

# Conservation of biodiversity essay



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With all the existing knowledge, Earth is like no other place in the entire universe. For among the countless stars, moons, asteroids, and other bodies arrayed across the vastness of outer space, only our tiny planet is known to support life. And some form of life is everywhere: on the slopes of high mountains and on the floors of the oceans, in scorching deserts and at the frigid poles. Life in enormously different shapes and sizes, from the giant blue whales and redwoods to butterflies and microbes is present everywhere. This is what is known as the ' biodiversity'. Biodiversity measures the vast variety of life in the earth and it is an indicator of the overall health of our planet. Because if some forms of life fail to survive and become extinct, it is a pointer to the environment becoming hostile towards those forms of life. To date, scientists have identified and counted about 1. 4 million species, only a small fraction of the number of species that may have existed once.

Organisms are inter-dependent. One organism can hardly survive without the helping hand from a host of others. For example, Man depends upon other organisms for its various needs and he shares the planet with all others. Without the diverse forms of life, man would not survive. Man gets his food directly or indirectly from plants, animals and other organisms. Man derives direct benefits of biodiversity from the harvest of domesticated or wild species for food, fibres, fuel, medicines and many other purposes. The biodiversity influences climate regulation, water purification, soil formation, flood prevention and nutrient recycling along with innumerable aesthetic and cultural impacts. Biodiversity is thus fundamental for maintaining current and future social and economic livelihoods. The number of species of plants,

animals, and microorganisms, the enormous diversity of genes in these species, the different ecosystems on the planet (deserts, rainforests and coral reefs) is all parts of this biological diversity. Even without much scientific knowledge, people from time immemorial have recognized the importance of biological diversity and have learnt to live in harmony with the nature. Yet, knowingly and unknowingly, man has attacked the biodiversity during the last one hundred years or more and now a large number of species are under tremendous stress.

Species diversity is useful to man in a variety of ways. A large number of species of edible plants is equivalent to giving more variety of crops satisfying diverse food habits. Similarly, a large number of species of animals ensures an appropriately long food chain that sustains the ecosystem. However, human activities are spreading their wings causing massive extinctions species. The cost associated with this is very high and we seldom realize it. The threats to biodiversity can be lessened only through a new model of development that avoids losses to biological diversity. The diversity must be preserved at any cost for the benefit of our future generations and if we cannot do the same, our descendents will never forgive us.

The Biodiversity concept was globally conceived after the publication: *Conserving the World's Biological Diversity* brought out by IUCN (International Union for Conservation of Nature), WWF (World Wildlife Fund), World Research Institute and World Bank.

## **Biodiversity or biological diversity**

The UN Convention on Biological Diversity (1992) defines biodiversity as:

Biodiversity or Biological diversity means the variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part.

Biodiversity is a term used to describe the whole of biological diversity, i. e., all living things: plants, animals, and microorganisms and all their interactions with each other and their environment. The term includes three levels of organization: In simple words Biodiversity means the number of species of plants, animals and micro-organisms occurring in a given habitat or a region, country, continent or the entire globe. Biodiversity includes diversity within species (Genetic diversity), between species (Species diversity) and of ecosystems (Ecosystem diversity).

## **Genetic diversity**

Genes are carriers of hereditary characteristics and each species has a variation of genes. This is what is known as Genetic Diversity. If a species becomes extinct, the genes, which are responsible for the distinctive characters of the species, are also lost forever. The genes may be present in hundreds of different combinations giving rise to different characteristics for individuals within the same species. Thus, all humans belong to the same species ' homo sapiens', yet each man is different from every other man at least in some respects of his physical, psychological and behavioral build-up. These differences from one individual to another reflect different gene-combinations and therefore, a rich genetic diversity. If the number of

individuals of a species is small, genetic variations are less, and eventually, this leads to extinction of the species.

