Week 3
Lecture 5

Anamika

Radiation

The radiations from the atomic blasts cause several health hazards. The radiations carry high energy and remove electrons from atoms and attach them to other atoms producing positive and negative ion pairs. Hence, they are known as ionizing radiations. The ionization property of these radiations proves to be highly injurious to the protoplasm. The ionizing radiations of ecological concern are classified as follows:

Corpuscular Radiations

These consist of streams of atomic or subatomic particles, which transfer their energy to the matter they strike.

(i) Alpha particles

These particles are large and travel few centimeters in the air. These cause large amount of local ionization.

(ii) Beta particles

These are small particles characterized by having high velocities. They can travel a few meters in space. These are capable of entering into the tissues for few centimeters.

Since alpha and beta particles have low penetration power they can produce harmful effects only when absorbed, ingested or deposited in or near living tissues.

(iii) Electromagnetic radiations

Electromagnetic radiations include waves of shorter wavelengths. These are capable of traveling long distances and can readily penetrate the living tissue. These include gamma rays. These can penetrate and produce effect even without being taken inside.

Other Types of Radiations

Besides radioactive radiations, some other radiations are also present in the atmosphere.

(i) Neutrons

These are large uncharged particles, which do not cause radiation by themselves, but they produce radioactivity in non-radioactive materials through which they pass.

(ii) X-rays

These are electromagnetic waves very similar to gamma rays, but originate from the outer electron shell of radioactive substances, which are not dispersed in nature.

(iii) Cosmic rays

These are radiations from the outer space, which contain alpha and beta particles together with gamma rays.

Sources of Radiations

The radiations are produced from the radioactive elements, which are known as radionuclides or radioactive isotopes, e.g. Uranium. Radium, Thorium, and Carbon-14. These contribute to background radiation. But isotopes of certain metabolically important elements like Carbon-14, Cobalt-60, Calcium 45, Iodine-131, Phosphorus-32, etc. are not ecologically harmful but are used as tracers. The third category of radionuclides comprises of fission products of uranium and certain other elements. These are cesium, strontium, and plutonium etc.

Biological Effects of Radiation

The effects of radiation have revealed that acute doses are found to be deleterious and may kill the organisms, whereas the increase in radiation in biological environment leads   to different kinds of mutations. The effects of Cobalt-60 or Cesium-137 gamma radiations have now been studied on communities and on ecosystems at different places. The research concludes that Irradiations eliminate varieties in species. The sensitivity of cells, tissues and organisms to radiation varies. The cells with larger chromosomes are more sensitive. Herbaceous communities and early stages of succession are resistant than the mature forest.

Nuclear Fall Outs or Radioactive Fall Outs

The atomic blasts not only produce the local ionizing radiations at that time but the radioisotopes produced as a result of explosion enter the atmosphere and continue to fallout gradually over broad geographic areas for a very long time. These are known as nuclear fallout or radioactive fallout. These are dangerous for life as they also produce ionizing radiations.

Biological Effects of Fall outs

The fallout of radionuclides combines with various metals and dust and from colloidal suspension combines with organic compounds to form complexes. The smaller particles of radionuclides adhere tightly to the leaves of plants and produce radiation

damage to leaf tissue besides entering the tissues also. Through grazing animals these enter the food chain directly at the primary consumers level. Radionuclides, which combine with organic substances, enter the food chain through producer tropic level. Therefore, the radionuclides fall out manages to enter the body of all living organisms. Radioactive Strontium-90 poses   a health hazard in human beings and other higher vertebrates. It continues to deposit in   the bones and causes bone cancer and leukemia. Radioactive Cesium-137 is known to cause irreversible genetic changes in different organisms. The fallout radiations do cause changes in the genetic constitution of organisms, resulting in gene mutations and chromosomal aberrations. Their considerable, doses may kill, cripple and alter the animals and plants in the areas.

Control of Radiation Pollution

Following measures can help in controlling the radioactive pollution:

(i) Workers in nuclear plants should be provided with nuclear gadgets and safety measures against accidents.

(ii) Leakage of radioactive elements from nuclear reactors, laboratories, transport, careless handling and use of radioactive fuels should be checked.

(iii) Level of radiation pollution should be monitored regularly in risk areas.

(iv) Disposal of radioactive wastes deserves special attention.

Case studies

Hiroshima and Nagasaki Episode

The tale of Hiroshima and Nagasaki is a painful experience. It is for the first time that an atomic bomb has been exploded over human population. The incident took place on August 6,1945 at 8:15 a.m. The bomb with an approximate temperature of around 100 million 0°C was exploded on a fine morning in Hiroshima (Japan). The temperature of the city hiked like anything, almost like an oven. After three days, Nagasaki too suffered the ravages of a nuclear attack. More than 1,00,000 people were reported to die just after the event took place. Since radiations from nuclear elements remain active even after, the generations to follow up also suffered from various diseases. Even the babies in the mother's womb were affected and a few perished. Blindness, deafness, skin diseases and cancers, distortion of bones and other parts became the fortune of human civilization.

Chernobyl Accident

This incident took place in Ukraine on April 26, 1986. There was a Chernobyl nuclear power plant in Ukraine after which the event has been named. Approximately four million people had been reported to suffer from the accident. The accident contaminated neighboring environment up to several kilometers. The sites were evacuated and resettlement was done for the affected people. The radiations released affected ground water and surface waters, affecting large areas of Europe. 131 Iodine and 137 Cesium are the most dangerous amongst the 20-odd radioactive elements

released during Chernobyl disaster. As per the Soviet Health Ministry, 31-persons died shortly after the disaster. Of the 276,614 people who worked for rehabilitation and cleaning operations, a total of 1065 died by the end of 1990.

Marine Pollution

All river drainages end up in the seas. On the way to sea, rivers carry large amounts of sewage, garbage, and agricultural discharge, biocides, including heavy metals. Besides   this discharge of oils and petroleum products and dumping of radionuclides waste into sea also cause marine pollution. Huge quantity of plastic is being added to sea and oceans. Over 50 million lb plastic packing material is being dumped in sea of commercial fleets. Many marine birds ingest plastic that causes gastro-intestinal disorders. The chemical in PCBs causes more damage as thinning of eggshell and tissue damage of egg. Radionuclide waste in sea includes Sr-90, Cs-137, Pu-239, and And Pu-240.

The pollutants in sea may become dispersed by turbulence and ocean currents and finally becomes a part of food chain. Bioaccumulation in food chain may result into loss of species diversity. The pollution in Baltic sea along the coast of Finland, took place largely from sewage and effluents from wood industries. This pollution effect brought changes. in species diversity in the bottom fauna. In less polluted water there was rich species diversity, which tended to decrease with increasing pollution load. In heavily polluted areas, macroscopic benthic animals were absent, but chirognomy larvae occurred at the bottom. In marine water the most serious pollutant is oil. Spill of oil or petroleum products due to accidents/ deliberate discharge of oil polluted waste brings about pollution. About 285 million gallons of oil are spilled each year into ocean, mostly from transport tankers. Oil pollution causes damage to marine fauna and flora including algae, fish, birds, and invertebrates. About 50,000 to 2,50,000 birds are killed every year by oil. The oil is soaked in feathers, displacing the air and thus interferes with buoyancy and maintenance of body temperature. Hydrocarbons and benzpyrene accumulate in food chain and consumption of fish by man may cause cancer. Detergents used to clean up the spill are also harmful to marine life.

Week 3
Lecture 6

Anamika

Nuclear hazards and Human health risks:

Nuclear energy can be both beneficial and harmful depending on the way in which it is used. We use X-rays to examine bones for fractures, treat cancer with radiation and diagnose diseases with the help of radioactive isotopes. The radioactive wastes from nuclear energy have caused serious environmental damage. Nuclear fission is the splitting of the nucleus of the atom. The first controlled fission of an atom was carried out in Germany in 1938. However the United States was the first country to develop an atomic bomb which was subsequently dropped on the Japanese cities of Hiroshima and Nagasaki. Several serious accidents have caused worldwide concern about safety and disposal of radioactive wastes. In order to appreciate the consequences of using nuclear fuels to generate energy it is important to understand how the fuel is processed.

Presently India does operate reprocessing plants to reprocess spent fuel as an alternative to storing them as nuclear waste. At each step in the cycle there

is a danger of exposure and poses several health and environmental concerns.

Although nuclear power has significant benefits, an incident which changed people's attitudes towards nuclear power plants was the Chernobyl disaster that occurred in 1986.

The degree and the kind of damage from nuclear accidents vary with the kind of radiation, the amount of radiation, the duration of exposure and the types of cells irradiated. Radiation can also cause mutations which are changes in the genetic makeup of the cells. Mutations can occur in the ovaries or the testes

leading to the formation of mutated eggs or sperms which in turn can lead to abnormal offspring. Mutations can also occur in the tissues of the body and may manifest themselves as abnormal tissue growths known as cancer. Two common cancers that are linked to increased radiation exposure are leukaemia and breast cancer.

Solid waste Management

In ancient cities, food scraps and other wastes were simply thrown into the unpaved streets where they accumulated. Around 320 B.C. in Athens, the first known law forbidding this practice was established and a system of waste removal began to evolve in several eastern Mediterranean cities. Disposal methods were very crude and often were just open pits outside the city walls. As populations increased, efforts were made to transport the wastes out further thus creating city dumps. Until recently the disposal of municipal solid waste did not

attract much public attention. The favoured means of disposal was to dump solid wastes outside the city or village limits. Around most towns and cities in India the approach roads are littered with multi-coloured plastic bags and other garbage.

Waste is also burnt to reduce its volume. Modern methods of disposal such as incineration and the development of sanitary landfills, etc. are now attempting to solve these problems. Lack of space for dumping solid waste has become a serious problem in several cities and towns all over the world. Dumping and burning wastes is not an acceptable practice today from either an environmental or a health perspective. Today disposal of solid waste should be part of an integrated waste management plan. The method of collection, processing, resource recovery and the final disposal should mesh with one another to achieve a common objective.

Sources of Urban and Industrial Wastes:

Urban waste consists of medical waste from hospitals; municipal solid wastes from homes, offices, markets (commercial waste) small cottage units, and horticulture waste from parks, gardens, orchards etc.

Waste from homes (Domestic waste)
It contains a variety of discarded materials like polyethylene bags, empty metal and aluminium cans, scrap metals, glass bottles, waste paper, diapers, cloth/rags, food waste, electronic waste (e-waste).

Waste from shops mainly consists of waste paper, packaging material, cans, bottles, polyethylene bags, peanut shells, egg shells, tea leaves etc.

Biomedical waste includes anatomical wastes, pathological wastes, infectious wastes etc.

Construction/demolition waste includes debris and rubbles, wood, concrete etc.

Horticulture waste and waste from slaughter houses include vegetable parts, residues and remains of slaughtered animals, respectively.

Industrial waste: Industrial waste consists of a large number of materials including factory rubbish, packaging material, organic wastes, acids, alkalis and metals etc. During some industrial processing large quantities of hazardous and toxic materials are also produced. The main sources of industrial wastes are chemical industries, metal and mineral processing industries. Radioactive wastes are generated by nuclear power plants. Thermal power plants produce fly ash in large quantities. Solid wastes from other types of industries include scrap

metal, rubber, plastic, paper, glass, wood, oils, paints, asphalt, tars, dyes, scrap leather, ceramics, abrasives, slag, heavy metals, asbestos, batteries.
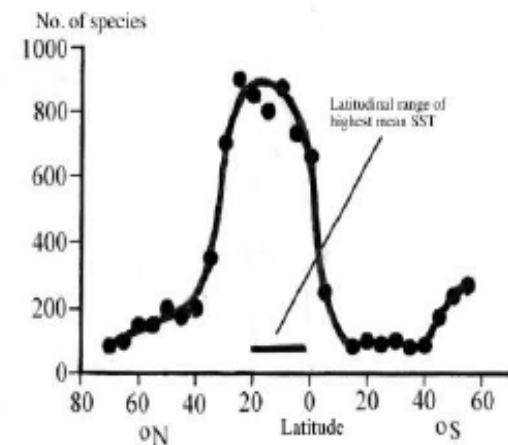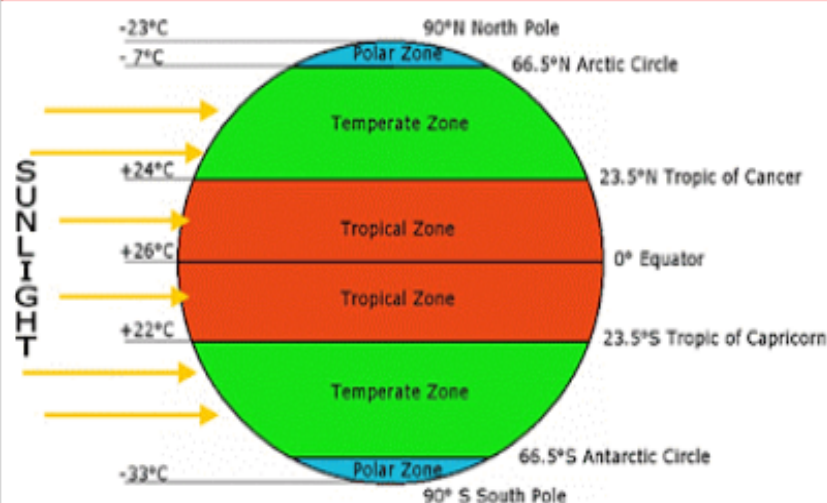
Week 3
Lecture 5

Anamika

Biodiversity at Global, National and Local Levels

- **1.5 million species are known** and described in the database which may be just 15% of the actual number of species lie on the earth.
- It is expected that **8 to 100 million species** lie on the earth surface. Globally about 1,70,000 flowering plants, 30,000 vertebrates and about 2,50,000 other groups of species have been described.
- Terrestrial biodiversity is best described as Biomes and Biomes are the largest ecological units present in different geographic area and are named after the dominant vegetation. e.g. the tropical rainforests, tall grass prairies etc. it is quite interesting to know that marine diversity is even much higher than terrestrial diversity. "Sea is the cradle of every known animal phylum".
- The economically developed nations exploited the biodiversity for their development.
- After realization of biodiversity as a **'common property resources'** for all the nations, the developed nations stared the practices of biodiversity conservation.
- The country which are moving towards biodiversity conservation are being recognized.
- The country like India is a signatory in the **World Heritage Convention (1972)** and included several protected areas as world heritage sites.

- This **convention include** Nanda Devi and valley of flower in the Himalaya, Sundarban in West Bengal, Western Ghats, Kaziranga in Assam, Manas on the border of Bhutan and India and Great Himalayan National Park.

