

- Turn off lights and fans as soon as you leave the room.
- Use tube lights and energy efficient bulbs that save energy rather than bulbs. A 40- watt tube light gives as much light as a 100 watt bulb.
- Keep the bulbs and tubes clean. Dust on tubes and bulbs decreases lighting levels by 20 to 30 percent.
- Switch off the television or radio as soon as the program of interest is over.
- A pressure cooker can save up to 75 percent of energy required for cooking. It is also faster.
- Keeping the vessel covered with a lid during cooking, helps to cook faster, thus saving energy.

Water conservation:

- Keep taps closed when brushing teeth and taking a bath
- Use drip and sprinkler type of irrigation in agricultural fields
- Practice rain water harvesting techniques
- Reuse the waste water from kitchens and bath for garden use

Soil conservation:

- Do not cut trees and induce soil erosion
- Practice contour farming, agro forestry and strip cropping
- Practice no till farming for less soil disturbance
- Avoid over use of fertilizers, pesticides and water logged conditions
- Use organic fertilizers and vermicompost
- Practice integrated pest management practices



World Earth day- April 22nd

Biodiversity

The word biodiversity refers to the variety of living organisms (flora and fauna). Biodiversity or Biological diversity is defined as the variability among all living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and ecological complexes of which they are part. Wilson, 1988 defined 'Biological diversity' or 'biodiversity' as that part of nature which includes the differences in genes among the individuals of a species, the variety and richness of all the plant and animal species at different scales in space i.e. local, regional, country wise and global, and various types of ecosystems- both terrestrial and aquatic-within a defined area.

Types of Biodiversity:

Biological diversity deals with the degree of nature's variety in the biosphere. This variety can be observed at three levels *i.e.*, genetic, species and ecosystem.

Genetic diversity: Genetic diversity refers to the variation at the level of individual genes. Tremendous amount of genetic diversity exists within individual species. This genetic variability is responsible for the different characters in species. Genetic diversity is the raw material from which new species arise through evolution. Today, the genetic diversity is made use to breed new crop varieties, disease resistant crops.

Species diversity The number of species of plants and animals that are present in a region constitutes its species diversity. This diversity is seen both in natural ecosystem and in agricultural ecosystem. Some areas are richer in species than others. For example, natural undisturbed tropical forests have much greater species richness than mono culture plantations developed by the forest department for timber products. A natural forest ecosystem provides large number of non-timber forest products that local people depend on such as fruits, fuel, wood, fodder, fiber, gum, resin and medicines. Timber plantations do not provide the large variety of goods that are essential for local consumption. Modern intensive agro ecosystem have a relatively lower density of crops than traditional agro-pastoral farming systems, where multiple crops were planted.

Areas that are rich in species diversity are called 'hotspots' of diversity and the countries with highest species richness or have a relatively large proportion of these hot spots of diversity are referred to as 'megadiversity nations'. India is among the world's 15 nations that are exceptionally rich in species diversity. The earth's biodiversity is distributed in specific ecological regions. There are over a thousand major eco-regions in the world. Of these, 200 are said to be the richest, rarest and most distinctive natural areas. These areas are referred to as the Global 200. It has been estimated that 50,000 endemic plants which comprise 20% of global plant life, probably occur in only 25 'hot spots' in the world. These hotspots harbor many rare and endangered species. Two criteria help in defining hotspots namely rich endemism and the degree of threat. To qualify as hotspots an area must contain at least 0.5 per cent or 1500 of the worlds 3,00,000 plants species as endemics (Myers *et al.*, 2000).