Man has learnt to work with the genetic variations existing in nature. Thus, it has been possible to create high-yielding and newer varieties of rice and other crops, and also animals through suitable combinations of effective genes. Biotechnology and bioengineering have helped man to create these to meet the ever-increasing demand for food and other items. By appropriately mixing genes from wild and domesticated species together, new varieties have been created. Genetic diversity is very rich in nature and scientists have been able to create a 'gene pool' by collecting and preserving gene-combinations from various species

### **Species diversity**

If one goes to a forest and lists all the different animals, birds and plants present, the rich diversity in species is easily observed. If he goes to another forest and does the same thing, the lists now he makes will be different from those made earlier. This represents species diversity from one location to another. Such diversity can be seen in all ecosystems. Any natural ecosystem possesses a much richer species diversity compared to an artificially created ecosystem. For example, a wild forest will have many species of animals and plants compared to a social forestry plantation. Areas where a very large number of different species are naturally found are known as ecological 'hot spots', which need to be conserved. India is recognized as one of 15 countries particularly rich in species diversity.

## **Ecosystem diversity**

Ecosystem diversity represents differences in ecosystem from one geographical location to another. It is observed that each geographical unit (country, state, district, etc.) has its own distinctive ecosystem. One location differs from another with respect to landscape consisting of inhabited or uninhabited land, forests, agricultural land, grassland, rivers, lakes, hills and mountains; human settlements and other factors. Consequently, the ecosystem of one place will have differences from the ecosystem of any other place. Some areas may continue to have a natural ecosystem which has not been disturbed by various human activities while others may have artificial ecosystem such as a park, game sanctuary, etc., which have been built by men for their own pleasure. When natural ecosystems are destroyed by human activities such as through construction of a dam or reservoir, or through installation of an industry or a huge settlement, the ecosystem diversity is affected.

## **Number of species in the world**

It is almost impossible to give the total number of different species living in the earth. We can see only some of the species and the large majority of the species are invisible to us. Again, we can see only those species which are in our close vicinity. Every state, every country has got its own species, both animals and plants and we can hardly expect to know the same. It is a favourite game in the schools to name as many animals as one can, prepare lists of birds and insects, name the vegetables, name the plants that grow in the locality, etc. Even if one aims to enlist all the species (animals – domestic and wild, cattle, pigs, sheep and goats, horses and camels, poultry, birds,

insects, vegetables, fruits, plants – food and non-food species, medicinal plants, herbs, etc.), the lists will be very very big and other people will be able to add more to the lists. It shows the enormity of the number of species. When one takes a powerful microscope and looks at the microorganisms, their number will overwhelm the observer.

People also know that the same species cannot be seen all throughout the year. We can see different species in every season. The general idea is that thousands of species can be found in the different ecosystems of the world and any attempt to enlist all the species and give them names would be a stupendous task. The scientists tried to develop a system during the mid-eighteenth century for naming and classifying organisms. A number of explorers from Europe went on long voyages to discover more species in other areas. Two of the best known explorers of those times were Alfred Russell Wallace and Charles Darwin. Wallace and Darwin sailed through the seas and the islands in search hitherto undiscovered species and the people came to know of the unexplored areas and their flora and fauna. Wallace was a British naturalist, who went to South America and to Indonesia for collecting and describing plants and animals not found in Europe. A British geologist, Charles Darwin sailed in a ship, H. M. S. Beagle to South America and collected numerous unknown species of plants and animals in their native habitats. The travels by the two men brought to the fore the rich diversity of life, with respect to both the number and variety of plants and animals on earth.

The explorers have shown that some species could be found only in certain specific locations and thus, the species found in a continent or a sub-

continent differ from those found in another. There are many examples. The one-horn rhino can be found in Assam (India) while Africa has two-horn rhino. The llamas are found in South America, the orangutans in Southeast Asia, and the marine iguanas in the Galapagos Islands only. Some species outlive others and the principle of the survival of the fittest (the natural selection) determines which species dominate. Over the years, the lists of species have grown in length and more and more species have been discovered.

Scientists assume that up to 100 million species may be there in the earth – the large majority still unknown and undiscovered. Only about 1.8 million of the species have been identified, classified and documented so far. It is also possible that a large number of species will simply vanish from the earth without being identified. Humans are just one species out of the millions.

