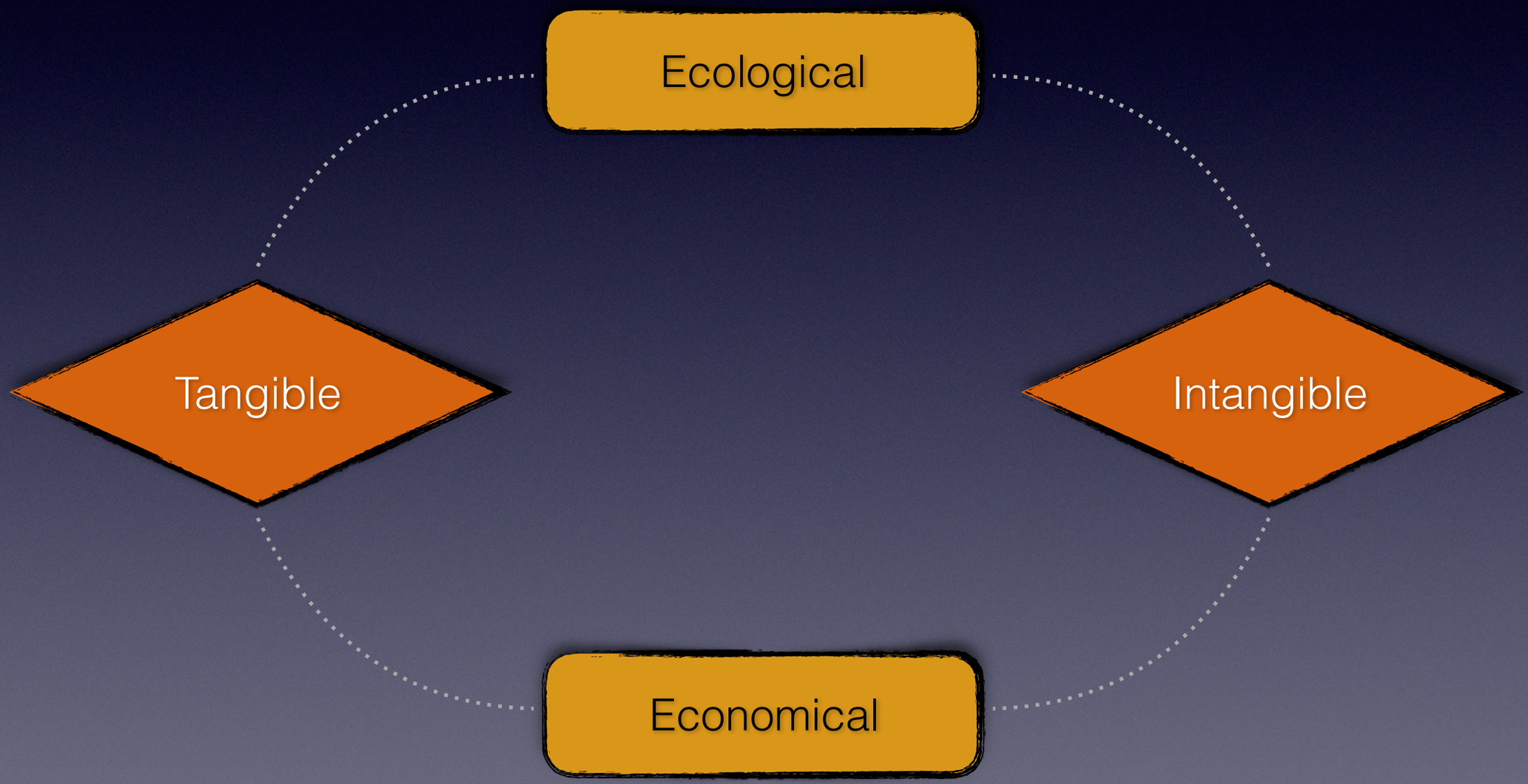
- Indian states of Assam, Nagaland, Manipur, Meghalaya & Tripura
- Adjoining region of Myanmar
- Numerous species of fresh water animals, birds & other endemic animal species