- India has also signed the **Convention in the Trade of Endangered Species (CITES, 1973)** to control the utilization of endangered plant and animals.

- MoEF, a agency to implement CBD (Convention on Biological Diversity) developed the strategy for Biodiversity conservation and formulated the **Biodiversity Act in 2002**.

- The biodiversity is not evenly distribute throughout the Globe. The countries lying mostly in tropics are characterized by **high species richness** and more endemic species, called Mega diversity nations.

- About **17 countries** belong to this category till date.

India as Mega-Diversity Nation

Indian-Biodiversity

Contributes:

- 6% of global species
- 47,000 species of plants(7% of global flora)
- 81,000 species of animals (6.5% of global fauna)
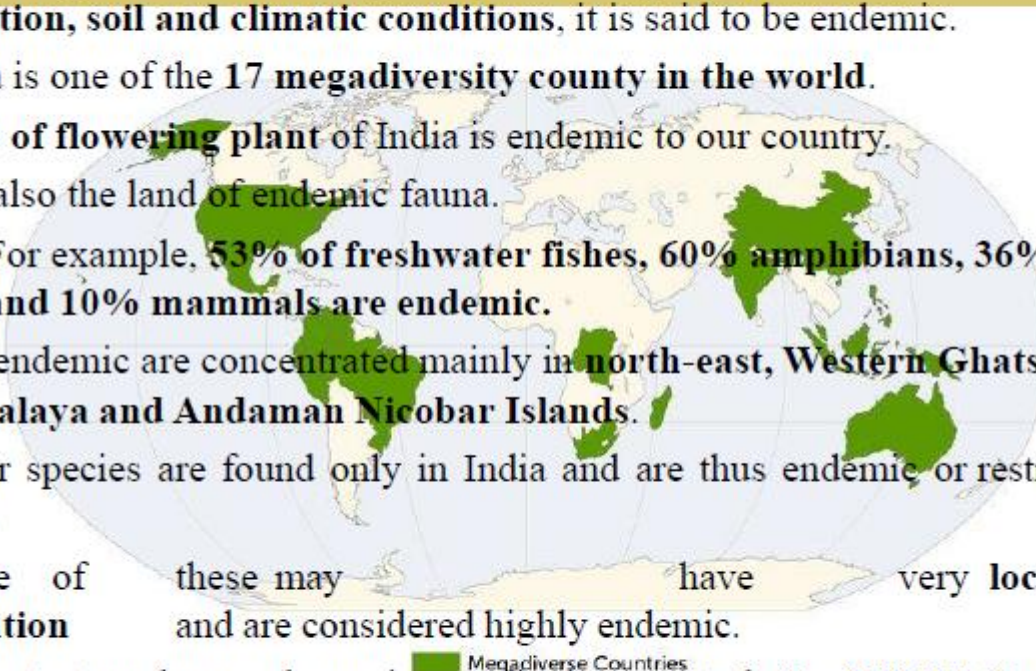- **Total species >129,000**

Rankings:

- 10th rank in plant rich countries of the world.
- 11th in terms of number of endemic species of higher vertebrates
- 6th among the centre of diversity and origin of agricultural crops

Endemic species of India

❖ When a species is found only in a particular geographical region **because of its isolation, soil and climatic conditions**, it is said to be endemic.

❖ India is one of the **17 megadiversity county in the world**.

❖ **33% of flowering plant** of India is endemic to our country.

❖ It is also the land of endemic fauna.

   ❖ For example, **53% of freshwater fishes, 60% amphibians, 36% reptiles and 10% mammals are endemic.**

❖ The endemic are concentrated mainly in **north-east, Western Ghats, north-west Himalaya and Andaman Nicobar Islands**.

❖ Other species are found only in India and are thus endemic or restricted to our country.

❖ Some of these may have very **localized distribution** and are considered highly endemic.

❖ To protect endangered species, India has created **the Wildlife Protection Act (1972).** This includes lists of plants and animals categorized according to the threat on their survival.

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 (Western Ghats)

Brown fish Owl (mainly found in subtropical region)

Indian cobra

Clouded leopard (foothills of Himalaya)

Indian elephant

Indian vulture

Red panda (Eastern Himalaya)

Olive ridley turtles found at the coast of Orissa (**Case Study: Operation Kachhapa**)

Oplismenus thwaitesii (Basket grass)

Gymnostachyum febrifugum (medicinal plant)

Impatiens sivarajanii (flowering plant)

IUCN RED LIST OF THREATENED SPECIES

The IUCN Red List (founded in 1964) of Threatened Species is the world's most comprehensive inventory of the global conservation status of plant and animal species. It uses a set of quantitative criteria to evaluate the extinction risk of thousands of species. These criteria are relevant to most species and all regions of the world. With its strong scientific base, The IUCN Red List is recognized as the most authoritative guide to the status of biological diversity. The IUCN Red List assesses the conservation status of species at a global level, drawing on expert knowledge from around the world. The IUCN Red List is used by institutional, business and community users such as:
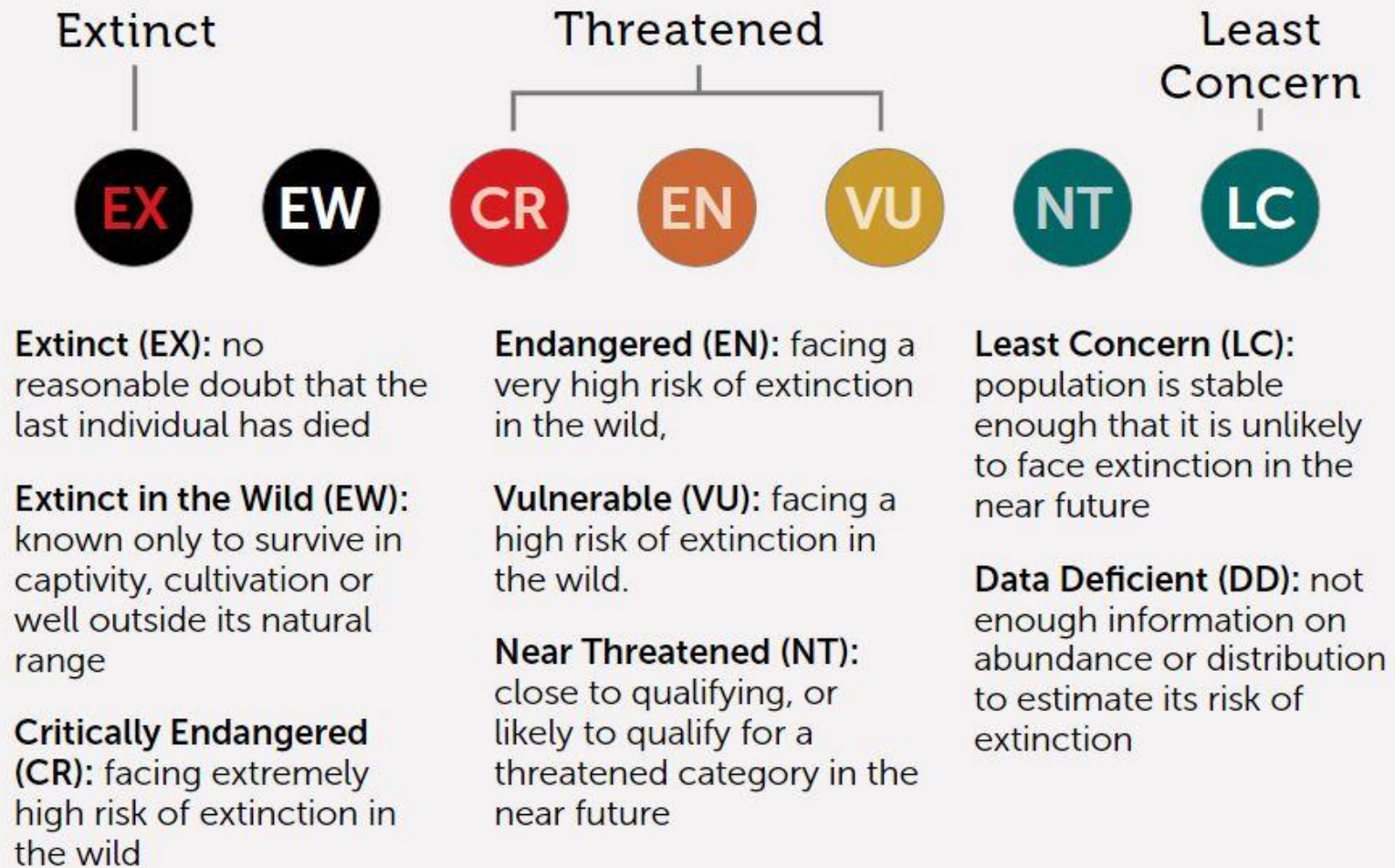
- national and international government agencies . wildlife departments
- conservation-related non-governmental organisations (NGOs) . natural resource planners
- educational organisations
- zoos and aquariums
- students
- media
- business community

IUCN Red List data are used for a variety of purposes:

- International agreements use IUCN Red List data to guide decision making and as an indicator of the status of nature. These include, but are not limited to agreements such as CITES, the Ramsar Convention, UN Sustainable Development Goals and CBD Aichi Targets
- World Bank Group Performance Standard PS6 uses IUCN Red List
  Index to minimize the risk to biodiversity from large-scale infrastructure and natural resource extraction projects

- Government agencies rely on IUCN Red List data to guide policies such as National Parks regulations

- Zoos use The IUCN Red List Categories to educate the public about species' status
- Scientists use IUCN Red List data as a primary data source in their analyses and publications
- Teachers and students use IUCN Red List data in college projects
- Journalists use IUCN Red List data to inform their articles
- Data from IUCN Red List are used as indicators for the United Nations Sustainable Development Goals, particularly Goal 15: Life on Land.
- The IUCN Red List Index is used by the Convention on Biological Diversity (CBD) to monitor progress towards achieving the Aichi Targets.
- The IUCN Red List Categories define the extinction risk of species assessed. Nine categories extend from NE (Not Evaluated) to EX (Extinct).
- Critically Endangered (CR), Endangered (EN) and Vulnerable (W) species are considered to be threatened with extinction.

THE RED LIST CATEGORIES

Extinct

Threatened

Least Concern

EX EW CR EN VU NT LC

Extinct (EX): no reasonable doubt that the last individual has died

Extinct in the Wild (EW): known only to survive in captivity, cultivation or well outside its natural range

Critically Endangered (CR): facing extremely high risk of extinction in the wild

Endangered (EN): facing a very high risk of extinction in the wild,

Vulnerable (VU): facing a high risk of extinction in the wild.

Near Threatened (NT): close to qualifying, or likely to qualify for a threatened category in the near future

Least Concern (LC): population is stable enough that it is unlikely to face extinction in the near future

Data Deficient (DD): not enough information on abundance or distribution to estimate its risk of extinction

IUCN INDIA

- India a mega diverse country accounts for 7-8% of all recorded speciesOver 45,968 species of plants and 91.364 species of animals.

- 4 of 34 globally identified biodiversity hotspots: The Himalayas, theWestern Ghats, the North-East, and the Nicobar Islands in India.

- India became a State Member of IUCN in 1969, through the Ministry ofEnvironment Forest and Climate Change (MoEFCC).

- The IUCN India Country Office was established in 2007 in New Delhi.

CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora, also known as the Washington Convention) is a multilateral treaty to protect endangered plants and animals. It was drafted as a result of a resolution adopted in 1963 at a meeting of members of the International Union for Conservation of Nature (IUCN). The convention was opened for signature in 1973 and CITES entered into force on 1 July 1975. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species in the wild, and it accords varying degrees of protection to more than 35,000 species of animals and plants. In order to ensure that the General Agreement on Tariffs and Trade (GATT) was not violated, the Secretariat of GATT was consulted during the drafting process.

Convention on International Trade in Endangered Species of Wild Fauna and Flora

Week 3
Lecture 6

Anamika

Wildlife crime is a big business. Run by dangerous international networks, wildlife and animal parts are trafficked much like illegal drugs and arms. Experts at TRAFFIC, the wildlife trade monitoring network, estimate that it runs into billions of dollars.

Some examples of illegal wildlife trade are well known, such as poaching of elephants for ivory and tigers for their skins and bones. However, countless other species are similarly overexploited, from marine turtles to timber trees. Not all wildlife trade is illegal. Wild plants and animals from tens of thousands of species are caught or harvested from the wild and then sold legitimately as food, pets, ornamental plants, leather, tourist ornaments and medicine. Wildlife trade escalates into a crisis when an increasing proportion is illegal and unsustainable—directly threatening the survival of many species in the wild.

As human populations have grown, so has the demand for wildlife. People in many countries are accustomed to a lifestyle which fuels demand for wildlife. They expect access to a variety of seafoods, leather goods, timbers, medicinal ingredients and textiles. At the other end, extreme poverty means some people see wildlife as valuable barter for trade.

Demand Drives Crime

Rhino horn, elephant ivory and tiger products continue to command high prices among consumers, especially in Asia. In Vietnam, the recent myth that rhino horn can cure cancer has led to massive poaching in South Africa and pushed the price of rhino horn to rival gold.

Gaps in Protection

Corruption, toothless laws, weak judicial systems and light sentences allow criminal networks to keep plundering wildlife with little regard to consequences. These factors make illegal wildlife trade a low risk business with high returns. The poachers—often poor locals— are the usually the only ones caught, leaving

the real masterminds and their network safe and operational with the ability to strike again.There are certain places in the world where wildlife trade is particularly threatening. These areas are called 'Wldlife trade hotspots." They include China's international borders, trade hubs in East/Southern Africa and Southeast Asia, the eastern borders of the European Union, some markets in Mexico, parts of the Caribbean, parts of Indonesia and New Guinea, and the Solomon Islands. While these hotspots might be trouble areas at present, they also offer opportunities for great conservation success, if action and funds are well-focused. Wildlife trade alone is a major threat to some species, but its impact is frequently made worse by habitat loss and other pressures.

Altering Livelihoods

Local wildlife is considered an important resource by many communities, often the poorest, in the developing world. Some rural households depend on wild animals for protein, trees for fuel, and both wild animals and plants for natural cures.

Interruption of Nature

Overexploitation of species affects the living planet in wider ways. Just as overfishing causes imbalances in the whole marine system, our complex web of life on earth depends on careful and thoughtful use of wildlife species and their habitats.

Invasive Species

Many invasive species have been purposely introduced by wildlife traders or buyers. These invasive species prey on or compete with native species and are a major threat to the balance of nature. For example pet Burmese pythons let loose by their owners are now considered a major pest in Florida's everglades.

