Biodiversity

Dr Maya Mahajan

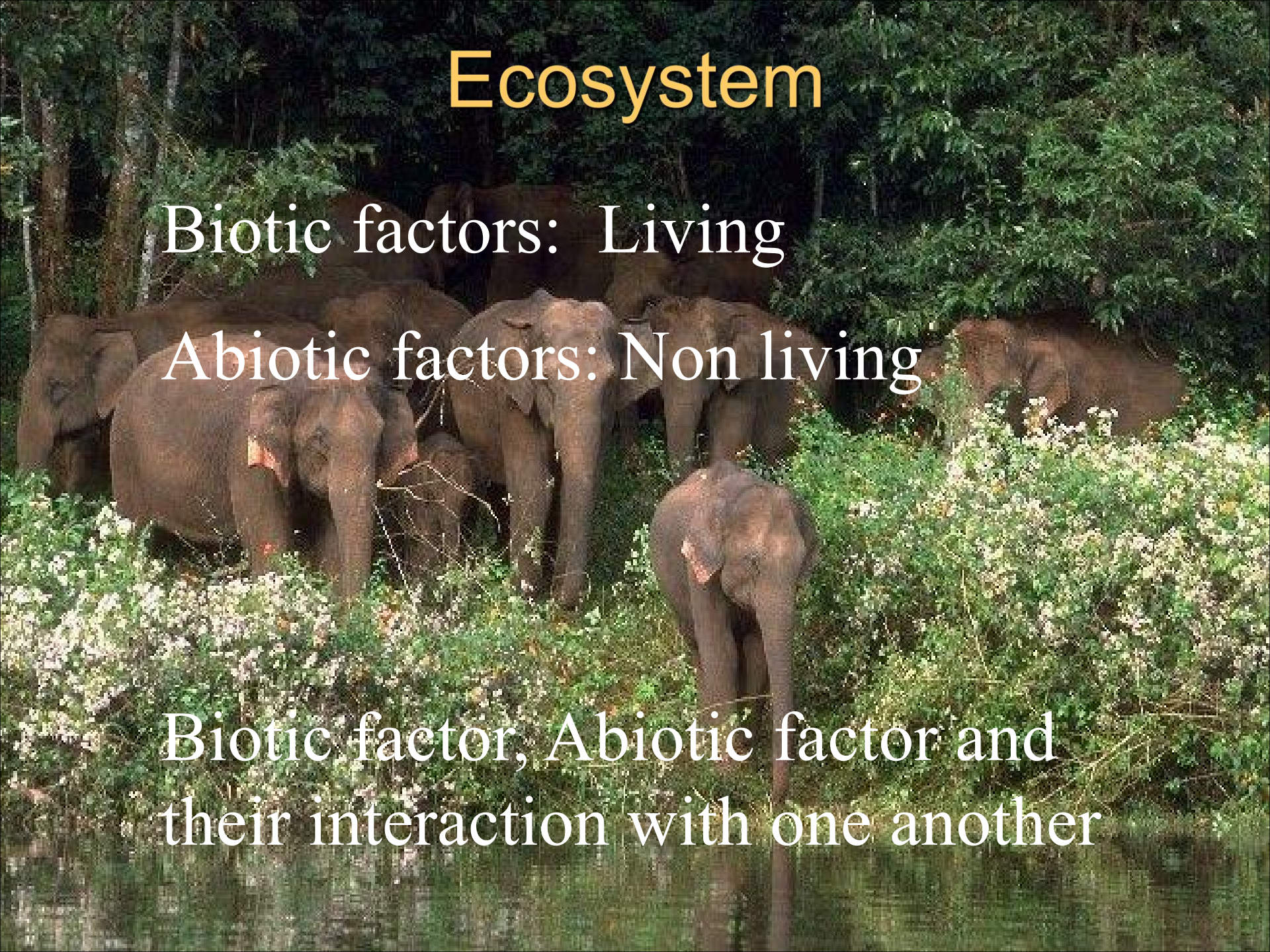
Environment and Ecology

- What is Environment?

  Surroundings: Natural and man made

- What is Ecology?

  The study of the interactions between organisms and their environment



Ecosystem

Biotic factors: Living

Abiotic factors: Non living

Biotic factor, Abiotic factor and their interaction with one another

What is Biodiversity?

Bio-diversity means the variety of life on Earth.

the product of four billion years of evolution.

