

The LNM Institute of Information Technology

# BIODIVERSITY



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# WHAT IS BIODIVERSITY ?

Biodiversity is defined as “the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species , between species and of ecosystems.”

The importance of this definition is that it draws attention to the many dimensions of biodiversity. It explicitly recognizes that every biota can be characterized by its taxonomic, ecological, and genetic diversity and that the way these dimensions of diversity vary over space and time is a key feature of biodiversity.

**Biodiversity includes all ecosystems—managed or unmanaged.**

Sometimes biodiversity is presumed to be a relevant feature of

only unmanaged ecosystems, such as wildlands, nature preserves, or national parks. This is incorrect. Managed systems—be they plantations, farms, croplands, aquaculture sites, rangelands, or even urban parks and urban ecosystems—have their own biodiversity. Given that cultivated systems alone now account for more than 24% of Earth's terrestrial surface, it is critical that any decision concerning biodiversity or ecosystem services address the maintenance of biodiversity in these largely anthropogenic systems .

## **How can we conserve biodiversity ?**

- Restoration of Biodiversity
- Imparting Environmental Education
- Use environmentally friendly cleaning products
- Population Control
- Reviewing the agriculture practice
- Controlling Urbanization

- Control over pollution.
- Conservation through Biotechnology
- Buying organic helps reduce the impacts of fertilizers and chemicals which can be extremely harmful to a range of organisms – particularly aquatic species. Lower chemical use translates to healthier ecosystems, and therefore greater biodiversity.
- Take the most environmentally friendly form of transport. This may mean walking or cycling instead of driving, or it may mean car-pooling with your neighbours or friends. Do whatever you can. This will help biodiversity in two ways: it will reduce fossil fuel consumption, which will in turn reduce the harmful impacts of fossil fuel extraction. It will also reduce greenhouse gas emission and the effects of climate change.
- Avoid eating endangered species such as Bluefin tuna, and look for the MSC (Marine Stewardship Council) logo. A lot of seafood is illegally caught or is fished from an unsustainable fishery. It is estimated that around 75% of the planets fisheries are currently fully or over-exploited<sup>5</sup>.

- In poorer countries, environmental regulations often don't exist or are badly enforced. Whether you're returning from an overseas holiday or buying gifts in your local store, be aware of what products are made of. Touristic souvenirs are often made from the by-products of endangered animals, and buying these things will encourage the killing of more of these creatures<sup>5</sup>.
- According to recent studies, meat consumption is one of the most powerful negative forces impacting biodiversity conservation in the modern world. Livestock production usually involves heavy fertilizer and chemical use, land degradation, and the hunting of competitor or 'pest' species – think dingos in Australia, which are often shot because they hunt sheep<sup>6</sup>.

## CAUSES OF MAN-ANIMAL CONFLICTS:

### **I. Habitat shrinking :**

Causes less space, food etc in the forest result in animals stray out of habitat in search of food, water or shelter. Construction of roads especially big Highways and canals passing through dense

jungles and the big mines are some of the reason for habitat shrinking.**Habitat destruction** is the process in which natural habitat is rendered unable to support the species present. In this process, the organisms that previously used the site are displaced or destroyed, reducing biodiversity. Habitat destruction by human activity is mainly for the purpose of harvesting natural resources for industry production and urbanization. Clearing habitats for agriculture is the principal cause of habitat destruction. Other important causes of habitat destruction include mining, logging, trawling and urban sprawl. Habitat destruction is currently ranked as the primary cause of species extinction worldwide. It is a process of natural environmental change that may be caused by habitat fragmentation, geological processes, climate change or by human activities such as the introduction of invasive species, ecosystem nutrient depletion, and other human activities.

The terms **habitat loss** and **habitat reduction** are also used in a wider sense, including loss of habitat from other factors, such as water and noise pollution.

## II. Invasion of local people in forest area :

Invasion of local people in forest area has increased the pressure on the limited natural resources in the forest areas.

### **III. Water scarcity :**

Water scarcity is the lack of sufficient available water resources to meet the demands of water usage within a region. It already affects every continent and around 2.8 billion people around the world at least one month out of every year. More than 1.2 billion people lack access to clean drinking water.

The livestock and wild animals have to share the limited water sources on the fringes or inside forest.

### **IV. Animal Gazing :**

The crops like paddy, sugarcane, banana, pulses and vegetables etc are badly damaged mostly by wild boars, deer and blue bulls in this area which raid into the crops frequently leaving the owner farmers crying and cursing.