Ecosystem diversity:

There are a large variety of different ecosystem on earth, each having their own complement of distinctive inter linked species based on differences in the habitat. Ecosystem diversity can be described for a specific geographical region or a political entity such as a country, a state or a taluk. Distinctive ecosystems include landscapes like forests, grasslands, deserts, mountains *etc* as well as aquatic ecosystems like rivers, lakes and seas. Each region also has man-modified areas such as farmland or grazing pastures. It refers to the variation in the structure and functions of the ecosystem. It describes the number of niches, trophic levels and various ecological processes that sustain energy flow, food webs and the recycling of nutrients. It has focus on various biotic interactions

and the role and functions of **keystone species** (species determining the ability of large number of other species to persist in the community).

Methods of measuring Biodiversity:

There are three perspectives measuring of diversity at the level of community. These are (i) Alpha diversity, (ii) beta diversity and (iii) gamma diversity. Community diversity refers to the variations in the biological communities in which species live.

(i) **Alpha diversity** indicates diversity within the community. It refers to the diversity of organisms sharing the same community or habitat. A combination of species richness and equitability / evenness is used to represent diversity within a community or habitat.

(ii) **Beta diversity** indicates diversity between communities. Species frequently change when habitat or community changes. There are differences in species composition of communities along environmental gradients, *e.g.*, altitudinal gradient, moisture gradient, etc. the higher heterogeneity in the habitats in a region or greater dissimilarity between communities exhibit higher beta diversity.

(iii) **Gamma diversity** refers to the diversity of the habitats over the total land scope or geographical area. The sum of alpha and beta diversities of the ecosystems is an expression of the biodiversity of landscape, which is considered as Gamma Diversity.

Higher diversity at community level provides stability and higher productivity. In temperate grasslands, it has been observed that diverse communities are functionally more productive and stable, even under environmental stresses such as prolonged dry conditions.

Biogeographic Classification of India

Our country can be divided into ten major regions based on the geography, climate and pattern of vegetation seen and the communities of mammals, birds, reptiles, amphibians, insects and other invertebrates that live in them. Each of these regions contain a variety of ecosystems such as forests, grass lands, lakes, rivers, mountains and hills which have specific plant and animals species.

India's Biogeographic Zones:

1. The cold mountainous snow covered Trans-Himalayan region of Ladakh
2. The Himalayan ranges and valleys of Kashmir, Himachal Pradesh, Uttarakhand, Assam and other North eastern States.
3. The *Terai*, the low land where the Himalayan rivers flow into the plains
4. The Gangetic and Brahmaputra plains.
5. The Thar Desert of Rajasthan
6. The semi-arid grassland region of the Deccan plateau, Gujarat, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu
7. The North eastern States of India

8. The Western Ghats in Maharastra, Karnataka and Kerala
9. The Andaman and Nicobar Islands
10. The long western and eastern coastal belt with sandy beaches, forests and mangroves.

Threats to Biodiversity: *Habitat loss is mainly due to human population growth, industrialization and changes in the land use patterns, poaching of wild life and man wildlife conflicts.* Man has begin to overuse or misuse most of these natural ecosystems. Due to unsustainable resource-use, once productive forests and grasslands have been turned into deserts and wastelands have increased all over world. Scientists have estimated that human activities are likely to eliminate approximately 10 million species by the year 2050.

1) Human population growth, industrialization and changes in the land use patterns:

Around 1.8 million species of plants and animals are known to science. The actual number of species have been existing is $>10 \times 1.8$ millions. Though new species have been continually identified, the rate of extinction is very high (10-20,000 species per year *i.e.*, 1000 to 10,000 times faster rate). Human actions are expected to exterminate 25% of world's species in next 20-30 years. The mega extinction spasm is related to human population growth, industrialization and changes in the land use patterns in India. The reasons are:

- i Forests and grasslands are changed to agricultural land. Encroachments are being repeatedly legalized.
- ii Natural wetlands are drained to establish crop lands leading to loss of aquatic species.
- iii Mangroves have been cleared for fuel wood and prawn farming, which has led to decrease in the habitat essential for breeding of marine fish.
- iv Grasslands are changed to other forms, degraded by overgrazing. Loss to cattle, goat and sheep.
- v Natural forests are being deforested for timber and replanted for teak, sal *etc.* Such monoculture does not support biodiversity as in forests which has closed canopy and rich undergrowth. Excess collection of fire wood by lopping of branches of trees canopy is opened up altering the local biodiversity.
- vi Foraging cattle retard regeneration of forest as young seedlings are trampled.
- vii Ever increasing population gradually decrease buffer zones and forested areas. A prime example is Gir national park, the last bastion of Asiatic lion with a meter gauge railway line, state expressway and 3 temples.
- viii Repeated fires by local grazers to increase growth of grass ultimately reduce regeneration of grasses.