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"Biodiversity" was coined as a contraction of "biological diversity" in 1985. A symposium in 1986, and the follow-up book BioDiversity (Wilson 1986),

It is measured as the

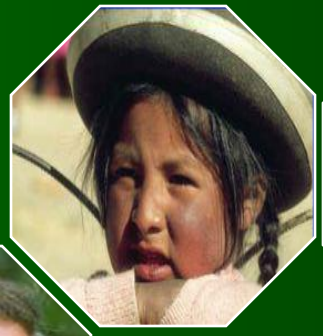
- Species Diversity
- Genetic diversity, &
- Variety of Ecosystems

Species Diversity

Genetic Diversity









Ecosystem Diversity

Terrestrial Ecosystem

- Evergreen forest, Shola
- Grass land
- Dry/Moist deciduous forest
- Alpine forest

Aquatic Ecosystem

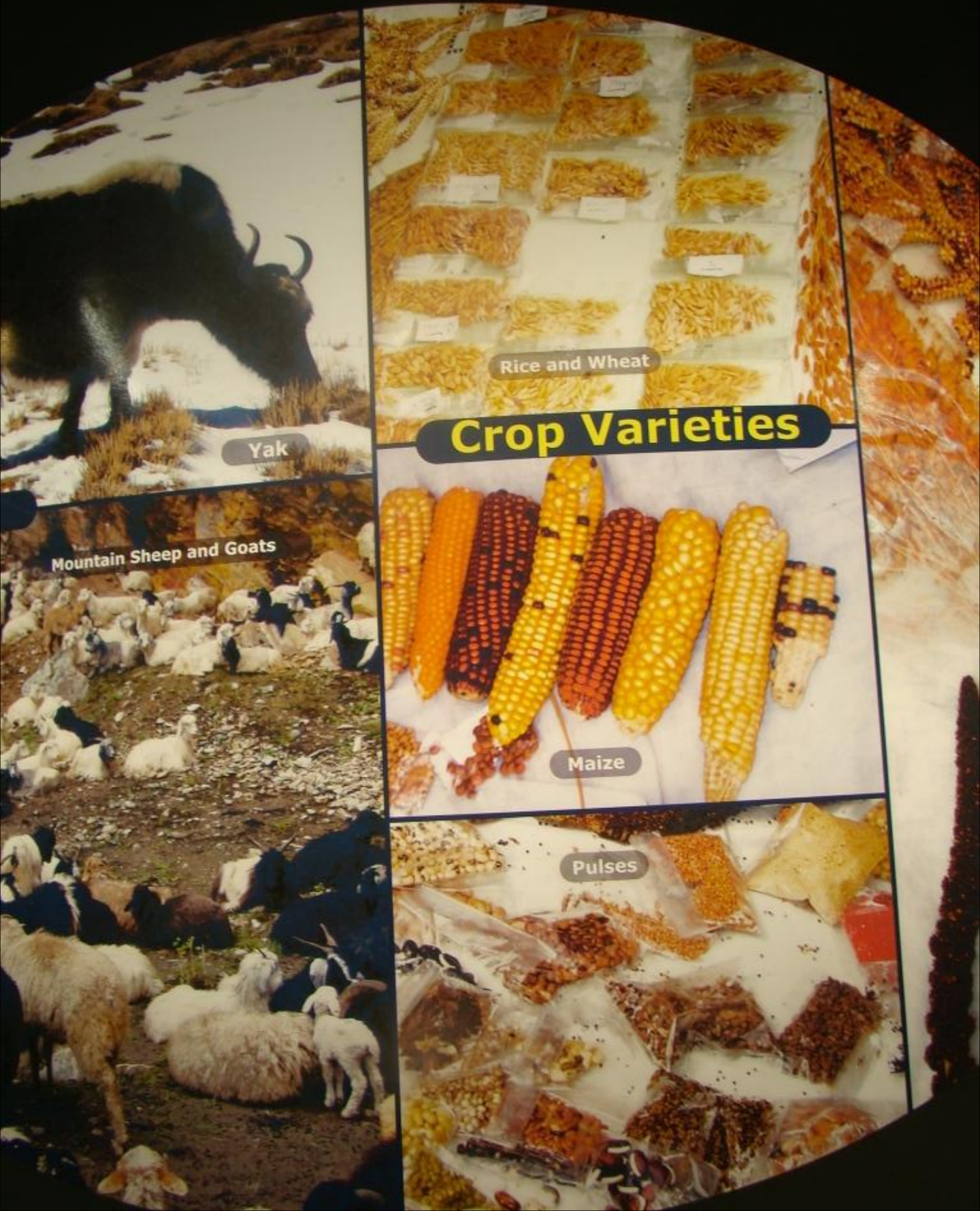
- River
- Lake, Pond

Marine/Coastal Ecosystem

- Mangrove Ecosystem, Coral Reef

Domesticated Diversity

- Different crop varieties and livestock breeds
- 50,000 Varieties or Rice in India. Navadanya has identified over 150 sps of rice in Western Ghats
- Warali tribes in Maharashtra grow different varieties of rice for different climatic conditions
- India's eight breeds of buffaloes represents the entire range of genetic diversity of the world


Yak
Rice and Wheat
Crop Varieties
Mountain Sheep and Goats
Maize
Pulses

Estimation of Biodiversity

For empirical measurement—

2 criteria: Species richness & Species Evenness

Measurement Indices:

Species richness-only number of species.