## **WAYS TO REDUCE CONFLICTS:**

- 1) Train police and forest department staff.
- 2) Aware people.

3) Constructing fence/wall to prevent wild animal attack.

4) Movement of animals can also be tracked through GPS.

## **National Parks and Sanctuaries**

A national park is a park in use for conservation purposes. Often it is a reserve of natural, semi-natural, or developed land that a sovereign state declares or owns. Although individual nations designate their own national parks differently, there is a common idea: the conservation of 'wild nature' for posterity and as a symbol of national pride.

A wildlife sanctuary, is a naturally occurring sanctuary, such as an island, that provides protection for species from hunting, predation, competition or poaching; it is a protected area, a geographic territory within which wildlife is protected. Such wildlife refuges are generally officially designated territories.



**There are about 89 national parks in India. Some of them are:**

- Kaziranga sanctuary
- Manas sanctuary
- Kelameru bird sanctuary
- Dachigam sanctuary
- Bandipur sanctuary
- Periyar sanctuary
- Kanha National Park
- Simlipal National Park
- Bharatpur bird sanctuary
- Corbett National Park
- Jaldapara sanctuary

## **SANCTUARIES**

A wildlife sanctuary, is a naturally occurring sanctuary, such as an island, that provides protection for species from hunting, predation, competition or poaching; it is a protected area, a geographic territory within which wildlife is protected. Such wildlife refuges are generally officially designated territories.

These are the areas where only wild animals (fauna) are present. The activities like harvesting of timbers, collection of forest products, cultivation of lands etc. are permitted as long as these do not interfere with the project. That is, controlled biotic interference is permitted in sanctuaries, which allows visiting of

tourists for recreation.

## **Some of the Sanctuaries are :**

- (i) Nandankanan Zoological Park
- (ii) Chandaka Elephant reserve
- (iii) Simlipal Tiger Reserve
- (iv) Bhitarkanika Wildlife Sanctuary
- (v) Gharial project at Tikarpada
- (vi) Chilika (Nalaban) Sanctuary

## **EX-SITU CONSERVATION:**

Ex-situ conservation involves maintenance and breeding of endangered plants and animals under partially or wholly controlled conditions in specific areas like zoo, gardens, nurseries etc. That is, the conservation of selected plants and animals in selected areas outside their natural habitat is known as ex-situ conservation.

The stresses on living organisms due to competition for food, water, space etc. can be avoided by ex-situ conservation thereby providing conditions necessary for a secure life and breeding.

**Some important areas under these conservation are:**

- (i) Seed gene bank,
- (ii) Field gene bank;
- (iii) Botanical gardens ;

## **IN-SITU CONSERVATION:**

Refers to conservation of ecosystems and natural habitats including maintenance and recovery of viable populations of species in their natural habitats. National parks and game reserves - These are different from zoological gardens and are established on terrestrial and aquatic ecosystems with the objective to preserve wildlife that cannot co-exist with human beings and human activities. National parks are under the jurisdiction of central government while game reserves are managed by the local county council

# BIODIVERSITY SEED BANKS IN INDIA

Our food and livelihood security depend on the sustained management of diverse biological resources that are economically important. The conservation of biodiversity in crop production systems is inherently linked to sustainable use and preservation, since the particular plant species would have been cultivated and nurtured for centuries.

Biodiversity is defined as the variety or differences in the living organisms on earth. It could mean differences in genetics, species, or in the ecosystem. All living organisms on the land, water and in air have their own diversity. Being the seventh largest country in the world, India is naturally major hub for biodiversity. Two of the 18 biodiversity hotspots in the world – the Himalayas and the Western Ghats – are present in the country. According to MoEF Report (1999), the country is estimated to have 49,219 plant species and 81,251 animal species, representing 12.5% of the world's flora and 6.6% of its fauna.

Agricultural biodiversity or agro-biodiversity is subset of biodiversity that has resulted from the natural selection processes and inventive developments of farming, herding and fishing by human over millennia. It consists of the diversity of genetic varieties, breeds and species used for food, fodder, fiber, fuel and pharmaceuticals. It also includes the diversity of non-harvested species that support production such as soil micro-organisms, predators, pollinators), as well as those in the wider environment that support agro-ecosystems.

Agro biodiversity plays an important role in agriculture, so local knowledge and culture can be considered as integral parts of agrobiodiversity, because it is the human activity of agriculture that shapes and conserves this biodiversity.

**Agro-biodiversity can be divided into two categories:**

- Intraspecific diversity covers the genetic variety within a single species – such as different subspecies of rice, Basmati rice, Thai Jasmine rice, Japanese Mochi rice, Sona Masuri, etc.
- Interspecific diversity refers to the number and types of different species such as potatoes, peppers, lettuce etc.