Western ghats bd hotspot

- Very large number of endemic plant species (52%)
- Maharashtra, karnataka, tamil nadu & kerala states
- The Agasthyamalai hills & the Silent Valley are rich important areas
- Evergreen & deciduous species of plants
- Threats: deforestation & projects



Significance of bd



Soil

BCG cycles

Air

Water

Climate

Hydrologic al cycle

Ecological services

Ecosystem stability

Aesthetic value

Carbon sink

Ethical value

Ecological services

Conservation of soils	Purification of air
Conservation of water	Moderation of climate
Regulation of hydrological cycle	Functioning of BGC cycles
Maintenance of ecosystem stability	Carbon sink for anthropogenic emission
Aesthetic value	Ethical value

Economic services

Source of food	Clothing
Shelter for aborigins	Drugs & medicines
Vitamins	Tourism
Fuel wood & timber	Sports goods
Industrial raw materials	Genetic storehouse

Relevance

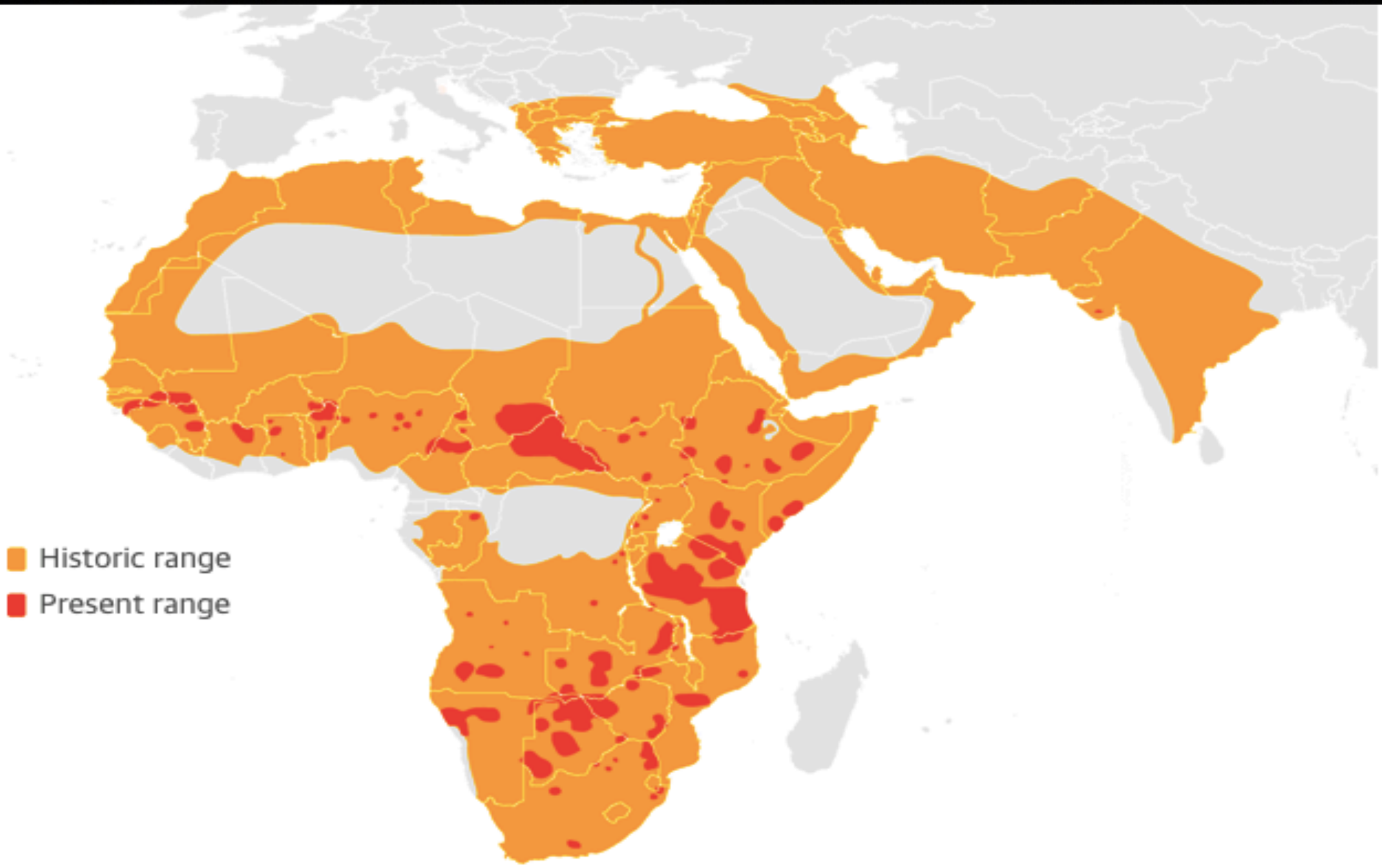
- Political significance
- Diplomatic significance
- Religious significance
- Advancement in biotech has increased the relevance of BD