Incidental Killing of Non-Target Species

Like marine species killed through bycatch, incidental killing of animals also happens on land. For example, crude traps set for musk deer or duikers cause damage and death to a variety of animals besides those intended.

MAN-WILDLIFE CONFLICT

Human-wildlife conflict refers to the interaction between wild animals and people and the resultant negative impact on people or their resources, or wild animals or their habitat. It occurs when growing human populations overlap with established wildlife territory, creating reduction of resources or life to some people and/or wild animals. The conflict takes many forms ranging from loss of life or injury to humans, and animals both wild and domesticated, to competition for scarce resources to loss and degradation of habitat.

Conflict management strategies earlier comprised lethal control, translocation, regulation of population size and preservation of endangered species. Recent management approaches attempt to use scientific research for better management outcomes, such as behaviour modification and reducing interaction. As human-wildlife conflicts inflict direct, indirect and opportunity costs, the mitigation of human-wildlife conflict is an important issue in the management of biodiversity and protected areas.

TO reduce conflict between people and animals, and improve the livelihoods of the people affected, WWF report 'Common Ground' identifies themes that can be used to compose a common ground or a basic list of available and tested solutions. These include:

•	A united effort: In order to be truly effective, prevention of human-wildlife conflict has to involve the full scope of society: international organizations, governments, NGOs, communities, consumers and individuals. Solutions are possible, but often they also need to have financial backing for their support and development.

•   Land-use planning: Ensuring that both humans and animals have the space they need is possible. Protecting key areas for wildlife, creating buffer zones and investing in alternative land uses are some of the solutions.

•   Community-based natural resource management: The local community is key since they are the ones who may wake up in the morning with a tiger or bear in their back yard. But they are also the people who can benefit the most from this. If people are empowered to manage their relationship with wild animals, these "unwanted" neighbours can become allies in bringing income and promoting a better quality of life for all

•   Compensation: I insurance: Compensation or insurance for animal-induced damage is another widely accepted solution. There are different ways this can be done. In Namibia, for example, community-based insurance systems exist for damage done to livestock. The Nepalese government pays compensation in areas around national parks.

•   Payment for Environmental Services: Payment for Environmental Services (PES) is a concept that has recently gained popularity in the international development and conservation community. The most popular of these is financial reward for the sequestering of carbon, but it is also seen as a potential solution for human-wildlife conflict.

•   Wildlife friendly products: Consumers is distant countries also have a role to play. Always look for products that are environmentally friendly and recognized by serious organizations.

•   Field based solutions: There are a number of practical field-based solutions that can limit the damage done both to humans and human property, and to wildlife, by preventing wildlife from entering fields or villages. However, such solutions can only be applied on a case-by-case basis. What people see as solution in one place, they may resist in another. And what works in one place, may have the opposite effect somewhere else.

NATIONAL PARK

National park, an area set aside by a national government for the preservation of the natural environment. A national park may be set aside for purposes of public recreation and enjoyment or because of its historical or scientific interest. Most of the landscapes and their accompanying plants and animals in a national park are kept in their natural state. Since the enormous forest cover of India is spread unevenly across the country, it is sometimes difficult to distribute these national parks in India state-wise. But we have tried to list one from every major state. Take a look at this list of the best national parks and wildlife sanctuaries in India before you decide to go on a wildlife watching spree. There are more than 103 National Parks in India and some important are: Jim Corbett National Park, Kaziranga National Park, Gir Forest National Park, Sundarban National Park, Satpura National Park, Eravikulam National Park, Pench National Park, Sariska National Park, Kanha National Park, Ranthambore National Park, Bandhavgarh Tiger Reserve, Bandipur National Park, Nagarhole National Park, Periyar National Park, Manas National Park, The Great Himalayan National Park, Sanjay Gandhi National Park, Rajaji National Park, Silent Valley National Park, Dudhwa National Park, Panna National Park, Van Vihar National Park

WILDLIFE SANCTUARY

- Any area other than area comprised with any reserve forest or the territorial waters can be notified by the State Government to constitute as a sanctuary if such area is of adequate ecological, faunal, floral, geomorphological, natural. or zoological significance, for the purpose of protecting, propagating or developing wildlife or its environment. Some restricted human activities are allowed inside the Sanctuary area. There are 551 existing wildlife sanctuaries in India covering an area of 119775.80 km2, which is 3.64 % of the geographical area of the country.

BIOSPHERE RESERVES

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. Biosphere reserves are areas comprising terrestrial, marine and coastal ecosystems. Each reserve promotes solutions reconciling the conservation of biodiversity with its sustainable use. Biosphere reserves are 'Science for Sustainability support sites' - special places for testing interdisciplinary approaches to understanding and managing changes and interactions between social and ecological systems, including conflict prevention and management of biodiversity. Biosphere reserves are nominated by national governments and remain under the sovereign jurisdiction of the states where they are located. Their status is internationally recognized. There are 701 biosphere reserves in 124 countries, including 21 transboundary sites.Biosphere reserves have three interrelated zones that aim to fulfil three complementary and mutually reinforcing functions:

• The core area(s) comprises a strictly protected ecosystem that contributes to the conservation of landscapes, ecosystems, species and genetic variation.
• The buffer zone surrounds or adjoins the core areas, and is used for activities compatible with sound ecological practices that can reinforce scientific research, monitoring, training and education.
• The transition area is the part of the reserve where the greatest activity is allowed, fostering economic and human development that is socio-culturally and ecologically sustainable.

The Indian government has established 18 biosphere reserves in India. Biosphere reserves of India

SACRED GROVES

"Segment of landscape, containing vegetation, life forms and geographical features, delimited and protected by human societies under the belief that to keep them in a relatively undisturbed state is expression of an important relationship of humans with the divine or with nature."

(Hughes and Chandra, 1998)

SACRED GROVES OF INDIA

Sacred groves of India are forest fragments of varying sizes, which are communally protected, and which usually have a significant religious connotation for the protecting community. Hunting and logging are usually strictly prohibited within these patches. Sacred groves of India are forest fragments of varying sizes, which are communally protected, and which usually have a significant religious

connotation for the protecting community. Hunting and logging are usually strictly prohibited within these patches. Other forms of forest usage like honey collection and deadwood collection are sometimes allowed on a sustainable basis. Sacred groves did not enjoy protection via federal legislation in India. Some NGOs work with local villagers to protect such groves. Traditionally, and in some cases even today, members of the community take turns to protect the grove. However, the introduction of the protected area category community reserves under the Wild Life (Protection) Amendment Act, 2002 has introduced legislation for providing government protection to community held lands, which could include sacred groves.

Indian sacred groves are often associated with temples, monasteries, shrines or with burial grounds. Historically, sacred groves find their mentions in Hindu, Jain and Buddhist texts, from sacred tree groves in Hinduism to sacred deer parks in Buddhism for example. Sacred groves may be loosely used to refer to natural habitat protected on religious grounds. Other historical references to sacred groves can be obtained in Vrukshayurveda an ancient treatise, ancient classics such as Kalidasa's Vikramuurvashiiya. There has been a growing interest in creating green patches such as Nakshatravana grove. The Hindu tradition considers forests to be of three types - Tapovan, Mahavan and Sreevan. Tapovan are forests associated with penance (Tapas), and are inhabited by saints and rishis. Mahavan refers to the grand natural forests. Tapovan and Mahavan are considered to be a Raksha ("sanctuary") for flora and fauna as ordinary human beings are not allowed to enter these forests. Sreevan, which means, "forests of prosperity", consists of dense forests and groves. From the former, people would collect dry wood, leaves, forest produce and a limited amount of timber, though natural ecosystem would not be unnecessarily disturbed. Groves were considered as spaces of forests from where harvesting could be done. Sometimes, specific trees like mango trees could be planted and nurtured here. Groves were associated with religious rites, festivals and recreation. Typical recreational activities associated with these groves included jhoola/ jhoolan. In the villages, Panchavati, or a cluster of five trees that represented the forests, were maintained. These trees represented the five elements of Earth, Water, Fire, Air and Space.
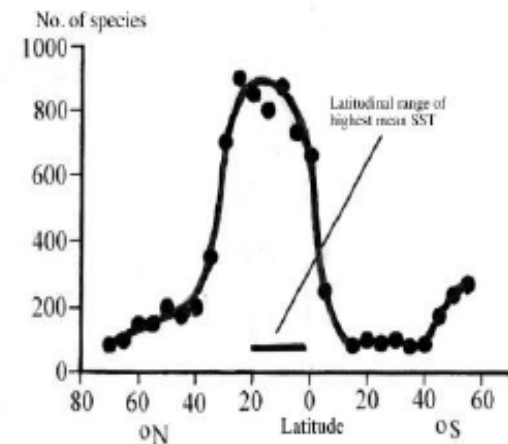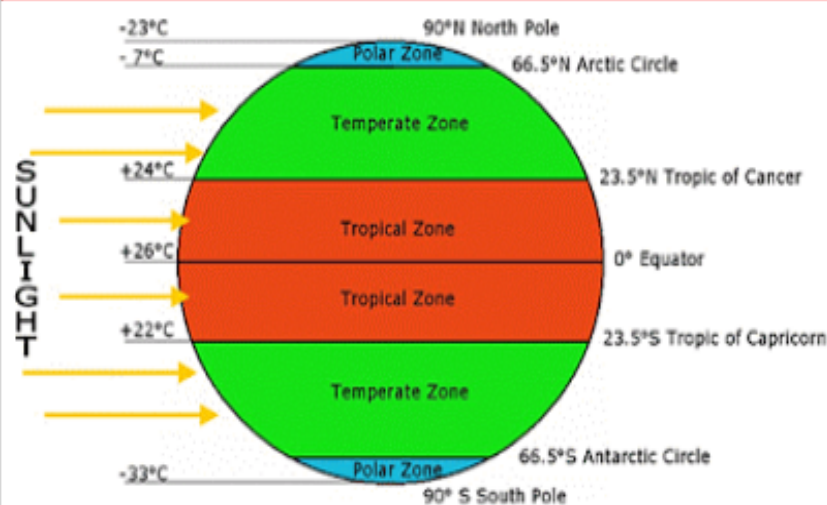
Week 3
Lecture 5

Anamika

Biodiversity at Global, National and Local Levels

- **1.5 million species are known** and described in the database which may be just 15% of the actual number of species lie on the earth.
- It is expected that **8 to 100 million species** lie on the earth surface. Globally about 1,70,000 flowering plants, 30,000 vertebrates and about 2,50,000 other groups of species have been described.
- Terrestrial biodiversity is best described as Biomes and Biomes are the largest ecological units present in different geographic area and are named after the dominant vegetation. e.g. the tropical rainforests, tall grass prairies etc. it is quite interesting to know that marine diversity is even much higher than terrestrial diversity. "Sea is the cradle of every known animal phylum".
- The economically developed nations exploited the biodiversity for their development.
- After realization of biodiversity as a **'common property resources'** for all the nations, the developed nations stared the practices of biodiversity conservation.
- The country which are moving towards biodiversity conservation are being recognized.
- The country like India is a signatory in the **World Heritage Convention (1972)** and included several protected areas as world heritage sites.

- This **convention include** Nanda Devi and valley of flower in the Himalaya, Sundarban in West Bengal, Western Ghats, Kaziranga in Assam, Manas on the border of Bhutan and India and Great Himalayan National Park.

- India has also signed the **Convention in the Trade of Endangered Species (CITES, 1973)** to control the utilization of endangered plant and animals.

- MoEF, a agency to implement CBD (Convention on Biological Diversity) developed the strategy for Biodiversity conservation and formulated the **Biodiversity Act in 2002**.

- The biodiversity is not evenly distribute throughout the Globe. The countries lying mostly in tropics are characterized by **high species richness** and more endemic species, called Mega diversity nations.

- About **17 countries** belong to this category till date.

India as Mega-Diversity Nation

Indian-Biodiversity

Contributes:

- 6% of global species
- 47,000 species of plants(7% of global flora)
- 81,000 species of animals (6.5% of global fauna)
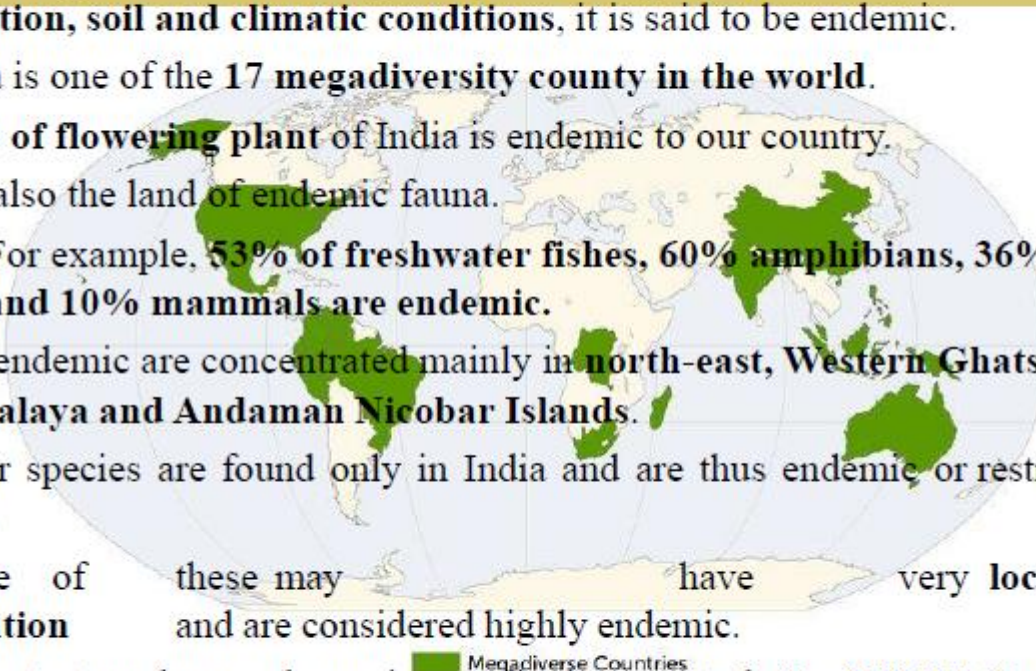- **Total species >129,000**

Rankings:

- 10th rank in plant rich countries of the world.
- 11th in terms of number of endemic species of higher vertebrates
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Endemic species of India

❖ When a species is found only in a particular geographical region **because of its isolation, soil and climatic conditions**, it is said to be endemic.

❖ India is one of the **17 megadiversity county in the world**.

❖ **33% of flowering plant** of India is endemic to our country.

❖ It is also the land of endemic fauna.

