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Component-I (B) - Description of Module

Items	Description of Module
Subject Name	**Geography**
Paper Name	**Environmental Geography**
Module Name/Title	**Conservation of Biodiversity (Biological Diversity) Act, 2002**
Module Id	**EG-16**
Pre-requisites	
Objectives	
Keywords	In-situ, Ex-situ, Control, Extinction, Habitat, Ecosystem, Species, Plants, Animals

Structure

Objectives

- *Define biodiversity and biodiversity loss*
- *List various causes of biodiversity loss*
- *Describe various methods of conservation of biodiversity in the World*
- *Describe status conservation of biodiversity in India*
- *Discuss about Biodiversity Conservation Council of India (BiCCI)*

1.1 Introduction

Before starting the discussion it is necessary to understand the concept of conservation. The word conservation is derived from two Latin words '*con*' meaning 'together' and '*servare*' meaning to 'keep' or guard. Thus the literal meaning of conservation is to keep together. This word was coined by *Gifford Pinchot*. The term conservation is defined as a sacrifice of the present generation to future generations, whenever it is carried for, this conflict beginning far before the ideal is reached with conservationist are inclined to advocate. Mostly, we hear the term conservation with respect to recourse i.e., resource conservation but here the discussion is with respect to the biodiversity conservation and biodiversity too is a resource. Thus the present note deals with the conservation of biodiversity, its causes and effects. In the past 20 years remarkable progress has been made towards understanding how the loss of biodiversity

affects the functioning of ecosystems and thus affects society. Soon after the 1992 Earth Summit in Rio de Janeiro, interest in understanding how biodiversity loss might affect the dynamics and functioning of ecosystems and the supply of goods and services, grew dramatically. Major international research initiatives formed; hundreds of experiments were performed in ecosystems all over the globe; new ecological theories were developed and tested against experimental results. During the 1980s, concern about the rate at which species were being lost from ecosystems led to research showing that organisms can influence the physical formation of habitats, fluxes of elements in biogeochemical cycles, and the productivity of ecosystems. Such research suggested that loss of certain life forms could substantially alter the structure and functioning of whole ecosystems. By the 1990s, several international initiatives were focused on the more specific question of how the diversity of life forms impacts upon ecosystems. The Scientific Committee on Problems of the Environment (SCOPE) produced an influential book reviewing the state of knowledge on biodiversity and ecosystem functioning (BEF). By the mid-1990s, BEF studies had manipulated the species richness of plants in laboratory and field experiments and suggested that ecosystem functions, like biomass production and nutrient cycling, respond strongly to changes in biological diversity.

1.2 Biodiversity loss and their causes

See the irony of the fact that the species are disappearing before even we have named them or determined their possible uses and role in the biosphere, suggest that it is wised to make serious attempts to conserve them. It is now that the people of the world are realising that diversity at all level i.e., gene pool, species and biotic community is important and needs to be conserved for sustainable development. The major causes of biodiversity decline are land use changes, pollution, changes in atmospheric CO_2 concentrations, changes in the nitrogen cycle and acid rain, climate alterations, and the introduction of exotic species, all coincident to human population growth. For rainforests, the primary factor is land conversion. Climate will probably change least in tropical regions, and nitrogen problems are not as important because growth in rainforests is usually limited more by low phosphorus levels than by nitrogen insufficiency. The introduction of exotic species is also less of a problem than in temperate areas because there is so much diversity in tropical forests that newcomers have difficulty becoming established. There is also an ethical responsibility of looking after our planet, so that we may pass it on in a good health to our future generations. But there are

number of factors that are causing threat to our planet's biodiversity and some factors are discussed below which are among some of the biggest threats faced by biodiversity today.

- **Human Population Growth:** the human population growth is the very basic and root cause of the biodiversity loss around the world. Human population exacerbates every other factor having an impact on rainforests (not to mention other ecosystems). It has led to an unceasing search for more arable land for food production and livestock grazing, and for wood for fuel, construction, and energy. Previously undisturbed areas (which may or may not be suitable for the purposes to which they are constrained) are being transformed into agricultural or pasture land, stripped of wood, or mined for resources to support the energy needs of an ever-growing human population. Humans also tend to settle in areas of high biodiversity, which often have relatively rich soils and other attractions for human activities. This leads to great threats to biodiversity, especially since many of these areas have numerous endemic species.
- **Climate Change:** The phenomena of climate change is not new for the planet earth, throughout the history earth is altered and affected by the climate change in the long run in other words we can say that ecosystems have come and gone and species routine go extinct. But the matter of concern here is that during earlier times the rate of biodiversity loss and species extinction was at a slower rate and natural but during the contemporary times manmade climate changes have speeded up the process of extinction and loss without giving any time to ecosystems and species the time to adopt. Example from today is that the global temperature is rising and Arctic sea ice is melting which is affecting the marine biodiversity and can shift the vegetation zones having global implications but the process is so fast that they do not get time to adjust and ultimately they die and become extinct.
- **Deforestation and Habitat Loss:** deforestation is the direct cause of species extinction and biodiversity loss because man for satisfying his greed is cutting the forest at a so rapid rate that it is affecting the habitat and ecosystem. An estimated 18 million acres of forest are lost each year, due in part to logging and other human practices, destroying the ecosystems on which many species depend. Many species are widely distributed and thus, initially, habitat destruction may only reduce local population numbers. Species which are local, endemic, or which have specialized habitats are much more vulnerable to extinction, since once their particular habitat is degraded or converted for human activity, they will disappear. Most of the habitats