- ix Introductions of exotic weeds *eg.* lantana bushes, *Eupatorium* shrubs and ‘congress’ grass are invading at the expense of indigenous undergrowth species. Following traditional farming techniques like slash and burn in Himalayas, and *rab*, lopping of tree branches for making wood ash fertilizer in Western ghats are now leading to loss of biodiversity.
- x Over harvesting of fish by large trawling boats is leading to depletion of fish stocks. Marine turtles caught in the net are massacred off the coast of Orissa. The rare whale shark, a highly endangered species, is being killed off the coast of Gujarat.

2) Poaching: Specific threats to certain animals are related to large economic benefits. The skin and bones from tigers, ivory from elephants, horns from rhinos and perfume from the musk deer are extensively used abroad. Bears are killed for their gall bladders. Corals and shells are also collected for export or sold on the beaches of Chennai, Kanyakumari and the Andaman and Nicobar islands. Tortoises, exotic birds and other small animals are packed into tiny containers and smuggled abroad for the pet trade. A variety of wild plants with real or sometimes, dubious medicinal values are being over-harvested. The commonly collected plants include *Rauwolfia*, *Nux vomica*, *Datura*, *etc.* The garden plants collected for illegal trade include orchids, ferns and mosses.

3) Man wild life conflicts: Conflicting situations with wild life starts causing immense damage and danger to man. *Ex:* In Sambalpur, Orissa 195 humans are killed in last 5 years by elephants and in retaliation villagers killed 98 elephants and badly injured more than 30 elephants. Similarly incidents with tigers, leopards *etc.* are in news. Shrinking forest cover, human encroachment, ill and weak animals, lack of food (one adult elephant needs 200 kg green fodder and 150 kg of clean water) for animals, protecting villagers by putting electric fence are the main reasons for such happenings. As the compensation by government is not enough, conflicts occur between forest department and villagers.



Endangered & endemic species in India

Several species of plants and animals have been endangered due to human activities. The Species whose existence is in danger by human activities are called

endangered species. These endangered species have been categorized into four viz, 1) Vulnerable 2) Rare 3) Intermediate 4) Threatened. Endangered species which are on verge of extinction are called *threatened species*. Most of the endangered species are found today only in protected areas (PAs). Some eg of the species being Tiger, rhino, elephant; bird species include Siberian crane, great Indian bustard, Florican, vultures; reptiles and amphibians. Habitat loss caused by human activity is causing threat to plants species like orchids. Over harvesting as ingredients in medical products or cosmetics is also threatening species. To protect endangered species India has created a wildlife protection act. Under this plants and animals are characterized according to threat to their survival.

The species which are unique to a locality/region are called **endemic species**. Some species are found only in India and are thus endemic (restricted to our country). Some have very localized distribution and are considered highly endemic. Some species of this category being Indian wild ass, angular kashmiri stag, golden langur, pigmyhog.

Conservation of biodiversity: is of two types i.e., *In situ* and *Ex situ*

***In situ* conservation:** Conserving a species in its own environment by creating national parks and wildlife sanctuaries. Habit is protected with all the other spp that in it in nature Biodiversity at all levels can be best preserved *in situ* by setting aside wilderness as protected areas (in national parks and wildlife sanctuaries) with distinctive ecosystem included in the network. Such net work preserve the total diversity of life of the region. Biologists view point is to deal with areas which are 1) Species rich 2) Rare /threatened/endangered species / endemic species are found should be given imp as there spp would easily become extinct due to human activity. For eg. Elephants utilize open grasslands after the rains (when it is nutritious) but move into forest to feed on foliage in dry season. Hence a PA for elephant must be large to include a diverse habitat that supports a complete complement of interlinked species.