    ❖ For example, **53% of freshwater fishes, 60% amphibians, 36% reptiles and 10% mammals are endemic.**

❖ The endemic are concentrated mainly in **north-east, Western Ghats, north-west Himalaya and Andaman Nicobar Islands**.

❖ Other species are found only in India and are thus endemic or restricted to our country.

❖ Some of these may have very **localized distribution** and are considered highly endemic.

Megadiverse Countries

❖ To protect endangered species, India has created **the Wildlife Protection Act (1972).** This includes lists of plants and animals categorized according to the threat on their survival.

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 (Western Ghats)

Brown fish Owl (mainly found in subtropical region)

Indian cobra

Clouded leopard (foothills of Himalaya)

Indian elephant

Indian vulture

Red panda (Eastern Himalaya)

Olive ridley turtles found at the coast of Orissa (**Case Study: Operation Kachhapa**)

Oplismenus thwaitesii (Basket grass)

Gymnostachyum febrifugum (medicinal plant)

Impatiens sivarajanii (flowering plant)

IUCN RED LIST OF THREATENED SPECIES

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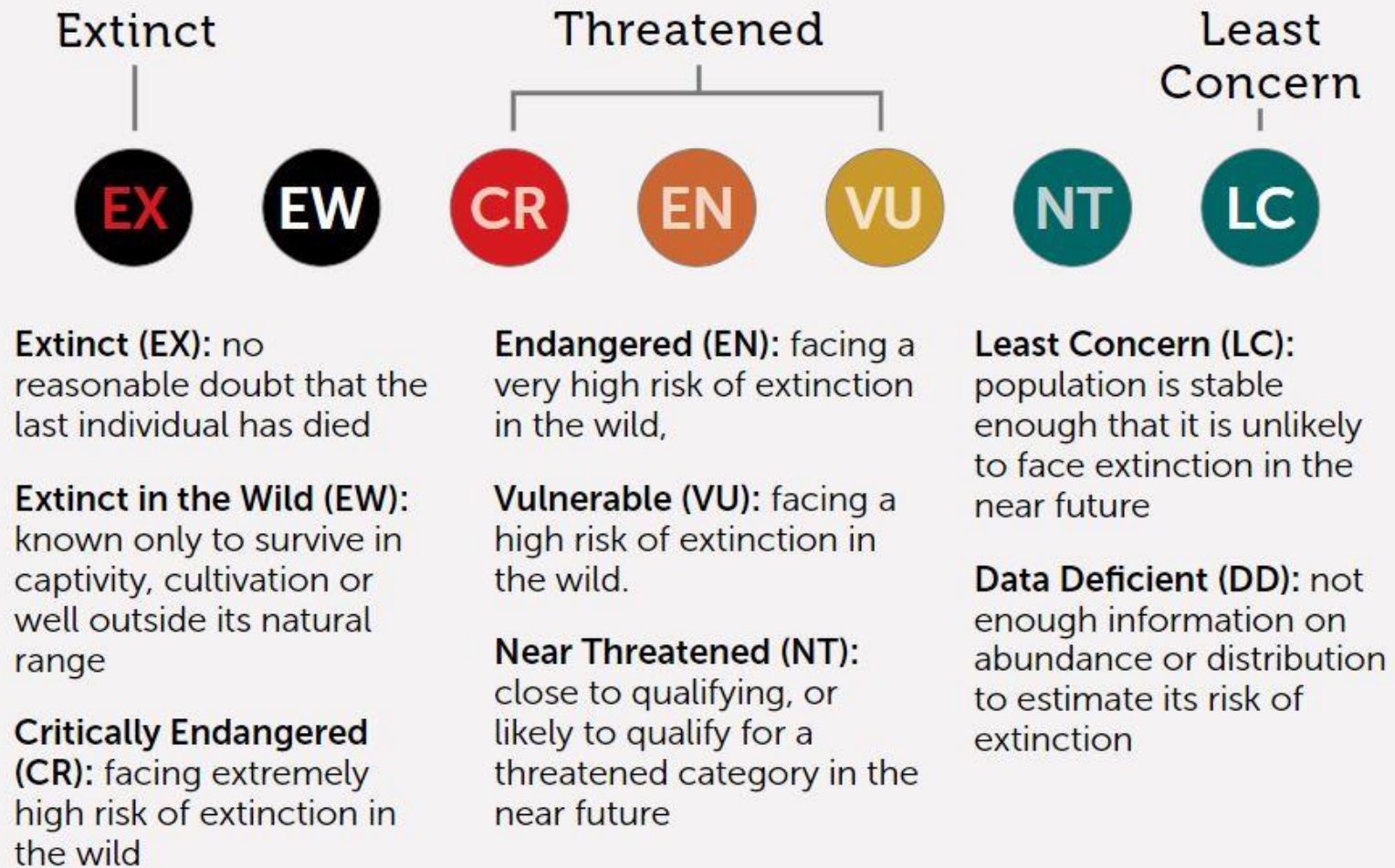
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- International agreements use IUCN Red List data to guide decision making and as an indicator of the status of nature. These include, but are not limited to agreements such as CITES, the Ramsar Convention, UN Sustainable Development Goals and CBD Aichi Targets
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- Government agencies rely on IUCN Red List data to guide policies such as National Parks regulations

- Zoos use The IUCN Red List Categories to educate the public about species' status
- Scientists use IUCN Red List data as a primary data source in their analyses and publications
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- The IUCN Red List Index is used by the Convention on Biological Diversity (CBD) to monitor progress towards achieving the Aichi Targets.
- The IUCN Red List Categories define the extinction risk of species assessed. Nine categories extend from NE (Not Evaluated) to EX (Extinct).
- Critically Endangered (CR), Endangered (EN) and Vulnerable (W) species are considered to be threatened with extinction.

THE RED LIST CATEGORIES

Extinct

Threatened

Least Concern

EX   EW   CR   EN   VU   NT   LC

Extinct (EX): no reasonable doubt that the last individual has died

Extinct in the Wild (EW): known only to survive in captivity, cultivation or well outside its natural range

Critically Endangered (CR): facing extremely high risk of extinction in the wild

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Near Threatened (NT): close to qualifying, or likely to qualify for a threatened category in the near future

Least Concern (LC): population is stable enough that it is unlikely to face extinction in the near future

Data Deficient (DD): not enough information on abundance or distribution to estimate its risk of extinction

IUCN INDIA

- India a mega diverse country accounts for 7-8% of all recorded speciesOver 45,968 species of plants and 91.364 species of animals.

- 4 of 34 globally identified biodiversity hotspots: The Himalayas, theWestern Ghats, the North-East, and the Nicobar Islands in India.

- India became a State Member of IUCN in 1969, through the Ministry ofEnvironment Forest and Climate Change (MoEFCC).

- The IUCN India Country Office was established in 2007 in New Delhi.

CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora, also known as the Washington Convention) is a multilateral treaty to protect endangered plants and animals. It was drafted as a result of a resolution adopted in 1963 at a meeting of members of the International Union for Conservation of Nature (IUCN). The convention was opened for signature in 1973 and CITES entered into force on 1 July 1975. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species in the wild, and it accords varying degrees of protection to more than 35,000 species of animals and plants. In order to ensure that the General Agreement on Tariffs and Trade (GATT) was not violated, the Secretariat of GATT was consulted during the drafting process.

Convention on International Trade in Endangered Species of Wild Fauna and Flora

Week 3
Lecture 6

Anamika

WILDLIFE POACHING AND ILLEGAL TRADE OF WILDLIFE

Wildlife crime is a big business. Run by dangerous international networks, wildlife and animal parts are trafficked much like illegal drugs and arms. Experts at TRAFFIC, the wildlife trade monitoring network, estimate that it runs into billions of dollars.

Some examples of illegal wildlife trade are well known, such as poaching of elephants for ivory and tigers for their skins and bones. However, countless other species are similarly overexploited, from marine turtles to timber trees. Not all wildlife trade is illegal. Wild plants and animals from tens of thousands of species are caught or harvested from the wild and then sold legitimately as food, pets, ornamental plants, leather, tourist ornaments and medicine. Wildlife trade escalates into a crisis when an increasing proportion is illegal and unsustainable—directly threatening the survival of many species in the wild.

As human populations have grown, so has the demand for wildlife. People in many countries are accustomed to a lifestyle which fuels demand for wildlife. They expect access to a variety of seafoods, leather goods, timbers, medicinal ingredients and textiles. At the other end, extreme poverty means some people see wildlife as valuable barter for trade.

Demand Drives Crime

Rhino horn, elephant ivory and tiger products continue to command high prices among consumers, especially in Asia. In Vietnam, the recent myth that rhino horn can cure cancer has led to massive poaching in South Africa and pushed the price of rhino horn to rival gold.

Gaps in Protection

Corruption, toothless laws, weak judicial systems and light sentences allow criminal networks to keep plundering wildlife with little regard to consequences. These factors make illegal wildlife trade a low risk business with high returns. The poachers—often poor locals— are the usually the only ones caught, leaving

the real masterminds and their network safe and operational with the ability to strike again.There are certain places in the world where wildlife trade is particularly threatening. These areas are called 'Wldlife trade hotspots." They include China's international borders, trade hubs in East/Southern Africa and Southeast Asia, the eastern borders of the European Union, some markets in Mexico, parts of the Caribbean, parts of Indonesia and New Guinea, and the Solomon Islands. While these hotspots might be trouble areas at present, they also offer opportunities for great conservation success, if action and funds are well-focused. Wildlife trade alone is a major threat to some species, but its impact is frequently made worse by habitat loss and other pressures.

Altering Livelihoods

Local wildlife is considered an important resource by many communities, often the poorest, in the developing world. Some rural households depend on wild animals for protein, trees for fuel, and both wild animals and plants for natural cures.

Interruption of Nature

Overexploitation of species affects the living planet in wider ways. Just as overfishing causes imbalances in the whole marine system, our complex web of life on earth depends on careful and thoughtful use of wildlife species and their habitats.

Invasive Species

Many invasive species have been purposely introduced by wildlife traders or buyers. These invasive species prey on or compete with native species and are a major threat to the balance of nature. For example pet Burmese pythons let loose by their owners are now considered a major pest in Florida's everglades.

Incidental Killing of Non-Target Species

Like marine species killed through bycatch, incidental killing of animals also happens on land. For example, crude traps set for musk deer or duikers cause damage and death to a variety of animals besides those intended.

MAN-WILDLIFE CONFLICT

Human-wildlife conflict refers to the interaction between wild animals and people and the resultant negative impact on people or their resources, or wild animals or their habitat. It occurs when growing human populations overlap with established wildlife territory, creating reduction of resources or life to some people and/or wild animals. The conflict takes many forms ranging from loss of life or injury to humans, and animals both wild and domesticated, to competition for scarce resources to loss and degradation of habitat.

Conflict management strategies earlier comprised lethal control, translocation, regulation of population size and preservation of endangered species. Recent management approaches attempt to use scientific research for better management outcomes, such as behaviour modification and reducing interaction. As human-wildlife conflicts inflict direct, indirect and opportunity costs, the mitigation of human-wildlife conflict is an important issue in the management of biodiversity and protected areas.

TO reduce conflict between people and animals, and improve the livelihoods of the people affected, WWF report 'Common Ground' identifies themes that can be used to compose a common ground or a basic list of available and tested solutions. These include:

- A united effort: In order to be truly effective, prevention of human-wildlife conflict has to involve the full scope of society: international organizations, governments, NGOs, communities, consumers and individuals. Solutions are possible, but often they also need to have financial backing for their support and development.

•   Land-use planning: Ensuring that both humans and animals have the space they need is possible. Protecting key areas for wildlife, creating buffer zones and investing in alternative land uses are some of the solutions.

•   Community-based natural resource management: The local community is key since they are the ones who may wake up in the morning with a tiger or bear in their back yard. But they are also the people who can benefit the most from this. If people are empowered to manage their relationship with wild animals, these "unwanted" neighbours can become allies in bringing income and promoting a better quality of life for all

•   Compensation: I insurance: Compensation or insurance for animal-induced damage is another widely accepted solution. There are different ways this can be done. In Namibia, for example, community-based insurance systems exist for damage done to livestock. The Nepalese government pays compensation in areas around national parks.

•   Payment for Environmental Services: Payment for Environmental Services (PES) is a concept that has recently gained popularity in the international development and conservation community. The most popular of these is financial reward for the sequestering of carbon, but it is also seen as a potential solution for human-wildlife conflict.

•   Wildlife friendly products: Consumers is distant countries also have a role to play. Always look for products that are environmentally friendly and recognized by serious organizations.

•   Field based solutions: There are a number of practical field-based solutions that can limit the damage done both to humans and human property, and to wildlife, by preventing wildlife from entering fields or villages. However, such solutions can only be applied on a case-by-case basis. What people see as solution in one place, they may resist in another. And what works in one place, may have the opposite effect somewhere else.

NATIONAL PARK

National park, an area set aside by a national government for the preservation of the natural environment. A national park may be set aside for purposes of public recreation and enjoyment or because of its historical or scientific interest. Most of the landscapes and their accompanying plants and animals in a national park are kept in their natural state. Since the enormous forest cover of India is spread unevenly across the country, it is sometimes difficult to distribute these national parks in India state-wise. But we have tried to list one from every major state. Take a look at this list of the best national parks and wildlife sanctuaries in India before you decide to go on a wildlife watching spree. There are more than 103 National Parks in India and some important are: Jim Corbett National Park, Kaziranga National Park, Gir Forest National Park, Sundarban National Park, Satpura National Park, Eravikulam National Park, Pench National Park, Sariska National Park, Kanha National Park, Ranthambore National Park, Bandhavgarh Tiger Reserve, Bandipur National Park, Nagarhole National Park, Periyar National Park, Manas National Park, The Great Himalayan National Park, Sanjay Gandhi National Park, Rajaji National Park, Silent Valley National Park, Dudhwa National Park, Panna National Park, Van Vihar National Park

WILDLIFE SANCTUARY

• Any area other than area comprised with any reserve forest or the territorial waters can be notified by the State Government to constitute as a sanctuary if such area is of adequate ecological, faunal, floral, geomorphological, natural. or zoological significance, for the purpose of protecting, propagating or developing wildlife or its environment. Some restricted human activities are allowed inside the Sanctuary area. There are 551 existing wildlife sanctuaries in India covering an area of 119775.80 km2, which is 3.64 % of the geographical area of the country.