Simpson index-number and evenness

Shannon index - species richness and number

Alpha diversity—no. of species within the ecosystem

Beta diversity is species diversity between ecosystems; Comparison

Gamma diversity is a measure of the overall diversity for different ecosystems within a region.

Biodiversity Global

- No. of total species - ???? Not known
- estimated total at about 10 million - 30 million
- The number of described species 1.8 million;
- Majority of unidentified species are microbes and insects
- It has taken 4 billion years for this biodiversity to evolve,
- We are rapidly destroying it. (6^{th} Mass extinction-Man made)

India –one of the richest country in the world. Why?

- 8% of words biodiversity in just 2% of earths surface
- Diverse ecosystems and climatic conditions
- 16 major forest types. Forest cover 21%
- One of the 17 mega diversity countries in the world
- Has Global biodiversity hot spots (North east , Western Ghats
- Origin of 30,000 cultivated Plants
- High endemicity (11058 species of plants are endemic)

Centre of Plant Biodiversity

- At least 166 spp of crops and 320 species of wild relatives of cultivated crops are originated in India
- (NY Vavilov-Russian Scientist)
- Rice 50,000 varieties
- Mango 1,000 varieties
- Sorghum 5,000 varieties
- Pepper: 500 Varieties

All the world's buffalo breeds are found in India

All poultry breeds in India-Red Jungle fowl (Wild)

All cow breed originated from India-Zebu (wild)

India – biodiversity

- 45,500 plant species (17,527 flowering plants)
  - 91,200 species of animals, including
  - 57,000 insects (highest number)
  - 4,000 molluscs,
  - 2546 fish,
  - 460 reptiles,
  - 248 amphibians,
  - 1232 birds and
  - 397 mammals
  - 20000 invertebrates

Endemic species in India

- Species, whose distribution is confined to a particular region
- At high risk of extinction
- Endemism-rich areas: NE, NW, and E Himalayas, Western Ghats
- 44 mammals, 55 birds, 214 reptiles, 110 amphibians endemic to India
- 11,058 plants are endemic to India

Endemism in India

- 9% of fish
- 61% of amphibians
- 47% of reptiles
- 14% of birds
- 9% of mammals

Medicinal Plants

- India has 8000 medicinal plants
- Used in 50,000 herbal formulation

- A major source of livelihood
- Special Medicinal plant conservation areas have been established

Biodiversity Hotspots

in India: North East India and Western Ghats

Biodiversity hotspots criteria:

- Regions that harbor a great diversity of endemic species and at the same time be significantly altered by human activities
- Must support 1500 endemic species (0.1% of global)
- Must have lost more than 70% of original habitat
- 25 world hotspots have 44% of all plant species and 35% of all vertebrates in 1.4% of land area

Western Ghats

- One of the Biodiversity Hotspots in India
- More than 5000 sps of Plants
- Bird spp 508
- Mammals 140 (Asian elephants 15,000)
- Butterflies 334
- Fishes 290
- Reptiles and Amphibians 157 each
- Diverse Ecosystems: Evergreen, Shola, Moist and dry deciduous forest, Scrub jungle etc

High Endemism in Western Ghats

- Angiosperms 1500 (38%)
- Butterflies 37 (11%)
- Fishes 189 (65%)
- Amphibians 135 (86%)
- Reptiles 97 (62%)
- Birds 19 (4%)
- Mammals 18 (12%)