# Hot Spots:

- Hot spots are the areas with high density of biodiversity or mega

diversity which are most threatened at present.

- OF ALL THE HOT SPOTS IN THE WORLD , MOST OF THEM ARE

LOCATED IN TROPICAL AREAS

- Out of 25 hot spots in world, two are located in India namely North-East Himalayas and Western Ghats.

The hot spots are determined considering four factors:

(i) Degrees of endemism;

(ii) Degree of expectation

(iii) Degrees of threat to habitat due to its degradation and fragmentation and

(iv) Number of Species diversity.

# Biodiversity of India:

As per available data, the varieties of species living on the earth are 1753739. Out of the above species, 134781 are residing in India although surface area of India is 2% of the earth's surface. Wild life Institute of India has divided it into ten biogeographical regions and twenty five biotic provinces.

Biogeographical regions are:

- (i) Trans Himalayas,
- (ii) Gangetic plain,
- (iii) Desert,
- (iv) Semi Arid zone;
- (v) Western Ghats;
- (vi) Deccan peninsula,
- (vii) North eastern zone,
- (viii) Coastal lands
- (ix) Himalayas
- (x) Islands.

# Extinctions: The End of Biodiversity

## **What is extinction?**

- Extinctions occur when the last individual of a species dies out.
- Functional Extinctions occur when individuals remain but the odds of sustainable reproduction are low i.e. the species is effectively extinct even though individuals remain.



# When do extinctions occur?

- Extinctions occur when the environment of a species changes faster than the species can adapt.
  - In other words, a species' adaptations are no longer sufficient in allowing that species to acquire and compete for resources.
- Extinctions can be local, widespread, or global.
  - For example, the timber wolf was until recently extinct in Wisconsin but not in Minnesota
  - Wild elk and woodland caribou are now extinct in Wisconsin but may be found on game farms.

# Extinctions are natural.

- Extinctions occur naturally.
- Nearly all of the species that have existed on earth have gone extinct.
- There have been 5 major mass extinctions in geological history.
- Recovery from these events took millions of years.

## Modern Causes of Extinctions

- Major current causes of extinctions include:
  - Habitat Loss: fragmentation, degradation, and outright destruction of ecosystems that support native ecosystems (leading cause).
  - Invasive Species: the introduction or overpopulation of species that over-consume

natural resources and are uncontrolled by predators (second leading cause).

- Over-harvesting: the removal of species at rates that exceed reproduction
- Pollution: introduction of harmful agents that reduce the effectiveness of a species' adaptations

## EFFECTS ON SPECIES

### AMPHIBIANS

No group of animals has a higher rate of endangerment than amphibians. Scientists estimate that a third or more of all the roughly 6,300 known species of amphibians are at risk of extinction . The current amphibian extinction rate may range from 25,039 to 45,474 times the background extinction rate.

Frogs, toads, and salamanders are disappearing because of habitat loss, water and air pollution, climate change, ultraviolet light exposure, introduced exotic species, and disease. Because of

their sensitivity to environmental changes, vanishing amphibians should be viewed as the canary in the global coal mine, signaling subtle yet radical ecosystem changes that could ultimately claim many other species, including humans.

## FISH

Increasing demand for water, the damming of rivers throughout the world, the dumping and accumulation of various pollutants, and invasive species make aquatic ecosystems some of the most threatened on the planet; thus, it's not surprising that there are many fish species that are endangered in both freshwater and marine habitats.

The American Fisheries Society identified 700 species of freshwater or anadromous fish in North America as being imperiled, amounting to 39 percent of all such fish on the continent . In North American marine waters, at least 82 fish species are imperiled. Across the globe, 1,851 species of fish — 21

percent of all fish species evaluated — were deemed at risk of extinction by the IUCN in 2010, including more than a third of sharks and rays.

## INVERTEBRATES

Invertebrates, from butterflies to mollusks to earthworms to corals, are vastly diverse — and though no one knows just how many invertebrate species exist, they're estimated to account for about 97 percent of the total species of animals on Earth . Of the 1.3 million known invertebrate species, the IUCN has evaluated about 9,526 species, with about 30 percent of the species evaluated at risk of extinction. Freshwater invertebrates are severely threatened by water pollution, groundwater withdrawal, and water projects, while a large number of invertebrates of notable scientific significance have become either endangered or extinct due to deforestation, especially because of the rapid destruction of tropical rainforests. In the ocean, reef-building corals are declining at an alarming rate: 2008's first-ever

comprehensive global assessment of these animals revealed that a third of reef-building corals are threatened.