BIOSPHERE RESERVES

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. Biosphere reserves are areas comprising terrestrial, marine and coastal ecosystems. Each reserve promotes solutions reconciling the conservation of biodiversity with its sustainable use. Biosphere reserves are 'Science for Sustainability support sites' - special places for testing interdisciplinary approaches to understanding and managing changes and interactions between social and ecological systems, including conflict prevention and management of biodiversity. Biosphere reserves are nominated by national governments and remain under the sovereign jurisdiction of the states where they are located. Their status is internationally recognized. There are 701 biosphere reserves in 124 countries, including 21 transboundary sites.Biosphere reserves have three interrelated zones that aim to fulfil three complementary and mutually reinforcing functions:

- The core area(s) comprises a strictly protected ecosystem that contributes to the conservation of landscapes, ecosystems, species and genetic variation.
- The buffer zone surrounds or adjoins the core areas, and is used for activities compatible with sound ecological practices that can reinforce scientific research, monitoring, training and education.
- The transition area is the part of the reserve where the greatest activity is allowed, fostering economic and human development that is socio-culturally and ecologically sustainable.

The Indian government has established 18 biosphere reserves in India. Biosphere reserves of India

SACRED GROVES

"Segment of landscape, containing vegetation, life forms and geographical features, delimited and protected by human societies under the belief that to keep them in a relatively undisturbed state is expression of an important relationship of humans with the divine or with nature."

(Hughes and Chandra, 1998)

SACRED GROVES OF INDIA

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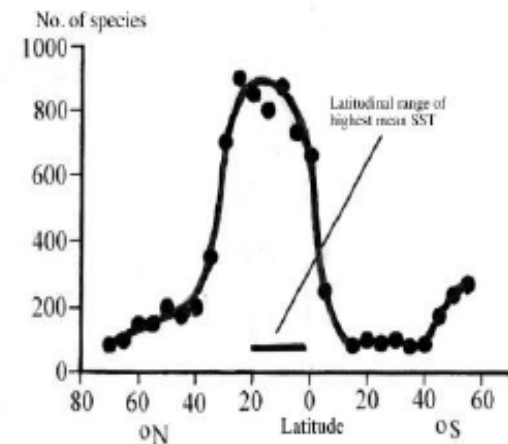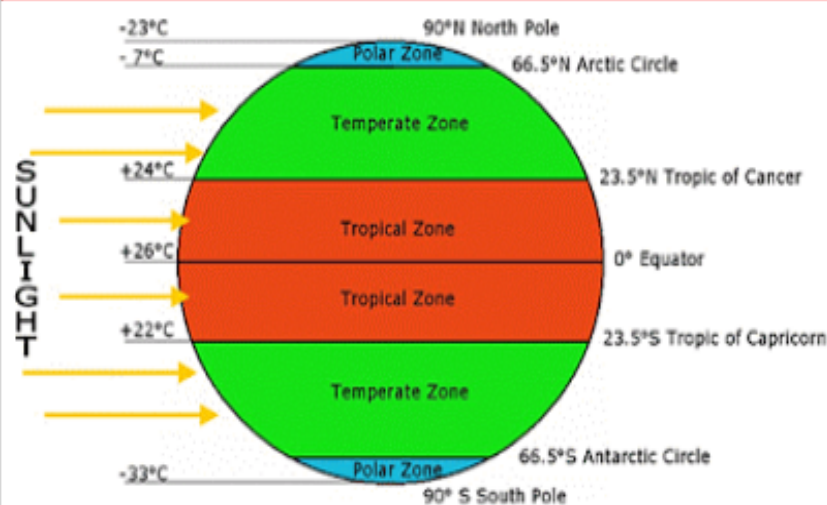
Week 3
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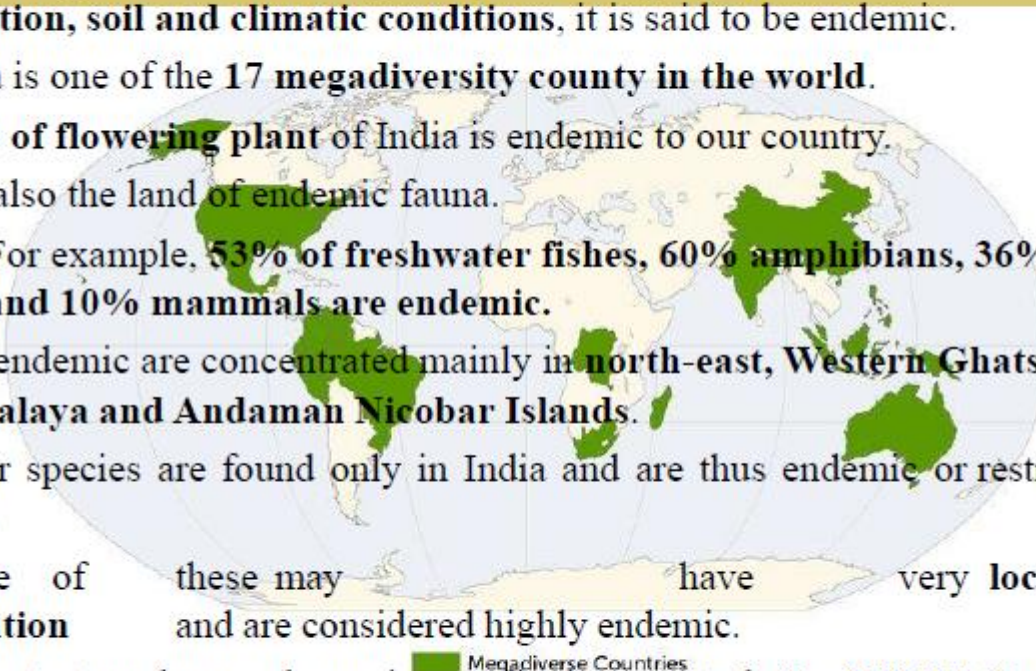- **Total species >129,000**

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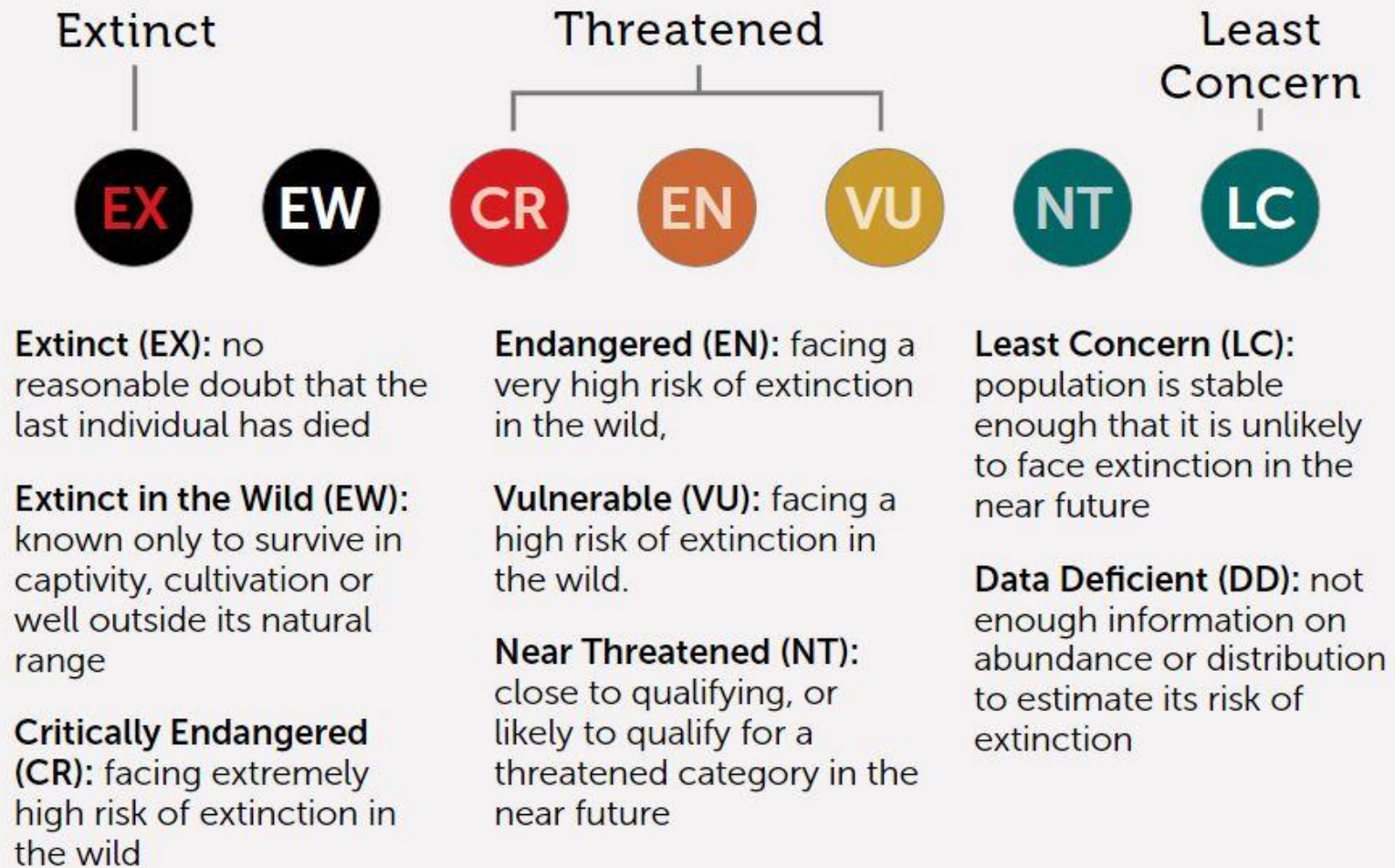
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CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora, also known as the Washington Convention) is a multilateral treaty to protect endangered plants and animals. It was drafted as a result of a resolution adopted in 1963 at a meeting of members of the International Union for Conservation of Nature (IUCN). The convention was opened for signature in 1973 and CITES entered into force on 1 July 1975. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species in the wild, and it accords varying degrees of protection to more than 35,000 species of animals and plants. In order to ensure that the General Agreement on Tariffs and Trade (GATT) was not violated, the Secretariat of GATT was consulted during the drafting process.

Convention on International Trade in Endangered Species of Wild Fauna and Flora

Week 3
Lecture 6

Anamika

WILDLIFE POACHING AND ILLEGAL TRADE OF WILDLIFE

Wildlife crime is a big business. Run by dangerous international networks, wildlife and animal parts are trafficked much like illegal drugs and arms. Experts at TRAFFIC, the wildlife trade monitoring network, estimate that it runs into billions of dollars.

Some examples of illegal wildlife trade are well known, such as poaching of elephants for ivory and tigers for their skins and bones. However, countless other species are similarly overexploited, from marine turtles to timber trees. Not all wildlife trade is illegal. Wild plants and animals from tens of thousands of species are caught or harvested from the wild and then sold legitimately as food, pets, ornamental plants, leather, tourist ornaments and medicine. Wildlife trade escalates into a crisis when an increasing proportion is illegal and unsustainable—directly threatening the survival of many species in the wild.

As human populations have grown, so has the demand for wildlife. People in many countries are accustomed to a lifestyle which fuels demand for wildlife. They expect access to a variety of seafoods, leather goods, timbers, medicinal ingredients and textiles. At the other end, extreme poverty means some people see wildlife as valuable barter for trade.

Demand Drives Crime

Rhino horn, elephant ivory and tiger products continue to command high prices among consumers, especially in Asia. In Vietnam, the recent myth that rhino horn can cure cancer has led to massive poaching in South Africa and pushed the price of rhino horn to rival gold.

Gaps in Protection

Corruption, toothless laws, weak judicial systems and light sentences allow criminal networks to keep plundering wildlife with little regard to consequences. These factors make illegal wildlife trade a low risk business with high returns. The poachers—often poor locals— are the usually the only ones caught, leaving

the real masterminds and their network safe and operational with the ability to strike again.There are certain places in the world where wildlife trade is particularly threatening. These areas are called 'Wldlife trade hotspots." They include China's international borders, trade hubs in East/Southern Africa and Southeast Asia, the eastern borders of the European Union, some markets in Mexico, parts of the Caribbean, parts of Indonesia and New Guinea, and the Solomon Islands. While these hotspots might be trouble areas at present, they also offer opportunities for great conservation success, if action and funds are well-focused. Wildlife trade alone is a major threat to some species, but its impact is frequently made worse by habitat loss and other pressures.

Altering Livelihoods

Local wildlife is considered an important resource by many communities, often the poorest, in the developing world. Some rural households depend on wild animals for protein, trees for fuel, and both wild animals and plants for natural cures.

Interruption of Nature

Overexploitation of species affects the living planet in wider ways. Just as overfishing causes imbalances in the whole marine system, our complex web of life on earth depends on careful and thoughtful use of wildlife species and their habitats.

Invasive Species

Many invasive species have been purposely introduced by wildlife traders or buyers. These invasive species prey on or compete with native species and are a major threat to the balance of nature. For example pet Burmese pythons let loose by their owners are now considered a major pest in Florida's everglades.

Incidental Killing of Non-Target Species

Like marine species killed through bycatch, incidental killing of animals also happens on land. For example, crude traps set for musk deer or duikers cause damage and death to a variety of animals besides those intended.

MAN-WILDLIFE CONFLICT

Human-wildlife conflict refers to the interaction between wild animals and people and the resultant negative impact on people or their resources, or wild animals or their habitat. It occurs when growing human populations overlap with established wildlife territory, creating reduction of resources or life to some people and/or wild animals. The conflict takes many forms ranging from loss of life or injury to humans, and animals both wild and domesticated, to competition for scarce resources to loss and degradation of habitat.

Conflict management strategies earlier comprised lethal control, translocation, regulation of population size and preservation of endangered species. Recent management approaches attempt to use scientific research for better management outcomes, such as behaviour modification and reducing interaction. As human-wildlife conflicts inflict direct, indirect and opportunity costs, the mitigation of human-wildlife conflict is an important issue in the management of biodiversity and protected areas.

TO reduce conflict between people and animals, and improve the livelihoods of the people affected, WWF report 'Common Ground' identifies themes that can be used to compose a common ground or a basic list of available and tested solutions. These include:

•   A united effort: In order to be truly effective, prevention of human-wildlife conflict has to involve the full scope of society: international organizations, governments, NGOs, communities, consumers and individuals. Solutions are possible, but often they also need to have financial backing for their support and development.

• Land-use planning: Ensuring that both humans and animals have the space they need is possible. Protecting key areas for wildlife, creating buffer zones and investing in alternative land uses are some of the solutions.

• Community-based natural resource management: The local community is key since they are the ones who may wake up in the morning with a tiger or bear in their back yard. But they are also the people who can benefit the most from this. If people are empowered to manage their relationship with wild animals, these "unwanted" neighbours can become allies in bringing income and promoting a better quality of life for all

• Compensation: I insurance: Compensation or insurance for animal-induced damage is another widely accepted solution. There are different ways this can be done. In Namibia, for example, community-based insurance systems exist for damage done to livestock. The Nepalese government pays compensation in areas around national parks.