Each species has well-defined characteristics and this fact was recognized long ago by the founder of modern systematics, Carolus Linnaeus, in his magnum opus *Systema Naturae* (1758). The individual characteristics of the species help in their classification and documentation as a distinct species. Biologists today think of species as “groups of interbreeding organisms with distinct morphological, physiological, behavioral, and ecological characteristics, each created in geographic isolation from other similar populations through a long evolutionary process”. This definition clearly shows that the species are dynamic in nature and they can change through time giving rise to hundreds of other forms, each evolving within a few generations.



## **Biogeographical classification of India**

The scientific study of the geographic distribution of plants and animals is known as the Biogeography of a region. This distribution is dependent on geologic history of the region, the climate, soil composition, and the presence of forests, deserts, rivers and water bodies, seas and oceans, hills and mountains, etc. Other important factors are interactions among the species, co-evolutionary influences, and the reproductive and nutritional requirements of plants and animals, etc. A biogeographic region is a large, generally continuous part of the Earth's surface which has a distinctive biotic community. Biogeographic regions are usually defined separately for floral and faunal communities and are largely restricted to the terrestrial areas of the Earth.

India is the seventh largest country in the world and Asia's second largest nation with an area of 3, 287, 263 square km. The Indian mainland stretches from 8° 4' to 37° 6' N latitude and from 68° 7' to 97° 25' E longitude. It has a land frontier of some 15, 200 km and a coastline of 7, 516 km. India's northern frontiers is with Xizang (Tibet) in the Peoples Republic of China, Nepal and Bhutan. In the northwest, India borders with Pakistan; in the northeast, China and Burma; and in the east, Myanmar (Burma). Physically, the massive country is divided into four relatively well-defined regions – the Himalayan Mountains, the Gangetic river plains, the southern (Deccan) plateau, and the islands of Lakshadweep, Andaman and Nicobar. The Himalayas in the far north include some of the highest peaks in the world. The highest mountain in the Indian Himalayas is Kanchenjunga (8586 m), which is located in Sikkim on the border with Nepal. To the south of the main

Himalayan massifs lie the Lesser Himalaya, rising to 3,600–4,600 m, and represented by the Pir Panjal in Kashmir and Dhauladhar in Himachal Pradesh. Further south, flanking the Indo-Gangetic Plain, are the Siwaliks, which rise to 900–1,500 m. The southern peninsula extends into the tropical waters of the Indian Ocean with the Bay of Bengal lying to the southeast and the Arabian Sea to the southwest.

Biogeographically, India is divided into 10 regions as shown in Table 4.1. The biogeographical zones of India along with their subdivisions are also shown in Fig. 4.1 (Source: “Conserving our Biological Wealth”, WWF for Nature-India (modified) and Zoological Survey of India).

### **The values of biodiversity**

People do not realize the true value of biodiversity till some species of plants and animals could no longer be found in his neighbourhood. For example, in a particular region, the coming of spring is associated with the cuckoo's singing. Then suddenly, people fail to hear the cuckoo as the bird has disappeared due to unfriendly environment and may have migrated to far-away regions. Now the people feel the absence of the bird and begin to understand the need for biodiversity.

There is a harmonious bonding between mankind and nature. When this bond is lost, biodiversity is also lost. Thus, biological diversity needs to be conserved by maintaining the appropriate conditions of habitat and physical environment, and by removing the threats against continuous existence of species. If we need some plant and animal species for our use, we must do it by following the principle of sustainable utilization. If a tree has to be cut,

more trees are to be planted. For this, coordination between economic development, population, resources and environment is to be established and the linkages between production, living standards and eco-friendly environment are to be maintained. Conservation measures relate to a rational use of bioresources. The World Summit on Sustainable Development, 2002 (WSSD 2002), held in Johannesburg, South Africa has for the first time called for measures so that loss of biological diversity can be halted.