Biodiversity loss

- Species extinction is defined as complete elimination of specific species of biological community from natural habitats as well as from cultivation or captivity as ‘zoos’ & protected areas
- Extinction of species and emergence of new species is a natural process of evolution
- The Earth has lost about 60 percent of all vertebrate individuals since 1970
- Australia has one of the worst recent extinction records of any continent, with more than 100 species of vertebrates going extinct since the first people arrived over 50 thousand years ago

The sixth mass extinction

- Biological annihilation: Overpopulation of humans or Overconsumption by humans
- A third of the thousands of species losing populations are not currently considered endangered & that up to 50% of all individual animals have been lost in recent decades
- Detailed data is available for land mammals, and almost half of these have lost 80% of their range in the last century
- Natural “background” rate: about one to five species per year
- Present rate: up to 1,000 times the background rate, with literally dozens going extinct every day



Guardian graphic | Source: PNAS

Historically lions lived across Africa, southern Europe, the Middle East, all the way up to Northwestern India. Today their habitat has been reduced to a few tiny pockets of the original area.

Earth's previous 5 mass extinctions

- End-Ordovician, 443 mya: A severe ice age led to sea level falling by 100m, wiping out 60-70% of all species which were prominently ocean dwellers at the time. Then the ice melted leaving the oceans starved of oxygen

- Late Devonian, c 360 mya: A prolonged climate change event, again hitting life in shallow seas very hard, killing 70% of species including almost all corals

- Permian-Triassic, c 250 mya: The big one – more than 95% of species perished, including trilobites & giant insects – strongly linked to massive volcanic eruptions in Siberia (a savage episode of global warming)

- Triassic-Jurassic, c 200 mya: 3/4 of species were lost, again most likely due to another huge outburst of volcanism- left the Earth clear for dinosaurs to flourish

- Cretaceous-Tertiary, 65 mya: A giant asteroid impact on Mexico, just after large volcanic eruptions in what is now India, saw the end of the dinosaurs & ammonites. Mammals, & eventually humans, took advantage

Natural process of loss

- Extinction of species & emergence of new species is a natural process of evolution