• Payment for Environmental Services: Payment for Environmental Services (PES) is a concept that has recently gained popularity in the international development and conservation community. The most popular of these is financial reward for the sequestering of carbon, but it is also seen as a potential solution for human-wildlife conflict.

• Wildlife friendly products: Consumers is distant countries also have a role to play. Always look for products that are environmentally friendly and recognized by serious organizations.

• Field based solutions: There are a number of practical field-based solutions that can limit the damage done both to humans and human property, and to wildlife, by preventing wildlife from entering fields or villages. However, such solutions can only be applied on a case-by-case basis. What people see as solution in one place, they may resist in another. And what works in one place, may have the opposite effect somewhere else.

NATIONAL PARK

National park, an area set aside by a national government for the preservation of the natural environment. A national park may be set aside for purposes of public recreation and enjoyment or because of its historical or scientific interest. Most of the landscapes and their accompanying plants and animals in a national park are kept in their natural state. Since the enormous forest cover of India is spread unevenly across the country, it is sometimes difficult to distribute these national parks in India state-wise. But we have tried to list one from every major state. Take a look at this list of the best national parks and wildlife sanctuaries in India before you decide to go on a wildlife watching spree. There are more than 103 National Parks in India and some important are: Jim Corbett National Park, Kaziranga National Park, Gir Forest National Park, Sundarban National Park, Satpura National Park, Eravikulam National Park, Pench National Park, Sariska National Park, Kanha National Park, Ranthambore National Park, Bandhavgarh Tiger Reserve, Bandipur National Park, Nagarhole National Park, Periyar National Park, Manas National Park, The Great Himalayan National Park, Sanjay Gandhi National Park, Rajaji National Park, Silent Valley National Park, Dudhwa National Park, Panna National Park, Van Vihar National Park

WILDLIFE SANCTUARY

• Any area other than area comprised with any reserve forest or the territorial waters can be notified by the State Government to constitute as a sanctuary if such area is of adequate ecological, faunal, floral, geomorphological, natural. or zoological significance, for the purpose of protecting, propagating or developing wildlife or its environment. Some restricted human activities are allowed inside the Sanctuary area. There are 551 existing wildlife sanctuaries in India covering an area of 119775.80 km2, which is 3.64 % of the geographical area of the country.

BIOSPHERE RESERVES

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. Biosphere reserves are areas comprising terrestrial, marine and coastal ecosystems. Each reserve promotes solutions reconciling the conservation of biodiversity with its sustainable use. Biosphere reserves are 'Science for Sustainability support sites' - special places for testing interdisciplinary approaches to understanding and managing changes and interactions between social and ecological systems, including conflict prevention and management of biodiversity. Biosphere reserves are nominated by national governments and remain under the sovereign jurisdiction of the states where they are located. Their status is internationally recognized. There are 701 biosphere reserves in 124 countries, including 21 transboundary sites.Biosphere reserves have three interrelated zones that aim to fulfil three complementary and mutually reinforcing functions:

• The core area(s) comprises a strictly protected ecosystem that contributes to the conservation of landscapes, ecosystems, species and genetic variation.
• The buffer zone surrounds or adjoins the core areas, and is used for activities compatible with sound ecological practices that can reinforce scientific research, monitoring, training and education.
• The transition area is the part of the reserve where the greatest activity is allowed, fostering economic and human development that is socio-culturally and ecologically sustainable.

The Indian government has established 18 biosphere reserves in India. Biosphere reserves of India

SACRED GROVES OF INDIA

Sacred groves of India are forest fragments of varying sizes, which are communally protected, and which usually have a significant religious connotation for the protecting community. Hunting and logging are usually strictly prohibited within these patches. Sacred groves of India are forest fragments of varying sizes, which are communally protected, and which usually have a significant religious

connotation for the protecting community. Hunting and logging are usually strictly prohibited within these patches. Other forms of forest usage like honey collection and deadwood collection are sometimes allowed on a sustainable basis. Sacred groves did not enjoy protection via federal legislation in India. Some NGOs work with local villagers to protect such groves. Traditionally, and in some cases even today, members of the community take turns to protect the grove. However, the introduction of the protected area category community reserves under the Wild Life (Protection) Amendment Act, 2002 has introduced legislation for providing government protection to community held lands, which could include sacred groves.

Indian sacred groves are often associated with temples, monasteries, shrines or with burial grounds. Historically, sacred groves find their mentions in Hindu, Jain and Buddhist texts, from sacred tree groves in Hinduism to sacred deer parks in Buddhism for example. Sacred groves may be loosely used to refer to natural habitat protected on religious grounds. Other historical references to sacred groves can be obtained in Vrukshayurveda an ancient treatise, ancient classics such as Kalidasa's Vikramuurvashiiya. There has been a growing interest in creating green patches such as Nakshatravana grove. The Hindu tradition considers forests to be of three types - Tapovan, Mahavan and Sreevan. Tapovan are forests associated with penance (Tapas), and are inhabited by saints and rishis. Mahavan refers to the grand natural forests. Tapovan and Mahavan are considered to be a Raksha ("sanctuary") for flora and fauna as ordinary human beings are not allowed to enter these forests. Sreevan, which means, "forests of prosperity", consists of dense forests and groves. From the former, people would collect dry wood, leaves, forest produce and a limited amount of timber, though natural ecosystem would not be unnecessarily disturbed. Groves were considered as spaces of forests from where harvesting could be done. Sometimes, specific trees like mango trees could be planted and nurtured here. Groves were associated with religious rites, festivals and recreation. Typical recreational activities associated with these groves included jhoola/ jhoolan. In the villages, Panchavati, or a cluster of five trees that represented the forests, were maintained. These trees represented the five elements of Earth, Water, Fire, Air and Space.
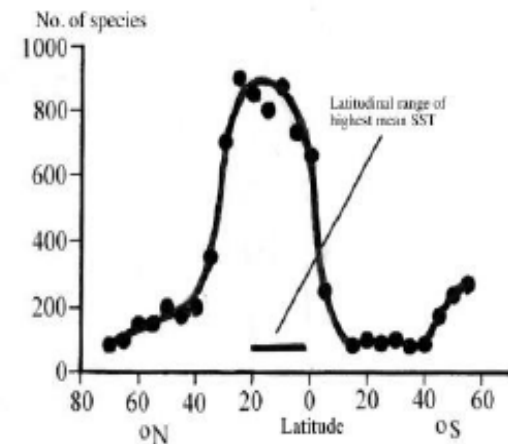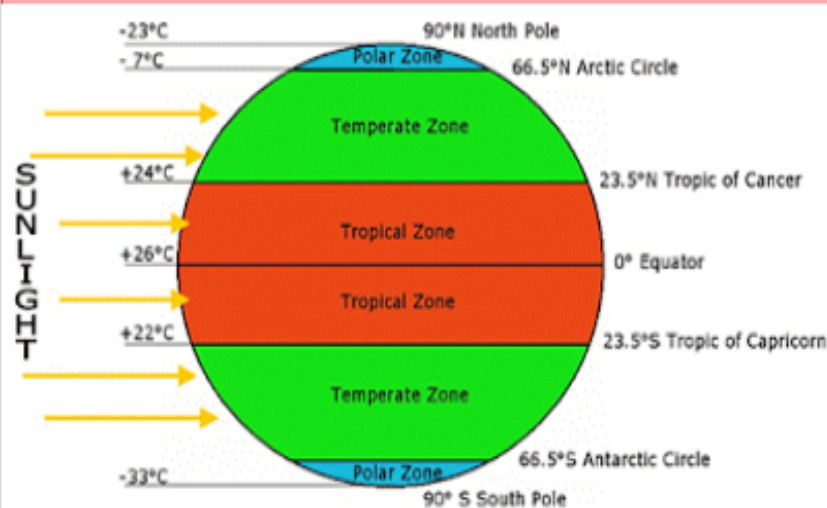
Week 3
Lecture 5

Anamika

Biodiversity at Global, National and Local Levels

- **1.5 million species are known** and described in the database which may be just 15% of the actual number of species lie on the earth.
- It is expected that **8 to 100 million species** lie on the earth surface. Globally about 1,70,000 flowering plants, 30,000 vertebrates and about 2,50,000 other groups of species have been described.
- Terrestrial biodiversity is best described as Biomes and Biomes are the largest ecological units present in different geographic area and are named after the dominant vegetation. e.g. the tropical rainforests, tall grass prairies etc. it is quite interesting to know that marine diversity is even much higher than terrestrial diversity. "Sea is the cradle of every known animal phylum".
- The economically developed nations exploited the biodiversity for their development.
- After realization of biodiversity as a **'common property resources'** for all the nations, the developed nations stared the practices of biodiversity conservation.
- The country which are moving towards biodiversity conservation are being recognized.
- The country like India is a signatory in the **World Heritage Convention (1972)** and included several protected areas as world heritage sites.

- This **convention include** Nanda Devi and valley of flower in the Himalaya, Sundarban in West Bengal, Western Ghats, Kaziranga in Assam, Manas on the border of Bhutan and India and Great Himalayan National Park.

- India has also signed the **Convention in the Trade of Endangered Species (CITES, 1973)** to control the utilization of endangered plant and animals.

- MoEF, a agency to implement CBD (Convention on Biological Diversity) developed the strategy for Biodiversity conservation and formulated the **Biodiversity Act in 2002**.

- The biodiversity is not evenly distribute throughout the Globe. The countries lying mostly in tropics are characterized by **high species richness** and more endemic species, called Mega diversity nations.

- About **17 countries** belong to this category till date.

India as Mega-Diversity Nation

Indian-Biodiversity

Contributes:

- 6% of global species
- 47,000 species of plants(7% of global flora)
- 81,000 species of animals (6.5% of global fauna)
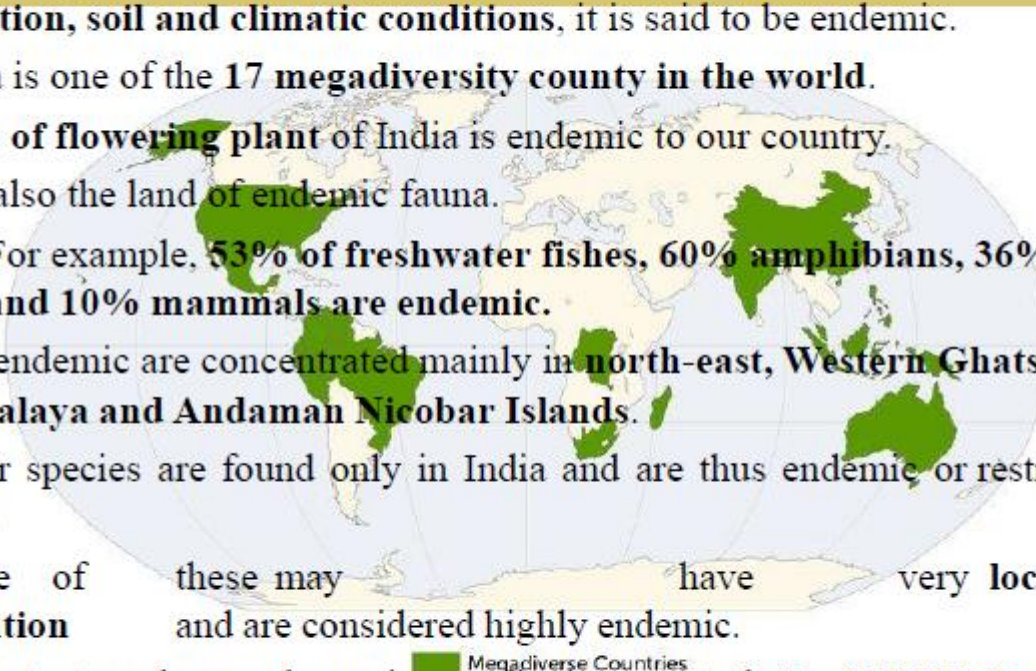- **Total species >129,000**

Rankings:

- 10th rank in plant rich countries of the world.
- 11th in terms of number of endemic species of higher vertebrates
- 6th among the centre of diversity and origin of agricultural crops

Endemic species of India

❖ When a species is found only in a particular geographical region **because of its isolation, soil and climatic conditions**, it is said to be endemic.

❖ India is one of the **17 megadiversity county in the world**.

❖ **33% of flowering plant** of India is endemic to our country.

❖ It is also the land of endemic fauna.

   ❖ For example, **53% of freshwater fishes, 60% amphibians, 36% reptiles and 10% mammals are endemic.**

❖ The endemic are concentrated mainly in **north-east, Western Ghats, north-west Himalaya and Andaman Nicobar Islands**.

❖ Other species are found only in India and are thus endemic or restricted to our country.

❖ Some of these may have very **localized distribution** and are considered highly endemic.

Megadiverse Countries

❖ To protect endangered species, India has created **the Wildlife Protection Act (1972).** This includes lists of plants and animals categorized according to the threat on their survival.