Western Ghat Conservation plan by Govt appointed committees

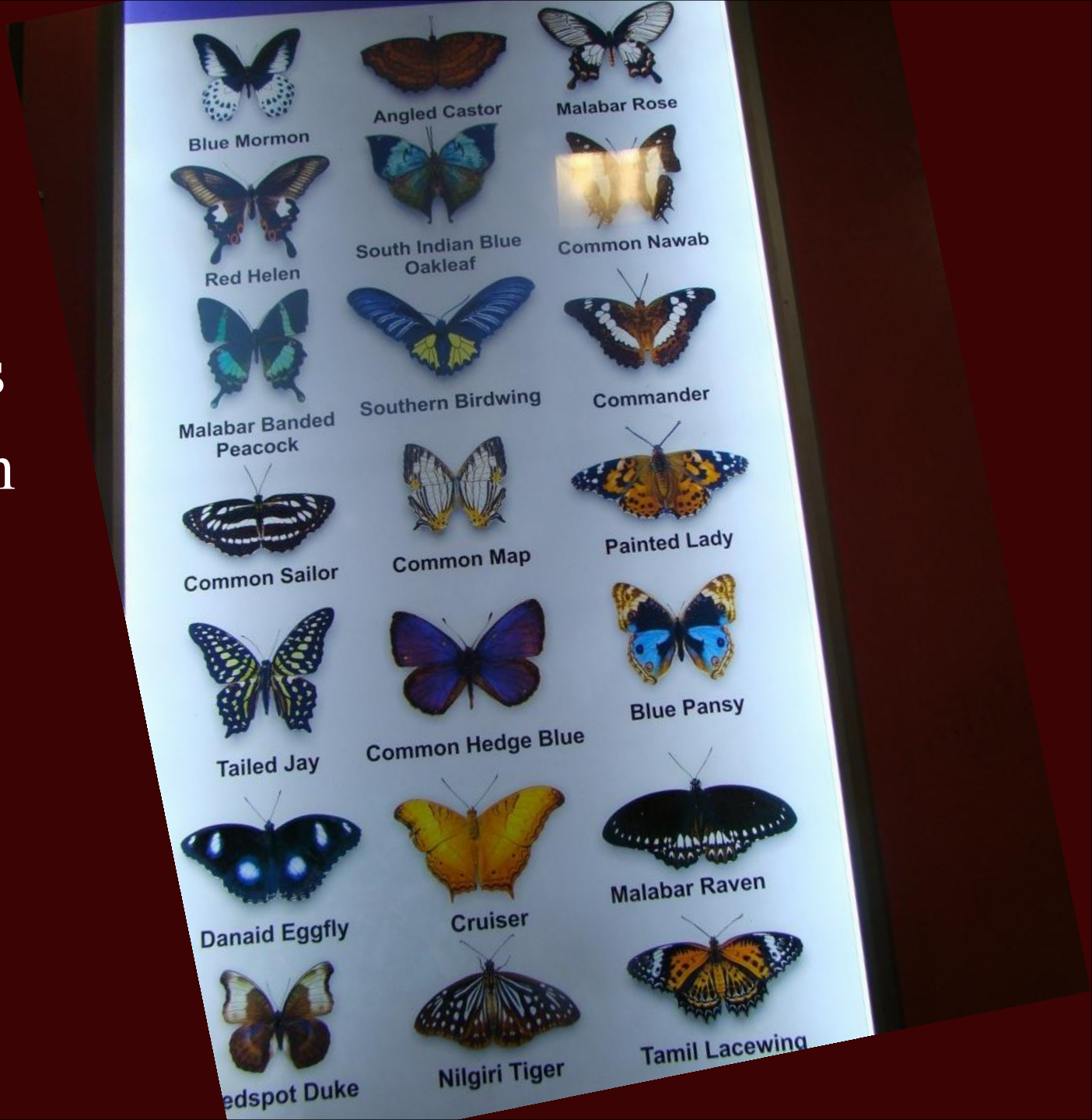
- Western Ghat Conservation plan
- Controversy Between

- Madhav Gadgil report and Kasturirangan report (diluted)

Nilgiri Thar-
State animal of TN- Endangered

Static.panoramio.com

Butterflies in Western Ghats



Nilgiri Biosphere Reserve

- India's first Biosphere Reserve (Siruvani Hills comes under NBR
- Plant sps 3300
- Birds 350 sps
- Butterflies 300 sps
- Reptiles and amphibians 80 sps
- Mammals 100 sps

- **Endangered & Endemic to the area Lion Tailed Macaque, Nilgiri Thar**

Why to Conserve ?

Ecological services:

- Biodiversity provides us food security, water recharge, climate regulation.
- Every species has its own role to play in the ecosystem

Every single species is an integral part of the vast chain of life

No chain is stronger than its weakest link !

Why to Conserve?

- **Economic Value:**

✓ Many species are used as food, fibre, medicine and resource for industrial products & energy. Values of many sp. (and even the species itself) are still unknown.

✓ 25% of all our drugs comes from plants

✓ Around 119 pure chemical substances extracted from about 90 species of higher plants are also used in allopathic

✓ **Vinca** to treat Hodgkins disease and cancer

✓ **Sarpagandha** traditionally used for snake bite, dysentery, nervous disorder, fever, Reserpine, an extract from the plant is now the principal source of material for traquilizers medicine.

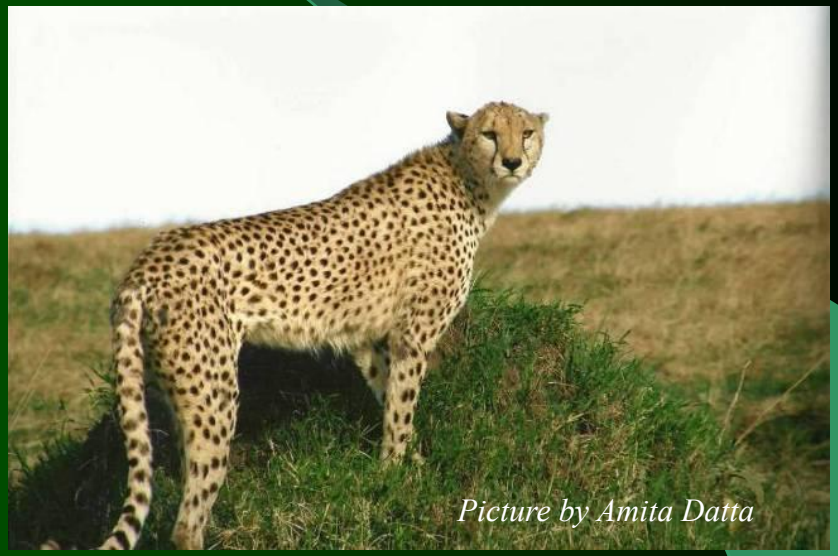
Ethical Value

Ethical value:

Every one has a right to live on this planet

Aesthetic Value:.