Protecting biodiversity is in the interest of the people and the world. Over the years, the human civilization has been built around the biological resources and these have acted as the pillars for consolidation, expansion and survival of civilization. The innumerable natural species (both plants and animals) have constituted the base for agriculture, cosmetics, pharmaceuticals, pulp and paper, horticulture, construction and also, waste elimination. The loss of biodiversity seriously affects the food supplies, medicines, conventional and non-conventional energy and reduces the scope for recreation and tourism.

#### Consumptive and productive values

The pleasure and satisfaction the people obtain through use of natural resources is immeasurable. This is the consumptive utilization of natural products or biodiversity, such as firewood, games, vegetables and poultry. A large number of goods are manufactured and from natural sources and are sold in the market – this is the productive value of biodiversity. Wild biological resources are domesticated through modern agriculture, are used in prevention of plant and animal diseases, etc. These impart productive

value to the biodiversity. The consumptive and the productive uses of biodiversity have economic value.

#### Non-consumptive value

The biodiversity has also non-consumptive value. A forest, a hill, a river add to the beauty of a place; flocks of birds returning to their nests in the evening gives an aesthetic value to the place. The animal voices in the night such as the foxes shouting remind the people of the wild nature and gives aesthetic pleasure. All these constitute the non-consumptive value of the biodiversity. There are various other values which we can neither see or realize; for example, the biodiversity of a place helps in maintaining the water resources, prevents water and soil loss, contributes to the genetic development and evolution of bio-system, contributes to climate adjustment and material recycling, etc.

#### Spiritual, ethical and existence values

These values of biodiversity are related to ethics and philosophy. For example, the people attach certain significance to some species of plants and animals and worship them in the belief that their continuous existence is required for man's survival. The people just attach special value to some species and environment which are not to be exploited at any cost because the next generation will benefit from them. Attaching such significance to nature and nature's objects in almost religious or spiritual manner gives similar values to the biodiversity. This type of value helps in building a strong bond between man and nature, and the people feel passion, concern and responsibility for the species.

## Ecological value

Each ecosystem serves some purpose and when the people realize the value of this service, it becomes the ecological value of biodiversity. When we have a large wetland in our neighbourhood, it serves to moderate waterlogging, filters the sediments, purify the water by taking away the excess nutrients and the contaminants, grows aquatic plants to be used as food and medicines, supports aquatic life including fish, etc. When the people realize that the wetland is giving them very important services, it is like attaching ecological value to the wetland which motivates the people to take steps for conservation. A wetland supports lots of biodiversity by acting as spawning and nursery grounds for fish and by providing a habitat to birds and animals. These are ecosystem values. Similarly, a huge forest serves to moderate water table, control extremes of weather, and generates oxygen for human consumption. These services give an ecological value to the forest.

The services that the biological diversity give to humans are:

- Provision of food, fuel and fiber
- Provision of shelter and building materials
- Purification of air and water
- Detoxification and decomposition of wastes
- Stabilization and moderation of the Earth's climate
- Moderation of floods, droughts, temperature extremes and the forces of wind
- Generation and renewal of soil fertility, including nutrient cycling
- Pollination of plants, including many crops

- Control of pests and diseases
- Maintenance of genetic resources as key inputs to crop varieties and
- Livestock breeds, medicines, and other products
- Ability to adapt to change

Each species is part of an ecosystem where it interacts with members of its own and also with other species. There are producers, consumers, decomposers, and many variations of these roles such as competitors, dispersers and pollinators, and more. A species that is seen as relatively unimportant may also have some important role which it is playing unknown to us.

#### Potential value

The potential value of biodiversity is the value which is still not known to people. With the increased need for bio-resources and the decrease in supply, it may be found that some resources which might not have any use long ago may be very useful today or in future. The nature has immense potential to offer – some are already in use, others are in the process of discovery, and many more are yet to be discovered. Over the years, people have found a large number of cures, life-saving medicines from wild plants. In times of an epidemic or a pest outbreak threatening food crops, man has always turned towards nature for solutions, and found the remedies. It is like the diversity of plants and animals having infinite number of cures for our problems. The nature's potential is truly unlimited.