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
(Western Ghats)

Brown fish Owl (mainly found in
subtropical region)

Indian cobra

Clouded leopard (foothills
of Himalaya)

Indian elephant

Indian vulture

Red panda (Eastern Himalaya)

Olive ridley turtles found at the coast of Orissa (**Case Study: Operation Kachhapa**)

Oplismenus thwaitesii (Basket grass)

Gymnostachyum febrifugum (medicinal plant)

Impatiens sivarajanii (flowering plant)

IUCN RED LIST OF THREATENED SPECIES

The IUCN Red List (founded in 1964) of Threatened Species is the world's most comprehensive inventory of the global conservation status of plant and animal species. It uses a set of quantitative criteria to evaluate the extinction risk of thousands of species. These criteria are relevant to most species and all regions of the world. With its strong scientific base, The IUCN Red List is recognized as the most authoritative guide to the status of biological diversity. The IUCN Red List assesses the conservation status of species at a global level, drawing on expert knowledge from around the world. The IUCN Red List is used by institutional, business and community users such as:
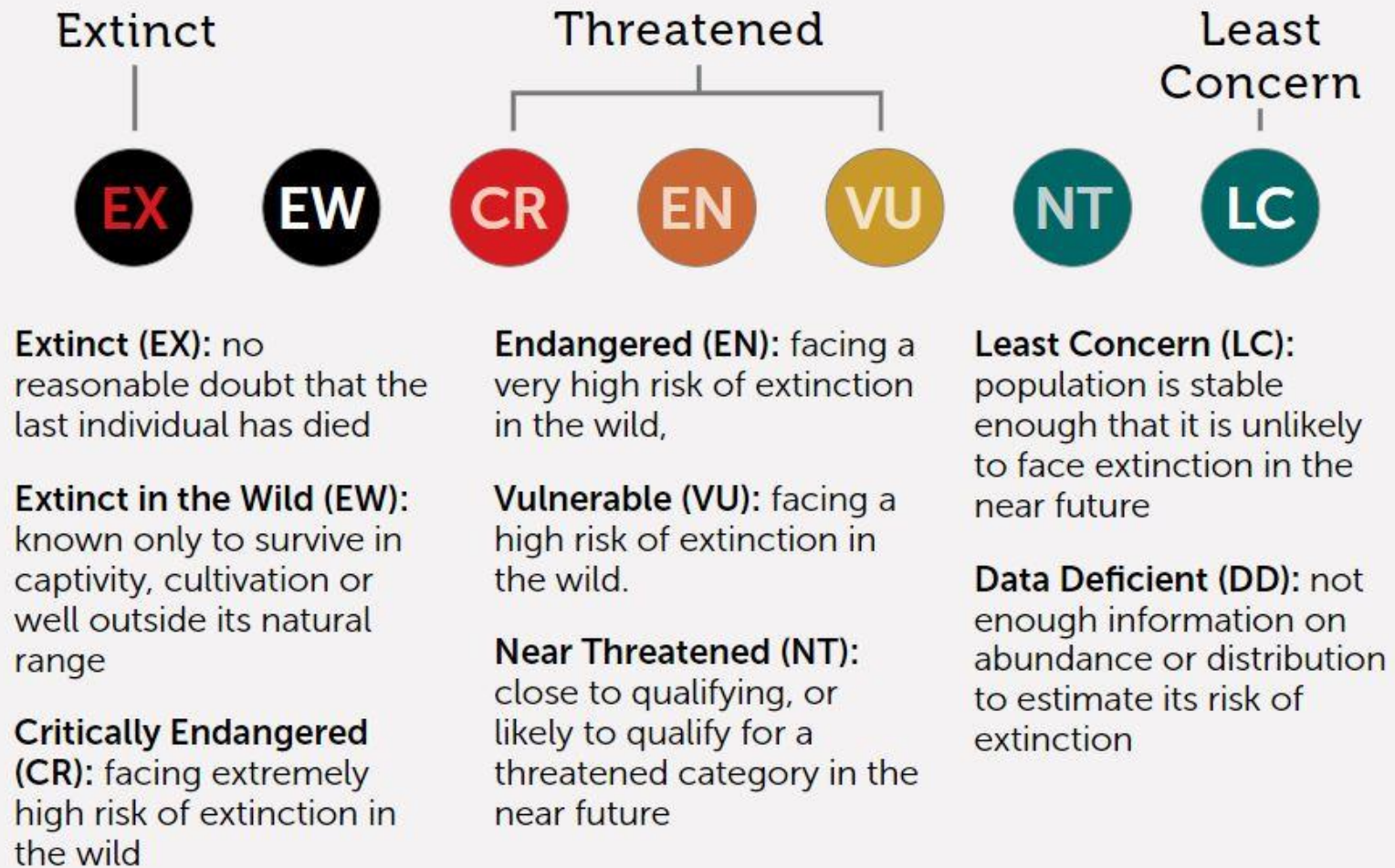
- national and international government agencies . wildlife departments
- conservation-related non-governmental organisations (NGOs) . natural resource planners
- educational organisations
- zoos and aquariums
- students
- media
- business community

IUCN Red List data are used for a variety of purposes:

- International agreements use IUCN Red List data to guide decision making and as an indicator of the status of nature. These include, but are not limited to agreements such as CITES, the Ramsar Convention, UN Sustainable Development Goals and CBD Aichi Targets
- World Bank Group Performance Standard PS6 uses IUCN Red List
  Index to minimize the risk to biodiversity from large-scale infrastructure and natural resource extraction projects

- Government agencies rely on IUCN Red List data to guide policies such as National Parks regulations

- Zoos use The IUCN Red List Categories to educate the public about species' status
- Scientists use IUCN Red List data as a primary data source in their analyses and publications
- Teachers and students use IUCN Red List data in college projects
- Journalists use IUCN Red List data to inform their articles
- Data from IUCN Red List are used as indicators for the United Nations Sustainable Development Goals, particularly Goal 15: Life on Land.
- The IUCN Red List Index is used by the Convention on Biological Diversity (CBD) to monitor progress towards achieving the Aichi Targets.
- The IUCN Red List Categories define the extinction risk of species assessed. Nine categories extend from NE (Not Evaluated) to EX (Extinct).
- Critically Endangered (CR), Endangered (EN) and Vulnerable (W) species are considered to be threatened with extinction.

THE RED LIST CATEGORIES

Extinct

Threatened

Least Concern

EX · **EW** · **CR** · **EN** · **VU** · **NT** · **LC**

Extinct (EX): no reasonable doubt that the last individual has died

Extinct in the Wild (EW): known only to survive in captivity, cultivation or well outside its natural range

Critically Endangered (CR): facing extremely high risk of extinction in the wild

Endangered (EN): facing a very high risk of extinction in the wild,

Vulnerable (VU): facing a high risk of extinction in the wild.

Near Threatened (NT): close to qualifying, or likely to qualify for a threatened category in the near future

Least Concern (LC): population is stable enough that it is unlikely to face extinction in the near future

Data Deficient (DD): not enough information on abundance or distribution to estimate its risk of extinction

IUCN INDIA

- India a mega diverse country accounts for 7-8% of all recorded speciesOver 45,968 species of plants and 91.364 species of animals.

- 4 of 34 globally identified biodiversity hotspots: The Himalayas, theWestern Ghats, the North-East, and the Nicobar Islands in India.

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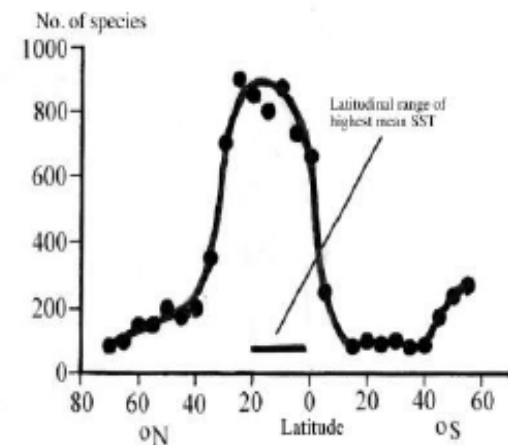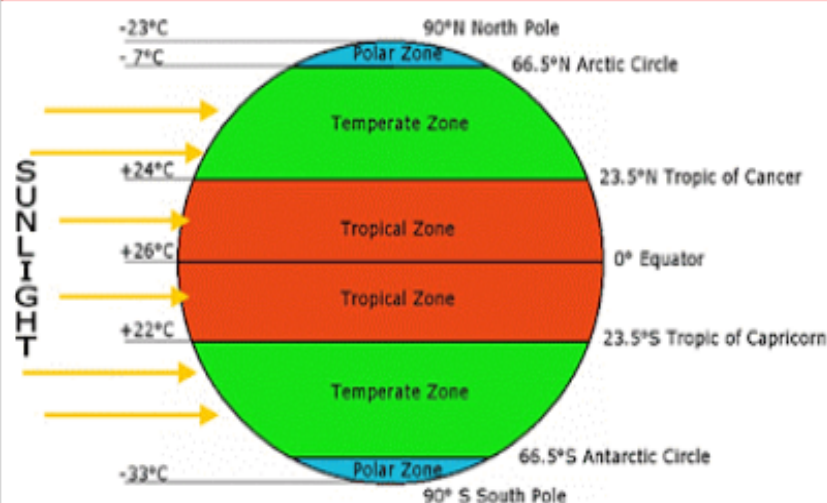
Week 3
Lecture 5

Anamika

Biodiversity at Global, National and Local Levels

- **1.5 million species are known** and described in the database which may be just 15% of the actual number of species lie on the earth.
- It is expected that **8 to 100 million species** lie on the earth surface. Globally about 1,70,000 flowering plants, 30,000 vertebrates and about 2,50,000 other groups of species have been described.
- Terrestrial biodiversity is best described as Biomes and Biomes are the largest ecological units present in different geographic area and are named after the dominant vegetation. e.g. the tropical rainforests, tall grass prairies etc. it is quite interesting to know that marine diversity is even much higher than terrestrial diversity. "Sea is the cradle of every known animal phylum".
- The economically developed nations exploited the biodiversity for their development.
- After realization of biodiversity as a **'common property resources'** for all the nations, the developed nations stared the practices of biodiversity conservation.
- The country which are moving towards biodiversity conservation are being recognized.
- The country like India is a signatory in the **World Heritage Convention (1972)** and included several protected areas as world heritage sites.

- This **convention include** Nanda Devi and valley of flower in the Himalaya, Sundarban in West Bengal, Western Ghats, Kaziranga in Assam, Manas on the border of Bhutan and India and Great Himalayan National Park.

- India has also signed the **Convention in the Trade of Endangered Species (CITES, 1973)** to control the utilization of endangered plant and animals.

- MoEF, a agency to implement CBD (Convention on Biological Diversity) developed the strategy for Biodiversity conservation and formulated the **Biodiversity Act in 2002**.

- The biodiversity is not evenly distribute throughout the Globe. The countries lying mostly in tropics are characterized by **high species richness** and more endemic species, called Mega diversity nations.

- About **17 countries** belong to this category till date.

India as Mega-Diversity Nation

Indian-Biodiversity

Contributes:

- 6% of global species
- 47,000 species of plants(7% of global flora)
- 81,000 species of animals (6.5% of global fauna)
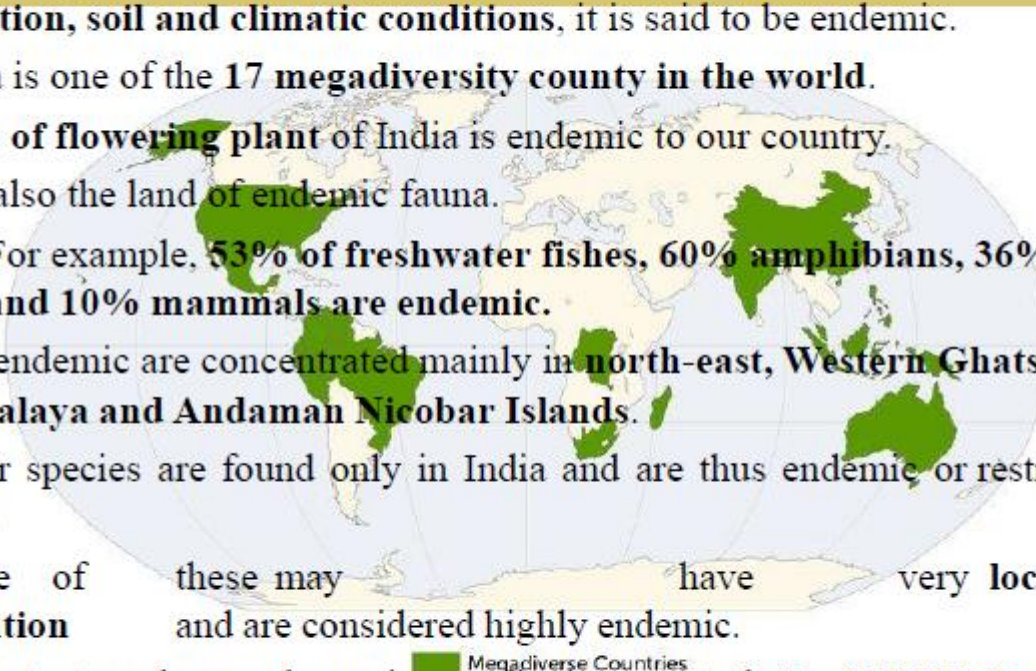- **Total species >129,000**

Rankings:

- 10th rank in plant rich countries of the world.
- 11th in terms of number of endemic species of higher vertebrates
- 6th among the centre of diversity and origin of agricultural crops

Endemic species of India

❖ When a species is found only in a particular geographical region **because of its isolation, soil and climatic conditions**, it is said to be endemic.

❖ India is one of the **17 megadiversity county in the world**.

❖ **33% of flowering plant** of India is endemic to our country.

❖ It is also the land of endemic fauna.

    ❖ For example, **53% of freshwater fishes, 60% amphibians, 36% reptiles and 10% mammals are endemic.**

❖ The endemic are concentrated mainly in **north-east, Western Ghats, north-west Himalaya and Andaman Nicobar Islands**.

❖ Other species are found only in India and are thus endemic or restricted to our country.

❖ Some of these may have very **localized distribution** and are considered highly endemic.

Megadiverse Countries

❖ To protect endangered species, India has created **the Wildlife Protection Act (1972).** This includes lists of plants and animals categorized according to the threat on their survival.