being destroyed are those which contain the highest levels of biodiversity, such as lowland tropical wet forests. In this case, habitat loss is caused by clearing, selective logging, and burning.

- **Overexploitation:** Overhunting, overfishing and over-harvesting contribute greatly to the loss of biodiversity, killing off numerous species over the past several hundred years. Poaching and other forms of hunting for profit increase the risk of extinction; the extinction of an apex predator — or, a predator at the top of a food chain — can result in catastrophic consequences for ecosystems.
- **Pollution:** From the burning of fossil fuels (releasing dangerous chemicals into the atmosphere and, in some cases, depleting ozone levels) to dumping 19 billion pounds of plastic into the ocean every year, pollution completely disrupts the Earth's ecosystems. While it may not necessarily cause extinction, pollutants do have the potential to influents species' habits. For example, acid rain, which is typically caused by the burning of fossil fuels, can acidify smaller bodies of water and soil, negatively affecting the species that live there by changing breeding and feeding habits.
- **Agriculture:** The dramatic increase in the number of humans during the twentieth century has instigated a concomitant growth in agriculture, and has led to conversion of wild lands to croplands, massive diversions of water from lakes, rivers and underground aquifers, and, at the same time, has polluted water and land resources with pesticides, fertilizers, and animal wastes. The result has been the destruction, disturbance or disabling of terrestrial ecosystems, and polluted, oxygen-depleted and atrophied water resources. Formerly, agriculture in different regions of the world was relatively independent and local. Now, however, much of it has become part of the global exchange economy and has caused significant changes in social organization.

1.3 Conservation of Biodiversity in the World

People make the use of term preservation and conservation as synonyms but there is a difference of hemisphere in the meaning of both the term. In ecological context preservation means upkeep of rare and endangered species of plants and animals in specially protected areas so that their population may increase to optimum level. No use of such resources is permitted. On the other hand conservation is a process which aim at proper use preservation and management of natural resources in such a way that they are always available for judicious use by humans as well as ecological balance is maintained. Conservation is thus defined as the establishment and observation of economically,

socially and politically acceptable norms, standards, patterns or models of behaviours in the use of natural resources by a given society. Conservation is the planned management of natural resources, to retain the balance in nature and retain the diversity. It also includes wise use of natural resources in such a way that the needs of present generation are met and at the same time leaving enough for the future generations. The conservation of biodiversity is important to prevent the loss of genetic diversity of a species, save a species from becoming extinct and protect ecosystems damage and degradation. Thus the conservation efforts can be grouped into the following two categories:

1. ***In-situ (on-site) Conservation*:** *In-Situ* conservation includes the protection of plants and animals within their natural habitats or in protected areas. Protected areas are land or sea dedicated to protect and maintain biodiversity. The in-situ strategy emphasizes protection of total ecosystems for the conservation of overall biodiversity of genes, populations, species, communities and the ecological processes. The in-situ approach includes protection of a group of typical ecosystems through a network of protected areas as recognised by the UNEP and the World Conservation Union (IUCN). *In situ* conservation of biodiversity is advantageous in that it is a cheap and convenient method that requires people's our supportive role. It maintains all organisms at different trophic levels from producers to top consumers such as carnivores. In natural environment, organisms not only live and multiply but also evolve and continue to maintain their ability to resist various environmental tresses such as drought storm, snow, temperature fluctuations, excessive rains, flood, fires, pathogens etc. *In situ* conservation requires only elimination of factors detrimental to the existence of the species and allows the larger number of species to grow simultaneously and flourish in their natural environment in which they were growing since a long time. The only disadvantage of *in situ* conservation is that it requires larger areas and minimizes the space for inhibiting human population which is increasing tremendously. The following areas may be set aside for *in situ* conservation:
    - **National Parks and Wildlife Sanctuaries (terrestrial protected areas):** the earliest national parks, the Yellowstone in USA (established in 1872) and the Royal near Sydney, Australia, were chosen because of their scenic beauty and recreational values. Many similar areas throughout the world

now protect rare species or wilderness areas. The United Nations has recognised 102102 protected areas covering more than 18.8 million km^2 covering 11.5 per cent of the earth's land surface and 12.65 per cent including the marine areas during 2003. There are 41997 protected areas around the world which fulfils the norms of IUCN categories.