- Each species adds to the richness and beauty of life on the Earth.
- Ones a species becomes extinct, its gone for ever



Every single day ….

- **We are losing**
  - **300 km2 of rainforest, (1 acre / second)**
  - **40 to 100 species**

  Already lost 1 million species,
  - **Natural rate of extinction - 1species/ year,**
  - **The present rate is 1species/hour (10,000 times higher)**

  - Tonight the Earth will be a little hotter, its waters more acidic

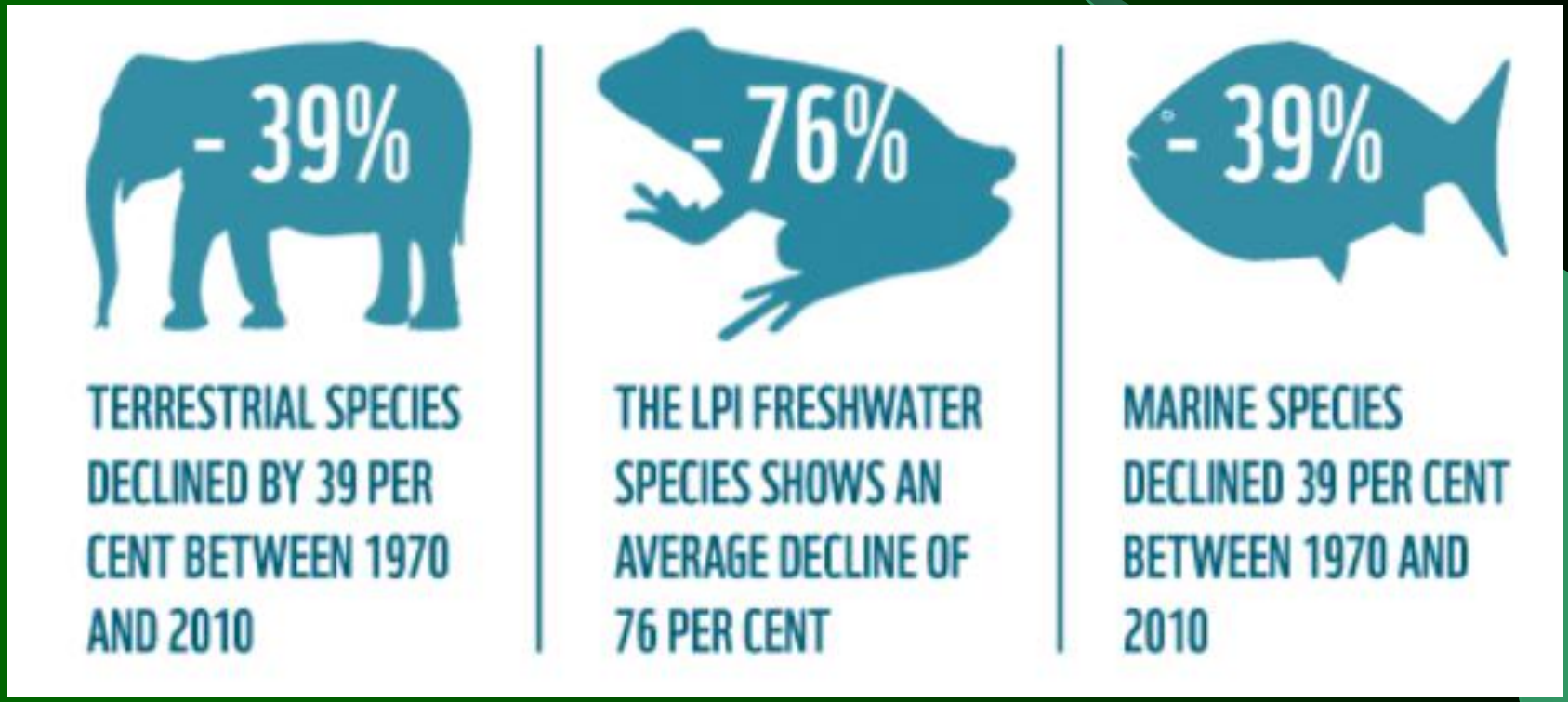
Living Planet Index 2014

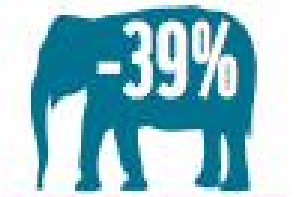
- WWF'S(World Wide Fund) Living Planet Report is a biennial publication that documents the state of the planet- the changing state of the biodiversity, ecosystems and humanity's demand on natural resources.