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 (Western Ghats)

Brown fish Owl (mainly found in subtropical region)

Indian cobra

Clouded leopard (foothills of Himalaya)

Indian elephant

Indian vulture

Red panda (Eastern Himalaya)

Olive ridley turtles found at the coast of Orissa (**Case Study: Operation Kachhapa**)

Oplismenus thwaitesii (Basket grass)

Gymnostachyum febrifugum (medicinal plant)

Impatiens sivarajanii (flowering plant)

IUCN RED LIST OF THREATENED SPECIES

The IUCN Red List (founded in 1964) of Threatened Species is the world's most comprehensive inventory of the global conservation status of plant and animal species. It uses a set of quantitative criteria to evaluate the extinction risk of thousands of species. These criteria are relevant to most species and all regions of the world. With its strong scientific base, The IUCN Red List is recognized as the most authoritative guide to the status of biological diversity. The IUCN Red List assesses the conservation status of species at a global level, drawing on expert knowledge from around the world. The IUCN Red List is used by institutional, business and community users such as:
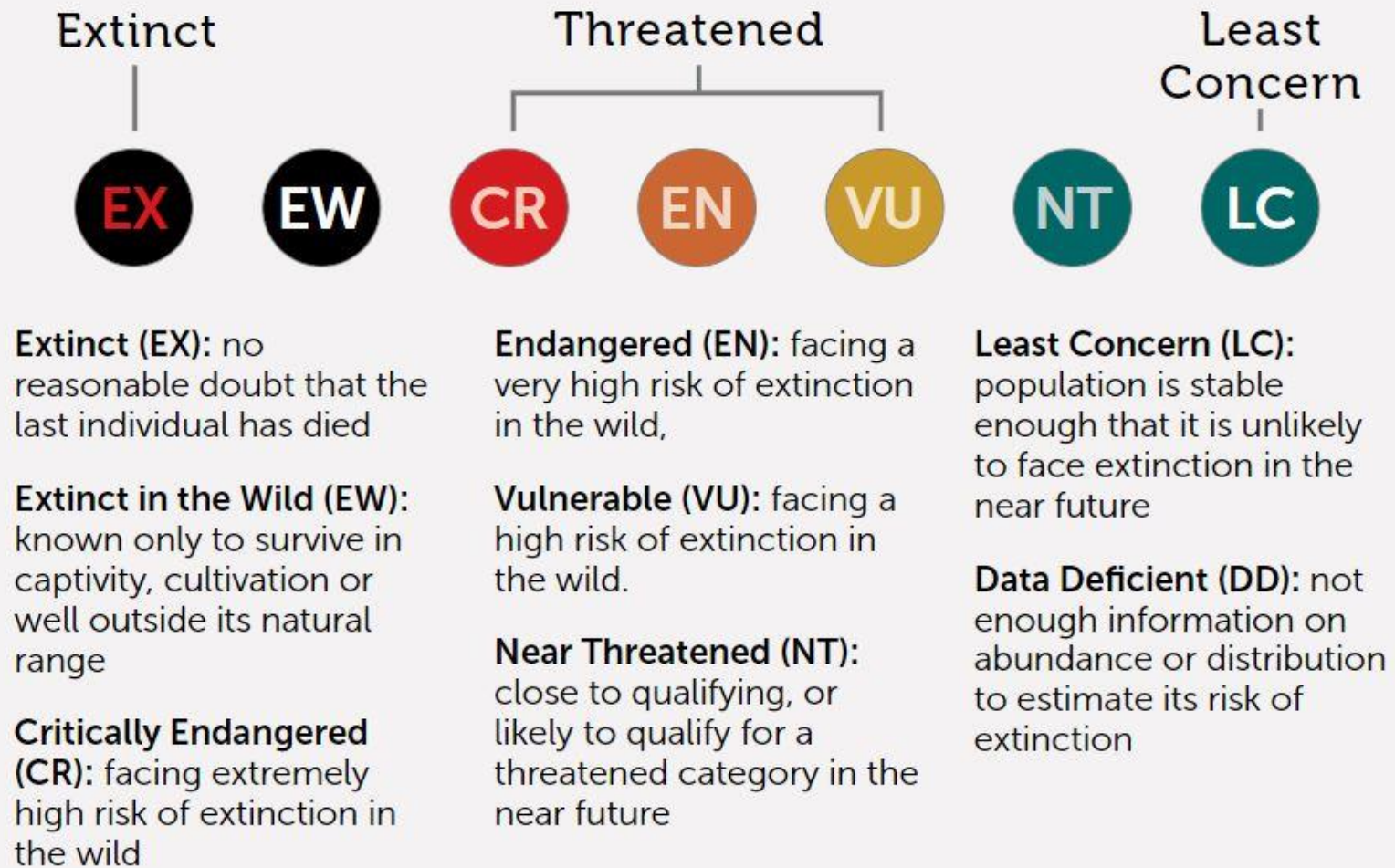
- national and international government agencies . wildlife departments
- conservation-related non-governmental organisations (NGOs) . natural resource planners
- educational organisations
- zoos and aquariums
- students
- media
- business community

IUCN Red List data are used for a variety of purposes:

- International agreements use IUCN Red List data to guide decision making and as an indicator of the status of nature. These include, but are not limited to agreements such as CITES, the Ramsar Convention, UN Sustainable Development Goals and CBD Aichi Targets
- World Bank Group Performance Standard PS6 uses IUCN Red List Index to minimize the risk to biodiversity from large-scale infrastructure and natural resource extraction projects

- Government agencies rely on IUCN Red List data to guide policies such as National Parks regulations

- Zoos use The IUCN Red List Categories to educate the public about species' status
- Scientists use IUCN Red List data as a primary data source in their analyses and publications
- Teachers and students use IUCN Red List data in college projects
- Journalists use IUCN Red List data to inform their articles
- Data from IUCN Red List are used as indicators for the United Nations Sustainable Development Goals, particularly Goal 15: Life on Land.
- The IUCN Red List Index is used by the Convention on Biological Diversity (CBD) to monitor progress towards achieving the Aichi Targets.
- The IUCN Red List Categories define the extinction risk of species assessed. Nine categories extend from NE (Not Evaluated) to EX (Extinct).
- Critically Endangered (CR), Endangered (EN) and Vulnerable (W) species are considered to be threatened with extinction.

THE RED LIST CATEGORIES

Extinct

Threatened

Least Concern

EX **EW** **CR** **EN** **VU** **NT** **LC**

Extinct (EX): no reasonable doubt that the last individual has died

Extinct in the Wild (EW): known only to survive in captivity, cultivation or well outside its natural range

Critically Endangered (CR): facing extremely high risk of extinction in the wild

Endangered (EN): facing a very high risk of extinction in the wild,

Vulnerable (VU): facing a high risk of extinction in the wild.

Near Threatened (NT): close to qualifying, or likely to qualify for a threatened category in the near future

Least Concern (LC): population is stable enough that it is unlikely to face extinction in the near future

Data Deficient (DD): not enough information on abundance or distribution to estimate its risk of extinction

IUCN INDIA

- India a mega diverse country accounts for 7-8% of all recorded speciesOver 45,968 species of plants and 91.364 species of animals.

- 4 of 34 globally identified biodiversity hotspots: The Himalayas, theWestern Ghats, the North-East, and the Nicobar Islands in India.

- India became a State Member of IUCN in 1969, through the Ministry ofEnvironment Forest and Climate Change (MoEFCC).

- The IUCN India Country Office was established in 2007 in New Delhi.

CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora, also known as the Washington Convention) is a multilateral treaty to protect endangered plants and animals. It was drafted as a result of a resolution adopted in 1963 at a meeting of members of the International Union for Conservation of Nature (IUCN). The convention was opened for signature in 1973 and CITES entered into force on 1 July 1975. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species in the wild, and it accords varying degrees of protection to more than 35,000 species of animals and plants. In order to ensure that the General Agreement on Tariffs and Trade (GATT) was not violated, the Secretariat of GATT was consulted during the drafting process.

Convention on International Trade in Endangered Species of Wild Fauna and Flora

Week 3
Lecture 6

Anamika

WILDLIFE POACHING AND ILLEGAL TRADE OF WILDLIFE

Wildlife crime is a big business. Run by dangerous international networks, wildlife and animal parts are trafficked much like illegal drugs and arms. Experts at TRAFFIC, the wildlife trade monitoring network, estimate that it runs into billions of dollars.

Some examples of illegal wildlife trade are well known, such as poaching of elephants for ivory and tigers for their skins and bones. However, countless other species are similarly overexploited, from marine turtles to timber trees. Not all wildlife trade is illegal. Wild plants and animals from tens of thousands of species are caught or harvested from the wild and then sold legitimately as food, pets, ornamental plants, leather, tourist ornaments and medicine. Wildlife trade escalates into a crisis when an increasing proportion is illegal and unsustainable—directly threatening the survival of many species in the wild.

As human populations have grown, so has the demand for wildlife. People in many countries are accustomed to a lifestyle which fuels demand for wildlife. They expect access to a variety of seafoods, leather goods, timbers, medicinal ingredients and textiles. At the other end, extreme poverty means some people see wildlife as valuable barter for trade.

Demand Drives Crime

Rhino horn, elephant ivory and tiger products continue to command high prices among consumers, especially in Asia. In Vietnam, the recent myth that rhino horn can cure cancer has led to massive poaching in South Africa and pushed the price of rhino horn to rival gold.

Gaps in Protection

Corruption, toothless laws, weak judicial systems and light sentences allow criminal networks to keep plundering wildlife with little regard to consequences. These factors make illegal wildlife trade a low risk business with high returns. The poachers—often poor locals— are the usually the only ones caught, leaving

the real masterminds and their network safe and operational with the ability to strike again.There are certain places in the world where wildlife trade is particularly threatening. These areas are called 'Wldlife trade hotspots." They include China's international borders, trade hubs in East/Southern Africa and Southeast Asia, the eastern borders of the European Union, some markets in Mexico, parts of the Caribbean, parts of Indonesia and New Guinea, and the Solomon Islands. While these hotspots might be trouble areas at present, they also offer opportunities for great conservation success, if action and funds are well-focused. Wildlife trade alone is a major threat to some species, but its impact is frequently made worse by habitat loss and other pressures.

Altering Livelihoods

Local wildlife is considered an important resource by many communities, often the poorest, in the developing world. Some rural households depend on wild animals for protein, trees for fuel, and both wild animals and plants for natural cures.

Interruption of Nature

Overexploitation of species affects the living planet in wider ways. Just as overfishing causes imbalances in the whole marine system, our complex web of life on earth depends on careful and thoughtful use of wildlife species and their habitats.

Invasive Species

Many invasive species have been purposely introduced by wildlife traders or buyers. These invasive species prey on or compete with native species and are a major threat to the balance of nature. For example pet Burmese pythons let loose by their owners are now considered a major pest in Florida's everglades.

Incidental Killing of Non-Target Species

Like marine species killed through bycatch, incidental killing of animals also happens on land. For example, crude traps set for musk deer or duikers cause damage and death to a variety of animals besides those intended.

MAN-WILDLIFE CONFLICT

Human-wildlife conflict refers to the interaction between wild animals and people and the resultant negative impact on people or their resources, or wild animals or their habitat. It occurs when growing human populations overlap with established wildlife territory, creating reduction of resources or life to some people and/or wild animals. The conflict takes many forms ranging from loss of life or injury to humans, and animals both wild and domesticated, to competition for scarce resources to loss and degradation of habitat.

Conflict management strategies earlier comprised lethal control, translocation, regulation of population size and preservation of endangered species. Recent management approaches attempt to use scientific research for better management outcomes, such as behaviour modification and reducing interaction. As human-wildlife conflicts inflict direct, indirect and opportunity costs, the mitigation of human-wildlife conflict is an important issue in the management of biodiversity and protected areas.

TO reduce conflict between people and animals, and improve the livelihoods of the people affected, WWF report 'Common Ground' identifies themes that can be used to compose a common ground or a basic list of available and tested solutions. These include:

•   A united effort: In order to be truly effective, prevention of human-wildlife conflict has to involve the full scope of society: international organizations, governments, NGOs, communities, consumers and individuals. Solutions are possible, but often they also need to have financial backing for their support and development.

- Land-use planning: Ensuring that both humans and animals have the space they need is possible. Protecting key areas for wildlife, creating buffer zones and investing in alternative land uses are some of the solutions.

- Community-based natural resource management: The local community is key since they are the ones who may wake up in the morning with a tiger or bear in their back yard. But they are also the people who can benefit the most from this. If people are empowered to manage their relationship with wild animals, these "unwanted" neighbours can become allies in bringing income and promoting a better quality of life for all

- Compensation: I insurance: Compensation or insurance for animal-induced damage is another widely accepted solution. There are different ways this can be done. In Namibia, for example, community-based insurance systems exist for damage done to livestock. The Nepalese government pays compensation in areas around national parks.

- Payment for Environmental Services: Payment for Environmental Services (PES) is a concept that has recently gained popularity in the international development and conservation community. The most popular of these is financial reward for the sequestering of carbon, but it is also seen as a potential solution for human-wildlife conflict.

- Wildlife friendly products: Consumers is distant countries also have a role to play. Always look for products that are environmentally friendly and recognized by serious organizations.

- Field based solutions: There are a number of practical field-based solutions that can limit the damage done both to humans and human property, and to wildlife, by preventing wildlife from entering fields or villages. However, such solutions can only be applied on a case-by-case basis. What people see as solution in one place, they may resist in another. And what works in one place, may have the opposite effect somewhere else.

NATIONAL PARK

National park, an area set aside by a national government for the preservation of the natural environment. A national park may be set aside for purposes of public recreation and enjoyment or because of its historical or scientific interest. Most of the landscapes and their accompanying plants and animals in a national park are kept in their natural state. Since the enormous forest cover of India is spread unevenly across the country, it is sometimes difficult to distribute these national parks in India state-wise. But we have tried to list one from every major state. Take a look at this list of the best national parks and wildlife sanctuaries in India before you decide to go on a wildlife watching spree. There are more than 103 National Parks in India and some important are: Jim Corbett National Park, Kaziranga National Park, Gir Forest National Park, Sundarban National Park, Satpura National Park, Eravikulam National Park, Pench National Park, Sariska National Park, Kanha National Park, Ranthambore National Park, Bandhavgarh Tiger Reserve, Bandipur National Park, Nagarhole National Park, Periyar National Park, Manas National Park, The Great Himalayan National Park, Sanjay Gandhi National Park, Rajaji National Park, Silent Valley National Park, Dudhwa National Park, Panna National Park, Van Vihar National Park

WILDLIFE SANCTUARY

• Any area other than area comprised with any reserve forest or the territorial waters can be notified by the State Government to constitute as a sanctuary if such area is of adequate ecological, faunal, floral, geomorphological, natural. or zoological significance, for the purpose of protecting, propagating or developing wildlife or its environment. Some restricted human activities are allowed inside the Sanctuary area. There are 551 existing wildlife sanctuaries in India covering an area of 119775.80 km2, which is 3.64 % of the geographical area of the country.

BIOSPHERE RESERVES

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. Biosphere reserves are areas comprising terrestrial, marine and coastal ecosystems. Each reserve promotes solutions reconciling the conservation of biodiversity with its sustainable use. Biosphere reserves are 'Science for Sustainability support sites' - special places for testing interdisciplinary approaches to understanding and managing changes and interactions between social and ecological systems, including conflict prevention and management of biodiversity. Biosphere reserves are nominated by national governments and remain under the sovereign jurisdiction of the states where they are located. Their status is internationally recognized. There are 701 biosphere reserves in 124 countries, including 21 transboundary sites.Biosphere reserves have three interrelated zones that aim to fulfil three complementary and mutually reinforcing functions:

- The core area(s) comprises a strictly protected ecosystem that contributes to the conservation of landscapes, ecosystems, species and genetic variation.
- The buffer zone surrounds or adjoins the core areas, and is used for activities compatible with sound ecological practices that can reinforce scientific research, monitoring, training and education.
- The transition area is the part of the reserve where the greatest activity is allowed, fostering economic and human development that is socio-culturally and ecologically sustainable.

The Indian government has established 18 biosphere reserves in India. Biosphere reserves of India

SACRED GROVES

"Segment of landscape , containing vegetation , life forms and geographical features, delimited and protected by human societies under the belief that to keep them in a relatively undisturbed state is expression of an important relationship of humans with the divine or with nature."

(Hughes and Chandra,1998)

SACRED GROVES OF INDIA

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