India has 589 PAs of which 89 are national parks and 500 are wildlife sanctuaries. Over 100 PAs are created in Andaman and Nicobar to preserve the special island ecosystem. The great Himalayan national park is the largest sanctuaries in the ecosystem and is the home of snow leopard. Dachigam sanctuary for hangul or kashmiri stag; Kaziranga national park for animals like elephant, guar, wild boar and swamp deer, and birds like ducks geese, pelicans and storks; Manas sanctuary for Golden langur, pigmy hog and wild boar are some of the examples worth mentioning under *in situ* conservation.

***Ex situ* conservation:** Conserving the species outside the natural habitat in a carefully controlled situation, such as botanical garden for plants or zoological parks for animals, expertise exists to multiply species under artificially managed condition. Gemplasm is preserved in a gene bank for future need, this is taken up for expensive endangered /extinct species. Care is taken to avoid inbreeding such that weak offspring would not develop. Breeding programmes in zoos provide animal needs including enclosures that

simulate their wild habitat. Modern zoo's function is to breed endangered species as a conservation. Successful examples are

1. Madras crocodile trust bank has successfully bred the 3 crocodiles. Here crocodiles lay two clutches of eggs in one year instead of one in wild .
2. Guchali zoo has bred pigmy hog
3. Delhi zoo has bred the rare Manipur brow antlered deer.

The successful breeding programme also aims at reintroduction of the species into wild habitat, with simultaneous removal of problems like poaching disturbances and man made influences.

Conservation of cultivars and livestock breeds:

Fifty years ago nearly 30,000 rice var. were grown in India now only a few of these are cultivated. The new varieties being developed use the germplasm of these original types. But if all these traditional types vanish, it would be difficult to develop new disease resistant varieties for future. Use of varieties from gene banks have been expensive and risky. Farmers need to be encouraged to grow traditional varieties. This is a concern for future of mankind. Gene banks have at present 34,000 cereals and 2200 pulses). Traditional breeds/ varieties have to be encouraged for genetic variability. In contrast men interested in cash returns in short time wouldn't appreciate the benefits of growing indigenous varieties.

Biological Diversity act 2002:

Biological diversity is a national asset of a country, hence the conservation of biodiversity assumes greater significance. The first attempt to bring the biodiversity into the legal frame work was made by way of the biodiversity bill 2000 which was passed by the Lok sabha on 2nd December 2002 and by Rajya Sabha on the December 2002.

Objectives of the act:

1. To conserve the Biological Diversity
2. Sustainable use of the components of biodiversity
3. Fair and equitable sharing of benefits arising out of the use of the B.D

A national biodiversity authority has been established by the Biodiversity Act 2002 to regulate act implementing rules 2004 has been operationalised since coming in to force.

Act: Regulating access well as pushing the officially sponsored documentation of biological resources and traditional practices through people's diversity registers at the local and data bases at the national levels, respectively. It further probes the extent to which the principles of conservation have realized.

Provisions of Act.