- Living Planet Index (LPI) 2014, measures more than 10,000 representative populations of mammals, birds, reptiles, amphibians and fish (has declined by 52 per cent since 1970.)

- http://wwf.panda.org/about_our_earth/all_publications/living_planet_report/
- .

Living planet report 2014-WWF





TERRESTRIAL SPECIES DECLINED BY 39 PER CENT BETWEEN 1970 AND 2010

The loss of habitat– particularly for **agriculture**, **urban development and energy production** – continues to be a major threat, compounded by **hunting**.

The main threats to freshwater species are **habitat loss, pollution and invasive species.** Changes to water levels and freshwater system connectivity

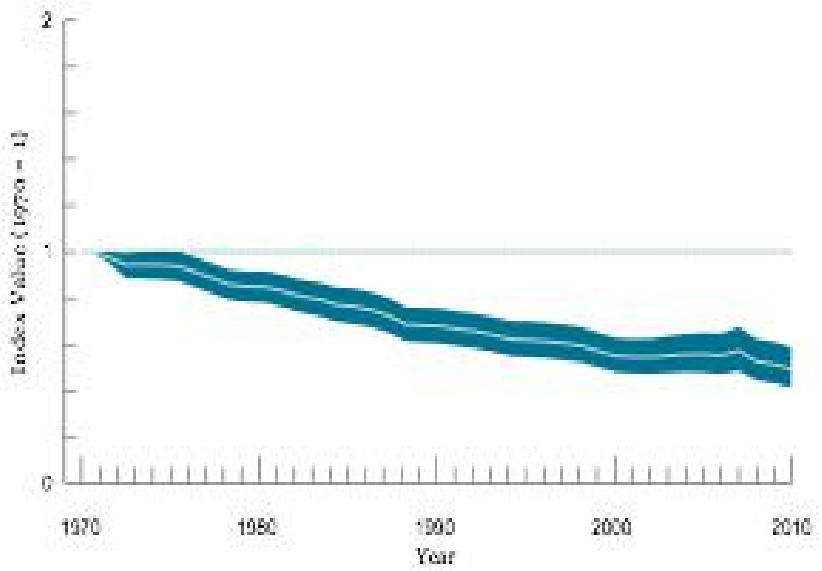
THE LPI FOR FRESHWATER SPECIES SHOWS AN AVERAGE DECLINE OF 76 PER CENT

MARINE SPECIES DECLINED 39 PER CENT BETWEEN 1970 AND 2010

The steepest declines can be seen in the **tropics and the Southern Ocean** – species in decline include **marine turtles,** many **sharks**, and large **migratory seabirds**

THE LIVING PLANET INDEX 2014

- Biodiversity is declining in both **temperate and tropical regions**, but the decline is **greater** in the **tropics.**



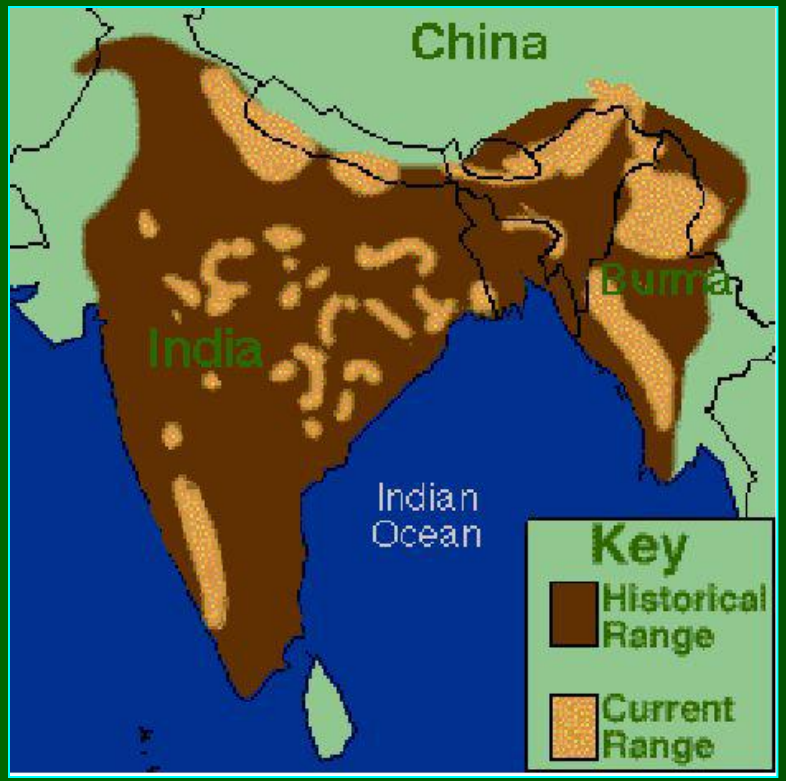
- **Habitat loss & degradation**, and exploitation through **hunting and fishing,** are the primary causes of decline.