- **Marine Protected Area:** since 1986 the IUCN has been promoting establishment of global system of marine protected areas. These are the areas of inter-tidal and sub-tidal region taken together with their overlying water and associated flora and fauna which have been reserved by law or other effective means to protect it. The main objective of marine protected areas are protection and restoration of depleted population of marine organisms, protection of endangered species and critical habitats, conserving and restoring marine ecosystem health for effective fishing management, to maintain biodiversity and ecological processes of marine and coastal ecosystems to use marine resources in sustainable and equitable way. According to World Database on Protected Areas records, 4116 protected areas in the UN list contain marine and coastal elements, covering 4.3 million km^2.
- **Biosphere Reserves:** biosphere reserves are a special category of protected areas of land or coastal environments where people are an integral component of the system. These are representative examples of natural biomes and contain unique biological communities. The concept of biosphere reserve was launched in 1975 as a part of the UNESCO's man and Biosphere Programme dealing with the conservation of ecosystems and the genetic resources contained therein.

2. ***Ex-situ* (off-site) *Conservation*:** conservation of plants and animals outside their natural habitats. These include botanical gardens, zoo, and gene banks; seed bank, tissue culture and cryopreservation.
    - **Seed Gene Bank:** the crop species diversity have declined with the onset of modern agricultural techniques, which will have severe implications on food security of the planet given environmental degradation, pests, epidemics and climate change. Seed gene banks are the easiest way to store *germplasm* of wild and cultivated plants at low

temperature in cold rooms. Preservation of genetic resources is carried out in the field gene banks under normal growing conditions in the case of plants which do not produce seeds for example banana and plantains.

- **In-vitro Gene Bank:** these are short and medium term storage for a range of crops woody species, fruit trees and horticultural species using tissue culture techniques. Tissue culture systems allow the propagation of plants with high multiplication rates in an aseptic environment. The cells are grown on a gel and fed with suitable nutrients and hormones to give rise to entire plants.
- **DNA Bank Network:** this is a worldwide unique concept. DNA band databases of all partners are linked and are accessible via a central web portal, providing DNA samples of complementary collections (microorganisms, protists, plants, algae, fungi and animals).

1.4 Conservation of Biodiversity in India

The country has taken significant steps for biodiversity conservation. Apart from establishing protected areas, a *National Biodiversity Act* was passed in 2002 which got the assent of President on 5 Feb 2003 and Biodiversity Rules were framed in 2004. A National Biodiversity Action Plan 2008 was released on 24 Feb 2009. India is the second most populous country, and therefore any plan attempting at conservation must consider socio-economic development as the mounting human pressure threatens the biotic resources of the country. Furthermore, ours is predominantly an agriculture country, and hence, policy makers should realize that conservation and sustainable utilization of biodiversity is the key to all developmental planning projects.

- ***In-situ (on site)***
- **Protected Area:** The protected areas are biogeographical areas where biological diversity along with natural and cultural resources are protected, maintained and managed through legal and administrative measures. The demarcation of biodiversity in each area is determined on the basis of climatic and physiological conditions. In these areas, hunting, firewood collection, timber harvesting etc. are prohibited so that the wild plants and animals can grow and multiply freely without any hindrance. Some protected areas are: Cold desert (Ladakh and Spiti), Hot desert (Thar), Saline

Swampy area (Sunderban and Rann of Kutch), Tropical moist deciduous forest (Western Ghats and north East) etc. Protected areas include national parks, sanctuaries and biosphere reserves. There are 37,000 protected areas throughout the world. As per World Conservation Monitoring Centre, India has 581 protected areas, national parks and sanctuaries.