## MAMMALS

Perhaps one of the most striking elements of the present extinction crisis is the fact that the majority of our closest relatives — the primates — are severely endangered. About 90 percent of primates — the group that contains monkeys, lemurs, lorises, galagos, tarsiers, and apes (as well as humans) — live in tropical forests, which are fast disappearing. The IUCN estimates that almost 50 percent of the world's primate species are at risk of extinction. Overall, the IUCN estimates that half the globe's 5,491 known mammals are declining in population and a fifth are clearly at risk of disappearing forever with no less than 1,131 mammals across the globe classified as endangered, threatened, or vulnerable. In addition to primates, marine mammals — including several species of whales, dolphins, and porpoises —

are among those mammals slipping most quickly toward extinction.

## PLANTS

Through photosynthesis, plants provide the oxygen we breathe and the food we eat and are thus the foundation of most life on Earth. They're also the source of a majority of medicines in use today. Of the more than 300,000 known species of plants, the IUCN has evaluated only 12,914 species, finding that about 68 percent of evaluated plant species are threatened with extinction.

Unlike animals, plants can't readily move as their habitat is destroyed, making them particularly vulnerable to extinction. Indeed, one study found that habitat destruction leads to an "extinction debt," whereby plants that appear dominant will disappear over time because they aren't able to disperse to new habitat patches . Global warming is likely to substantially exacerbate this problem. Already, scientists say, warming temperatures are causing quick and dramatic changes in the

range and distribution of plants around the world. With plants making up the backbone of ecosystems and the base of the food chain, that's very bad news for all species, which depend on plants for food, shelter, and survival.

## REPTILES

Globally, 21 percent of the total evaluated reptiles in the world are deemed endangered or vulnerable to extinction by the IUCN — 594 species — while in the United States, 32 reptile species are at risk, about 9 percent of the total. Island reptile species have been dealt the hardest blow, with at least 28 island reptiles having died out since 1600. But scientists say that island-style extinctions are creeping onto the mainlands because human activities fragment continental habitats, creating “virtual islands” as they isolate species from one another, preventing interbreeding and hindering populations' health. The main threats to reptiles are habitat destruction and the invasion of



nonnative species, which prey on reptiles and compete with them for habitat and food.

## BIRDS

- “Of about 6 to 10 million currently existing species, we have still only identified 1 million.”
- “For groups that we know well, knowledge of very recent species extinctions...allows us to be certain that **extinction rates are comparable to those of the great past extinctions.**”
- “For birds, of about 10,000 species worldwide
  - at least 128 have disappeared in the last 500 years
  - about 1,200 are currently seriously threatened with extinction (all but three from human activities)”

- The dodo was a bird endemic to the Indian Ocean island of Mauritius.
- It stood about a metre (3.3 feet) tall, weighing about 20 kilograms (44 lb).
- The dodo was first mentioned by Dutch sailors in 1598.
- By 1681, all dodos had been killed by hungry sailors or their domesticated animals.
- The extinction of the bird, within 80 years of its discovery, made people realize that humans could induce the extinction of plants and animals.

## Biodiversity & Medicine

- More than a quarter of all prescriptions written annually in the United States contain chemicals discovered in plants and animals.
- A few hundred wild species have stocked our pharmacies with antibiotics, anticancer agents, painkillers, and blood thinners.
- We have only discovered 10-20% of living species so far!

## Biodiversity & Agriculture

- There are almost 80,000 species of edible plants
- Fewer than 20 produce 90 percent of the world's food.
  - 4 crops (wheat, corn, rice, soybeans) provide most of the world's food.
- If underutilized species are conserved, they could help to feed growing populations.

## Biodiversity & Crops

- During the 1970s the U.S. corn crop was almost completely wiped out by a leaf fungus.
- The corn crop was saved by interbreeding it with a rare species of wild corn from Mexico.

- Genetic engineering may also offer some hope by facilitating transfer of genes between species.
  - This increases the value of wild strains which can be used as sources for new traits to be introduced into crops.

## Biodiversity & Ecosystem Services

- Ecosystem services include air and water purification, detoxification and decomposition of wastes, climate regulation, regeneration of soil fertility, and the production and maintenance of biological diversity.
- These are the key ingredients of our agricultural, pharmaceutical, and industrial enterprises.

- Such services are estimated to be worth trillions of dollars annually.
  - We get these services for free...for now.