Climate change is the next most common primary threat, and is likely to put more pressure on populations in the future

Shrinking ranges

Asian Elephant

Bengal Tiger



Siberian Tiger

Loss of Biodiversity in India

- The Cheetah -spotted big cat is extinct in India
- Pink Headed duck-Extinct
- Jerdon's courser rediscovered in 1985
- Loktak lake-Manipur Brow antler deer (Dancing deer) Endangered due to habitat loss
- 10% Plants, 20% Mammals, 5 % Birds are threatened.
- 150 Medicine plants disappeared

Endangered Indian Wildlife

Biodiversity loss

- Habitat Degradation
  - All Natural habitats are under threat from human activities
    - Over-exploitation, deforestation, reclamation, mining, roads, dams, Pollution,

    Habitat fragmentation

    Wildlife corridors destruction
  - If current trends continue, humanity will irreversibly alter virtually all of Earth's remaining natural ecosystems within a few decades.

Corridor Conservation

Green Corridor, or Wildlife Corridor, is a patch of habitat that connects populations of wild life, which may become isolated by activities such as forest clearing, fire and so on. **Such corridors are vital for the movement of animals,** requiring large home ranges, such as the elephant and tiger **for re-establishment and breeding**.

For instance, the Project Elephant, launched in 1992 by the Ministry of Environment and Forests, Government of India, has identified **30 State**

Biodiversity loss

- **Introduced Species/ Alien spp**

  -Lantana, Mikenia invasion in Western

  -Rabbit boom Doom story in Australia

Overexploitation of plants and animals

-Frog legs from India exported to Europe and North America- Now it is banned

Global climate change

-Loss of diversity due to extreme climatic conditions

Global warming & Biodiversity

1700 plants, animals and insects species moved pole wards at an average rate about 4 miles per decade in the last half of the 20th Century.

Mass death of Coral reefs because of coral bleaching World wide

Islands in Sunderban sinking,

Threat to Bengal Tiger

Over the past 25 years, penguin populations have shrunk by 33 percent in parts of Antarctica, due to declines in winter sea-ice habitat.

According to a new global study 90 percent of all large fishes have disappeared from the world's oceans in the past half century.

The Golden toad *(Bufo periglenes)* and the Harlequin frog *(Atelopus varius)* of Costa Rica have disappeared as a direct result of global warming

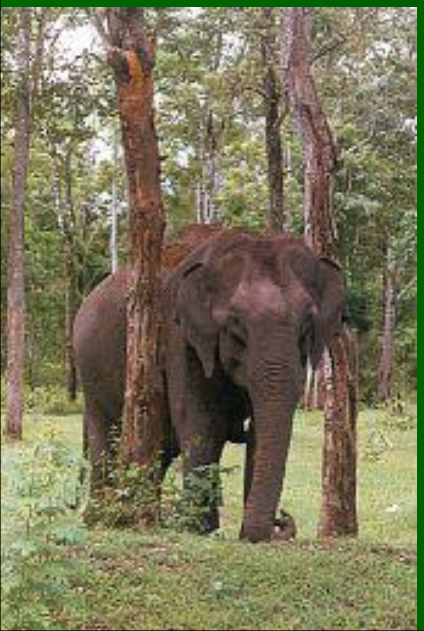
Human-Animal Conflicts

- Examples
  - Leopard at Sanjay Gandhi National Park, Borivili
    - our interference with the wildlife habitats
  - Crop raiding by elephants
    - Destruction of Wildlife Corridors
- Bharatpur (Keoladeo National Park)
  - Wrong conservation decisions avoiding people

Sariska -Tiger

Hunting/ Poaching

- Trade in tiger bone, skin
  - Major factor that threatens survival
  - Used for thousands of years in Asian medicine for treatment of rheumatism



Ivory trade

- Decimated Indian Elephant populations and skewed sex ratio

Tiger bone wine


© Martin Harvey - WWF
WWF
wwf.org.uk
No tiger poaching reported in Nepal in over 3 years!

Tradition of Conservation

- Animal worship
  - Snake, Peacock, Eagle, Rat, Cow
- Sacred groves
  - Vat Vruksha Pooja, Vana Mahotsava
  - Sacred flowers, leaves etc for Pooja
- Bishnoy Community
  - Known to lay down lives for plants/wildlife
- Budhism and Gandhism & Universal Brotherhood concepts
- Emperor Ashoka established Animal Hospitals in 3rd Century BC

Conservation Myth

"Nature conservation is Against development ?"