- Natural process is an exceedingly slow process

Climate change

Volcanic eruption

Meteor impact

Continental drift

Drought & famine

Overexploitation

Habitat destruction

Exotic species

Anthropogenic causes

Envt pollution

Global warming

Habitat destruction

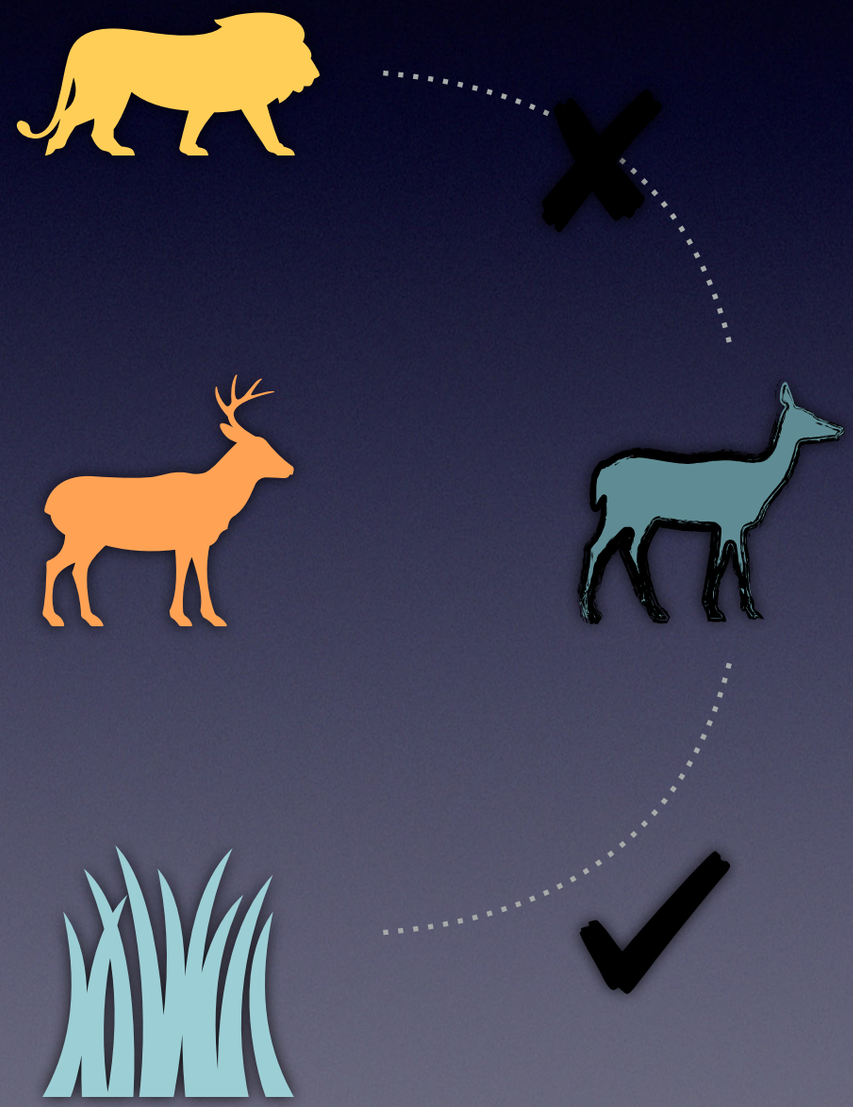
- Deforestation is root cause
- Fragmentation of habitat: the case of Asiatic lions
- Simplification of habitat
- Conversion of habitat: The so-called development projects

Over-exploitation

- The harvesting of wild animals & plants beyond a critical sustainable limit
- Hunting & poaching
- Tigers, rhinos, elephants & whales
- Trawler fishing in oceans

Introduction of exotic species

- Intentional or unintentional
- Islands or isolated ecosystems more vulnerable
- Not all become a problem; but those who do, become big ones
- Brown rats: ship transport
- Lantana comarra: forests



Environmental pollution

- Urbanisation & industrialisation
- Use & throwaway culture
- Biological ‘deserts’: example is Damodar river
- Vultures in India
- Honey bees & sparrows

Global warming & climate change

- Rising temperatures impact vegetation
- Coral bleaching
- Submergence of islands
- Polar glacial melting
- Northward migration of species (N. Hemisphere)

Others

- Diseases, affecting the entire populations
- Trade in wild species for pets: star turtles
- Species that have prospered because of humans
- Collective gain but individual suffering..!!