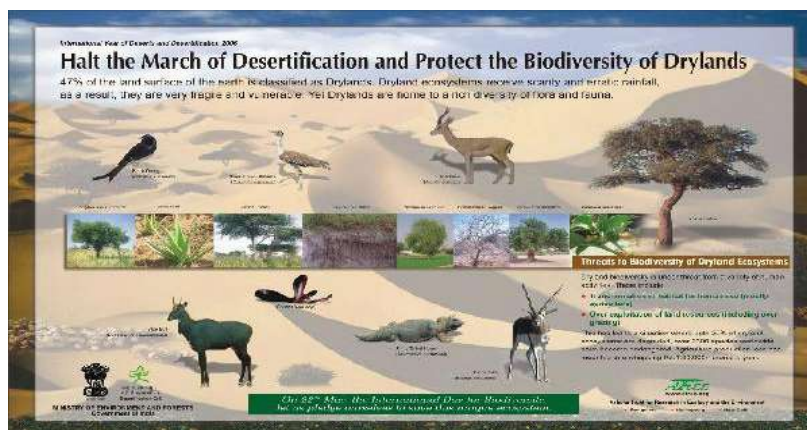
1. Prohibition on transfer of Indian genetic material outside the country without specific approval of the Indian Government

2. Prohibition of anyone claiming an (IPR) such as a patent over biodiversity or related knowledge without permission of Indian Government.
3. Regulation of collection and use of biodiversity by Indian national while exempting local communities from such restrictions
4. Measures from sharing of benefits from use of biodiversity including transfer of technology, monetary returns, joint research and development, joint IPR ownership etc.
5. Measures to conserve sustainable use of biological resources including habitat and species protection (EIP) of projects, integration of biodiversity into the plans and policies of various Departments and Sectors.
6. Provisions for local communities to have a say in the use of their resources and knowledge and to charge fees for this
7. Protection of indigenous or traditional laws such as registration of such knowledge
8. Regulation of the use of the genetically modified organisms
9. Setting up of National, state and local Biodiversity funds to be used to support conservation and benefit sharing
10. Setting up of Biodiversity Management committees (BMC) at local village levels, State Biodiversity Boards at state level and National Biodiversity Authority.

Functions of Authority:

1. Advise the central Government on any matter concerning conservation of biodiversity sustainable use of its components and fair and equitable sharing of benefits arising out of the use of biological resource and knowledge
2. Coordinate the activities of state biodiversity
3. Provide the technical assistance and guidance to the state biodiversity boards
4. Sponsor investigation and research
5. Engage consultants for a specific period not exceeding 3 years for providing technical assistance to the Authority in the effective discharges of its functions.
6. Collect, compile and publish technical and statistical data, manuals, codes or guides relating to conservation of biodiversity, sustainable use of its components and fair and equitable sharing of benefits arising out of the use of biological resource and knowledge's
7. Organize through mass media a comprehensive programme regarding conservation of biodiversity, sustainable use of components and fair and equitable sharing of benefits arising out of the use of biological resources and knowledge.
8. Plan and organize training of personnel engaged or likely to be engaged in programmes for the conservation of biodiversity and sustainable use of its components

9. Prepare the annual budget of the authority including its own receipts as also the devaluation from the central Government provided that the allocation by the central government shall be operated in accordance with budget provisions approved by the central govt.
10. Recommend creation of posts to the central Government for effective discharge of the functions by the authority.
11. Approve the method of recruitment to the officers and servants of the authority.
12. Take steps to build up data base and to create information and documentation system for biological resources and associated traditional knowledge through biodiversity register and electronic data bases to ensure effective management, promotion and sustainable uses.
13. Give directions to state Biodiversity Boards and the Biodiversity Management Committees in writing for effective implementation of the act.
14. Report to the central Government about the functioning of the Authority and implementation of the Act
15. Sanction grants to the State Biodiversity Board and Biodiversity Management committees for specific purposes.
16. Take necessary measures including appointment of legal experts to oppose grant of intellectual property right in any country outside india on any biological outside India on any biological resource and associated knowledge obtained from India and in an illegal manner.
17. Do such other functions as may be assigned or directed by the central government from time to time
18. Regulates the commercial utilization or biosurvey and bio-utilization of any biological resource by Indians.



International day for Biological Diversity - 22nd May

POLLUTION

Pollution is derived from Latin word ‘polluere’ which means ‘to contaminate’ any feature of environment. Pollution is the effect of undesirable changes in our surroundings