- Truth
  - Ultimately no development is sustainable without taking care of Nature,
  - On the other hand people participation is vital
- Sustainable Development
  - "Meeting the needs of the present without compromising the ability of future generations to meet their own needs"*

*

Conservation Efforts: International

The Biodiversity Convention

- Focuses on the conservation of biodiversity and on sustainable use of biological resources and equitable sharing of benefits arising from their use. 1992 at United Nations Conference on Environment and Development held in Brazil

The Convention on wetlands of International importance

- The Convention also known as the Ramsar Convention, was signed in Ramsar (Iran). It provides a framework for international cooperation for the conservation of wetland habitats.

International Convention

- World Heritage Convention 1972: biodiversity has to be seen as global heritage
- Convention on International Trade in Endangered species of Wild flora and fauna India 1977
- Bonn Convention on conservation of Migratory species. India 1979

National Conservation strategies

- Indian Forest Act 1927
- Environmental Protection Act 1986
- Forest Conservation act 1980
- Fisheries act 1897, 1984
- Wildlife protection act 1972 Amendment 1991
- Biodiversity Act 2002
- Maritime Zones Act

Conservation efforts

- Chipko movement,
- Silent valley was saved due to Environmentalist (Kerala shastra sahitya parishad) movement

- What if Pooyamkutty hydroelectric project in Kerala comes?

  -Submergence of 2400 ha of forest

  -174 sp of medicinal plants- loss

  -Loss of breeding ground of Elephants

Protected areas (In-situ Conservation)

- National Parks 102
- Wildlife Sanctuaries 515
- Community Reserves 4
- Conservation Reserves 47
- Tiger Reserves (41 sanctuaries & NPs)
- Elephant Reserves (25 ERs)
- Ramsar Sites (25 sites)
- Important Bird Areas (465 sites)
- UNESCO heritage Sites (5 sites)
- Biosphere Reserves (17 BR)
- Project snow leopard (Himalayan states)

Ex-Situ conservation

- Maintaining genetic germplasm in seed banks, zoos, captive breeding sites, gene banks…outside the natural habitat of the species
- Botanical Gardens
- Lead Garden projects
- Central Zoo Authority
- Lab for conservation of Endangered species, tiger, lion, black bug, vulture
- Vulture Conservation Breeding Centres
- Conservation of traditional farming practices,

SOLUTIONS

- PRESERVE NATURAL CAPITAL:

I. Restore damaged ecosystems
II. Halt the loss of priority habitats
III. Significantly expand protected areas

- PRODUCE BETTER:

I. Reduce inputs and waste
II. Manage resources sustainably
III. Scale-up renewable energy production

SOLUTIONS

- CONSUME MORE WISELY:

I. Through low-Footprint lifestyles
II. Sustainable energy use
III. Healthier food consumption patterns

- REDIRECT FINANCIAL FLOWS:

I. Value nature
II. Account for social and environmental costs
III. Support and reward conservation
IV. Sustainable resource management and innovation

SOLUTIONS

- EQUITABLE RESOURCE GOVERNANCE:

I. Share available resources
II. Make fair and ecologically informed choices
III. Measure success beyond GDP

What can we do?

- Acquire and propagate knowledge on Wildlife & Biodiversity
- Participate in decision making through EIAs
- Respond positively to conservation efforts
- Join hands with concerned organizations such as BNHS, WWF, GreenPeace etc., which are working for Nature Conservation
- Visit Natural forests and Sanctuaries and feel the Nature
- Respect everyone's right to live

What can we do?

- Be Vigilant

  Report to Forest authorities and/or Police of any Forest destruction, Tree cutting, Wildlife trade or hunting. Wildlife (Protection) Act, 1972 prohibits any person from hunting of Wild life and buying of Wild life products.

- Avoid Wildlife products

  Do not buy items made up of Ivory, Fur, leather, etc,

  Also try to convince other people not to buy them either.

- Minimise the use of wooden/paper materials.

FAUNAL DIVERSITY OF THE AMRITA VISHWA VIDYAPEETHAM, COIMBATORE CAMPUS

Dr Maya Mahajan & Dr M Murugesan

Rich bio-diversity in the Campus

Faunal bio-diversity

- 114 species of Birds
- 91 species of butterflies
- 21 species of mammals
- 17 species of reptiles

Amrita Prakriti Samrakshan Samiti-Activities

Amrita Prakriti Samrakshan Samiti-Activities

World Car free Day 28 Sept 2014

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SAVE NATURE FOR SUSTAINABLE FUTURE

Amma says.....

- *By protecting and preserving wild and domestic animals, trees, and plants we are protecting and preserving nature. Trees, animals, birds, plants, forests, mountains, lakes and rivers- everything that exits in nature-are in desperate need of our kindness, compassionate care and protection.*

- *There is an inseparable bond between man and nature. For man, there cannot be an existence removed from nature.*