Biodiversity Conservation

In-situ Conservation

Ex-situ Conservation

Biosphere

National Parks

Wildlife

Sacred Groves

Seed bank

Gene bank

Botanical

Zoological

Wildlife sanctuary	National park	Biosphere reserve
It is a natural habitat, owned by the government or private agency, that safeguards particular species of birds and animals	It is the protected area, which are established by the government, to conserve wildlife & also develop them	Notified areas which cover a larger area of land which may cover multiple National Parks & Sanctuaries
Preserves animals, birds, insects, reptiles, etc.	Preserves flora, fauna, landscape, historic objects, etc.	Protects entire biodiversity & helps economic development of the tribals
Restrictions are less and it is open to public	Highly restricted, random access to people is not allowed	Restrictions are relatively more
Boundaries are not fixed	Boundaries are fixed by legislation	Boundaries are fixed
Human activity allowed but up to a certain extent	Human activity not allowed at all	Human activity not allowed in the core zone

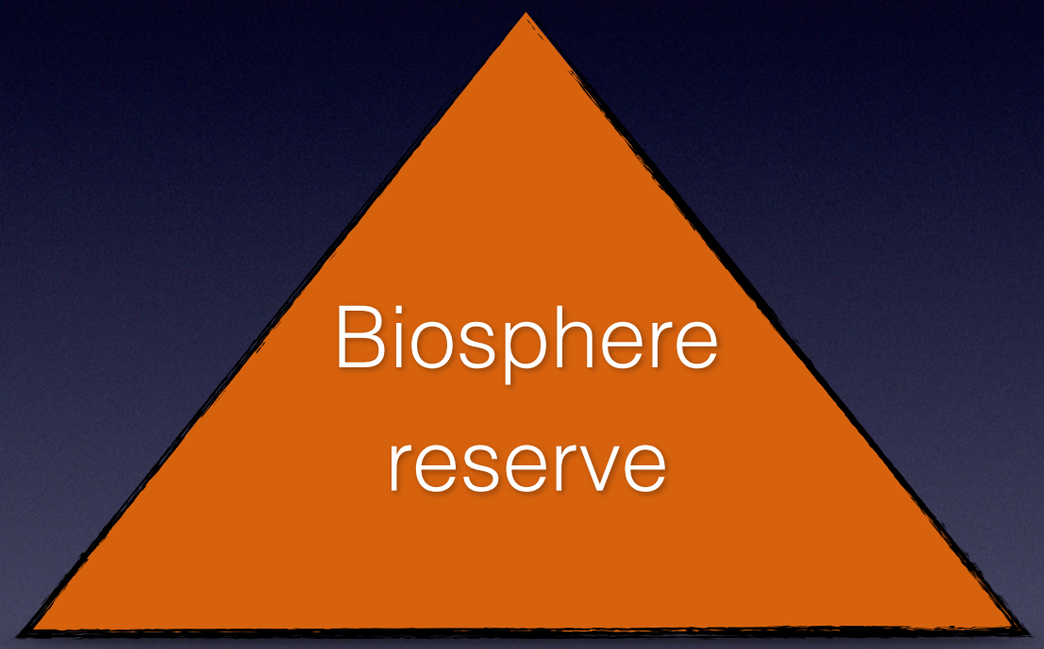
Biosphere reserve

- They include the areas of terrestrial & coastal ecosystems wherein abiotic & biological resources are managed & conserved in sustainable manner

- These are ‘living laboratories’ for the integrated management of ecological resources

- Within the ambit of the Man & Biosphere Program (MAB) of the UNESCO. The first BR was identified in 1976.