#### Scientific and Educational value

The nature and its intrinsic biodiversity is a limitless laboratory for scientific investigation and research. It has also tremendous learning resources. The uniqueness of each species, its life-cycle, etc. always fascinates the young and the old alike. People from different disciplines, botany, zoology, earth science, chemistry, sociology, anthropology, etc., find enough materials to do research. Everything in nature has also educational value. When one observes how the bees are collecting honey from different flowers and bring them to their home, and how systematically the bees do their work, is a great lesson in social behaviour, collective work, and discipline. When one looks at the ants line up one after another carrying small small food items to their home, it is a very interesting lesson on unity and strength. How the birds feed their young ones from their mouths have also many learning points. These are only a few examples. Everyone can learn from the nature and find out one hundred examples of how and why the nature is a great teacher.

### Intrinsic value

All organisms strive (usually unconsciously and in an evolutionary sense) to achieve certain basic predetermined goals – to grow, to reach maturity and to reproduce. These are called intrinsic values. Intrinsic value of biodiversity is non-anthropocentric i. e. not related to man and his needs.

### Social Value

The social value is related to how the society is deriving different benefits from biodiversity. This value is varied in nature. Some people simply enjoy an interaction with the nature. For example, they like to spend some time in

the bank of a river, or go in a safari to see animals in wild, do some fishing in a lake, or simply visit a naturally beautiful location in a picnic. The satisfaction behind such activities is the social value of biodiversity. Visits to a place of biological diversity have been associated with aesthetic, recreational, cultural and spiritual pleasures. Going for a swim in a river or a lake, or hitchhiking through hills and forests have immense health benefits and therefore, these activities are socially important. It is quite common to have different perceptions about the social values of biodiversity because the young and the old may have different views of nature, and similarly, the urban and the rural dwellers may look at species differently. The social value is therefore not fixed; it may have different meanings to different groups of people and may also change with time.

### Economic Value

When biodiversity is measured in terms of some monetary value and a price is determined, it becomes the economic value of biodiversity. All the above values and the social, educational, recreational benefits drawn from biodiversity can be described in terms of a cost, direct or indirect, and together they will measure the economic value. It is not an easy task to calculate the economic value, but a reasonable estimate may be made in the following way:

- the intrinsic values of the plant species present in the system,
- the intrinsic values of fish and other eatable species which are part of the biodiversity,



- the recreational value of the location including the animal and the birds species,
- the commercial value of any product that goes into the market for use as foodstuff, construction materials, etc.,
- the market value of any material that is used either directly as medicine or is used to manufacture medicines.

There may be many other items of economic value and their monetary values should be added to the above. Appropriate deduction should be made from the estimate to account for the restoration costs of various damages done to the system by human encroachment, flood and other natural damages, species extinction, etc.

## **Position of Global Biodiversity**

Apart from environmental factors, the species diversity depends on an appropriate reproduction rate. All individuals within a species have a finite life span and must die after the span is over. The survival of the species will be determined by the number of healthy offsprings each individual has been able to give birth to during its life span. If the reproduction rate is more than the death rate, the species will survive with ever-growing numbers. This is the case with man. However, if the reproduction rate comes down due to natural or environmental reasons, the particular species experience a decline in its numbers and is likely to become extinct in course of time. We have learnt so far that every species has some intrinsic value and provides some service to the ecosystem. If a species is no longer to be found, it means that some key service is lost and definitely, it will endanger human life too.

The World Conservation Monitoring Centre (WCMC), the biodiversity information and assessment wing of the United Nations Environment Programme (UNEP) has stated in 1992 that an estimate of 12.5 million species in the earth is quite reasonable. This estimate is shown in Table 4.3. 90 percent or more of these species are to be found in the moist tropical forests, comprising of about 8 per cent of the world's land surface. The biodiversity-rich regions of the world are Africa, Asia and the Pacific, and Latin America.