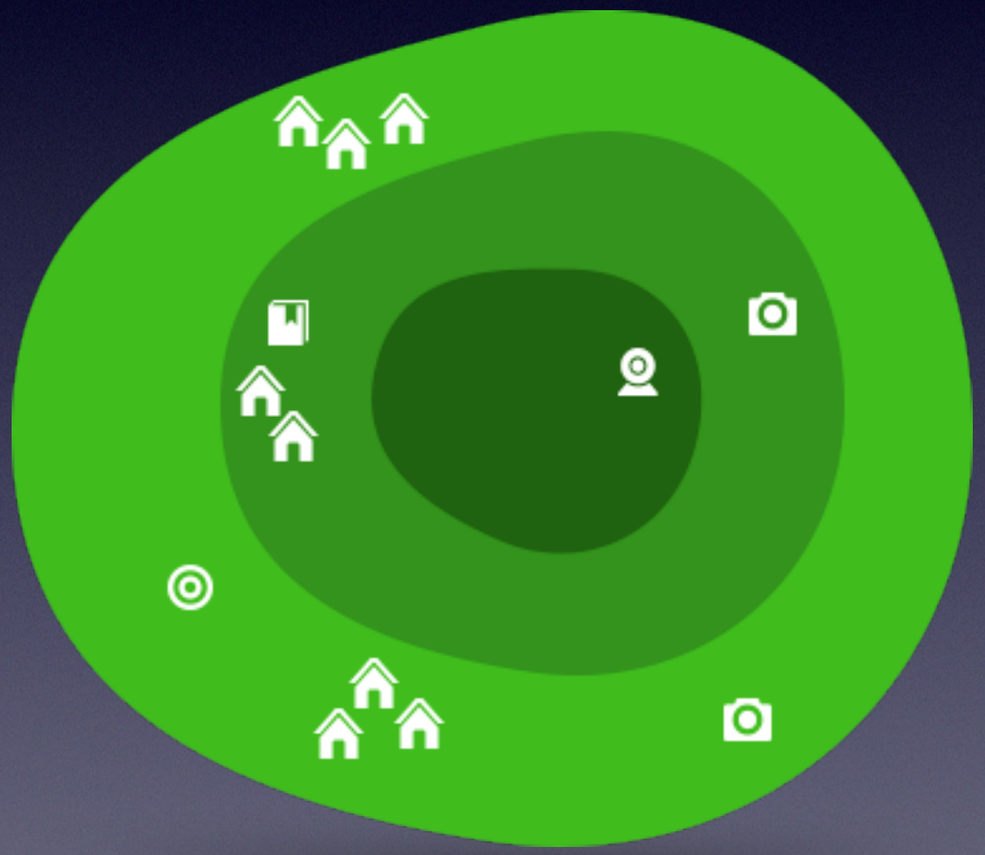
Development
role



Conservation
role

Logistic
role

Structure of BR



- Core area
- Buffer zone
- Transition area
- Human settlements
- Research station
- Monitoring
- Education / training
- Tourism / recreation

What the unesco says..

- Biosphere reserves form an international network of protected areas in which an integrated concept of conservation is being developed, combining the preservation of ecological and genetic diversity with research, environmental monitoring, education & training

- Biosphere reserves are selected as representative examples of the worlds ecosystems

Coral gardening

- One of the latest methods to regenerate degraded coral ecosystems.
- There are two methods of cultivating corals in the laboratories & transplanting them in the degraded reefs

Israeli method involves culturing minute coral fragments in situ nursery. Adult coral colonies thus obtained are transplanted on degraded reefs.
Japanese method involves culturing corals by developing corals from coral eggs to juvenile coral colonies. This is known as sexual propagation.

Must do…

- Various Biomes
- Ramsar convention
- Coral reefs, Wetlands & Mangroves
- CITES (The Washington Convention)
- Convention on Biological Diversity (Rio)
- IUCN Red Lists
- WWF
- Various Government Projects for particular species
- Initiatives by Tribes/People
- Sacred groves
- Constitutional provisions
- Laws that protect BD
- Schedules of the Wildlife Protection Act, 1972

Thank you