It is not known exactly how many species have become extinct over the years. Many species must have perished even without being identified and enlisted. It is also difficult to assess whether the conservation measures adopted by different countries have yielded any positive result. So far, two large groups of species, namely the mammals and the birds, have been comprehensively studied and according to an estimate of the International Union for Conservation of Nature (IUCN), 25 per cent of the world's approximately 4630 mammal species, and 11 per cent of the 9675 bird species can be stated as globally threatened species. This was the situation in 1996. These species are at significant risk of total extinction if no urgent measures are taken for their conservation.

It is found that the threatened and the vulnerable species are mostly terrestrial (land-based) and the principal reason for this is the destruction of their habitats by rapid decline in area under forests. However, freshwater species are equally under threat due to expansion of human activities and increasing use of rivers and lakes for recreation and other activities. Marine

life is also threatened particularly in the coastal regions due to pollution, oil-spill and dumping of wastes.

One of the important areas of biodiversity is the large number of food plants existing in the wild – some known, the large number unknown. The ancient man used to take food from these plants directly, and then the most convenient food plants were domesticated, cultivated and grown in a regular way. A very large number still exists in the wild. Many of these are lost already with destruction of forests in the tropics.

The botanical families accounting for the world's main food plants are only a few: for example, Gramineae (grasses, including cereals) and Leguminosae (legumes, including peas, beans and lentils) constitute most of the food plants. People in different places cultivate a total of 200 plants for food – out of these, about 20 plants are of major interest. High yielding varieties of almost all major crops have been prepared in the laboratories and released to the farmers. While people are engaged in the cultivation of these varieties and in increasing production by use of fertilizer and pesticides, the wild varieties have been mostly forgotten.

Timber from forests is a valuable resource – used in construction of houses, boats and ships, in making of door and window frames and panels, furniture and various fittings as well as decorative items, lamp posts, etc. Many different species are used and depending on their quality, they differ in prices. One tree needs several years of growth before it becomes fit for these needs. The timber is a declining commodity and because of steady decline in markets, the price has gone up many times. This has also led to

illegal felling of valuable trees by unscrupulous traders, black-marketing and cross-border illegal trade. With the growing market of plywood, a large number of trees have been quickly consumed by the plywood manufacturers. All these activities have led to disappearance of many timber-tree species from the forests or in a rapid decline in tree population. IUCN has estimated that out of about 10000 tree species, nearly 6000 have fallen into the threatened status, with 976 being Critically Endangered, 1319 as Endangered and 3609 as Vulnerable (Table 4. 4).

Sometimes, existing species are also affected by introduction of exotic or new species willfully into the habitats. The new species because of the care taken for their survival in the new environment, multiply rapidly and soon the species existing already find competitors for food and habitat. This also leads to some species becoming extinct or endangered. Introduction of some rapidly growing fish species from other places has resulted in extinction of local species in many countries.

Environmental pollution is a major contributor to biodiversity loss in many countries. It is already known that pesticide residues particularly arising from large scale use of DDT for malaria control are responsible for reduction in population of many bird species and other organisms. Air and water pollution put ecosystems under huge stress and reduce populations of sensitive species, especially in coastal zones and wetlands. Rapid environmental change, such as the El Niño event, can also have significant impacts on natural habitats. Global warming and the accompanying climate change has been responsible for many species migrating northward in search of cooler climate and has caused reduction in species population. Extreme climate

events such as high flood and long-lasting drought have put immense stress on many species, both animal and plant, and biodiversity is affected. Huge forest fires such as the ones occurring in Indonesia a few years ago destroyed many species along with their habitat.

Although biodiversity is often talked about, there are little concerted efforts to save biodiversity. Short-term and piecemeal economic, political and social measures are less effective in conservation of biodiversity. The measures are to be long-term, well planned and scientific; these will have to be built into all development activities. The countries will have to give adequate attention to the measures suggested under such international conventions as the Convention on Biological Diversity (CBD), Ramsar Convention, World Heritage Convent