- **National Parks of India:** A National Park is an area of land set aside to conserve the scenery (or environment) and natural objects and the wildlife therein. Under sec. 35 of the wildlife Protection Act (1972), whenever it appears to the State Government that an area, whether within a sanctuary or not, is by reason of its ecological, faunal, floral, geo-morphological or zoological importance, needed to be constituted as a National park for the purpose of propagating or developing wildlife therein or its environment, it may, by notification, declare its intention to constitute such as a National Park. All kinds of destruction, exploitation and removal of wildlife and damage to the habitat of any animal are strictly prohibited inside a National park. Grazing of domestic animals is also prohibited. However, the Chief Wildlife Warden may, after prior approval of the state government, permit destruction, exploitation and removal of wildlife from the NP if necessary for the improvement and better management of wildlife therein. There are 102 existing national parks in India covering an area of 40075 km^2 which is 1.22 per cent of the geographical area of the country. In addition to the above, 75 national parks covering an area of 16608 sq km are proposed in the Protected Area Network Report. The network of parks will go upto 177 after full implementation of the above report. Some of the important national parks of India are namely; Biological Park, Nandankanan (Odisha), Corbett national Park, Nainital (U.P.), Kaziranga National Park (Assam), Hazaribagh National Park, (Hazaribagh, Jharkhand), Bandhavgarh National Park (M.P), Bandipur National Park (Karnataka), Kanha National Park (M.P), Reibul Lamjao National Park (Manipur) and Nawgaon National Park (Maharashtra).
- **Sanctuaries:** Similar to the National park, a wildlife sanctuary is dedicated to protect wildlife, but it considers the conservation of species only and also the boundary of it is not limited by state legislation. 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. The area under a sanctuary remains in between 0.61 to 7818 km. Some important sanctuaries of India are as follows; Nandankanan Zoological Park, Chilika (Nalaban) Sanctuary, Nelapattu Bird Sanctuary, Salim Ali Bird Sanctuary, Dandeli Wildlife Sanctuary, Darrah Wildlife Sanctuary etc.

- **Biosphere Reserves:** the Ministry of Environment and Forest has notified 19 biosphere reserves in India which are also notified as National Parks. Nine of the nineteen biosphere reserves are a part of the World Network of Biosphere Reserves, based on the UNESCO Man and the Biosphere Programme list. The Gulf of Mannar, Nilgiri and Sunderbans biosphere reserves in India included in the list of the man and Biosphere programme. Biosphere reserves or natural reserves are multipurpose protected areas with boundaries circumscribed by legislation. The main aim of biosphere reserve is to preserve genetic diversity in representative ecosystems by protecting wild animals, traditional life style of inhabitant and domesticated plant/ animal genetic resources. These are scientifically managed allowing only the tourists to visit. Some of the important biosphere reserves in India are located at Nanda Devi, Manas, Dehang Debang, Gulf of Mannar, Nilgiri, Sunderbans, Pachmarhi, Great Nicobar, Khanghendzonga etc.
- **Community Reserves** can be declared by the State Government in any private or community land, not comprised within a National Park, Sanctuary or a Conservation Reserve, where an individual or a community has volunteered to conserve wildlife and its habitat. Community Reserves are declared for the purpose of protecting fauna, flora and traditional or cultural conservation values and practices. As in the case of a Conservation Reserve, the rights of people living inside a Community Reserve are not affected.
- ***Ex-situ* (off-site)**
- **Botanical Gardens and Zoos:** to complement in-situ conservation, ex-situ conservation is being undertaken through setting up botanical gardens, zoos, medicinal plants parks etc by various agencies The Indian Botanical Garden in Howrah (West Bengal) is over 200 years old. Other important botanical gardens are in Ooty, Bangalore and Lucknow. The most recent one is The Botanical Garden of Indian Republic established at NOIDA, near Delhi in April, 2002.

- **Gene Banks:** ex-situ collection and preservation of genetic resources is done through gene banks and seed banks. The National Bureau of Plant Genetic Resources (NBPGR), New Delhi preserves seeds of wild relatives of crop plants as well as cultivated varieties the National Bureau of Animal Genetic Resources at Karnal, Haryana maintains the genetic material for domesticated animals, and the National Bureau of Fish Genetic Resources, Lucknow for fishes.

  Cryopreservation: ("freeze preservation") is particularly useful for conserving vegetative propagated crops. Cryopreservation is the storage of material at ultra low temperature of liquid nitrogen (-196^0C) and essentially involves suspension of all metabolic processes and activities. Cryopreservation has been successfully applied to meristems, zygotic and somatic embryos, pollen, protoplasts cells and suspension cultures of a number of plant species.

1.5 Biodiversity Conservation Council of India (BiCCI)

Biodiversity Conservation Council of India is a non-profitable public charitable trust formed with an intention to conserve and manage the biodiversity of India. One of its primary objectives is to document all traditional farming, pastoralist systems and livestock practices and create bio-cultural protocols for communities and ecosystems on the lines of established practices. The objectives of *BiCCI* include documenting the indigenous bio-diversity of flora and fauna, raising awareness on the bio-diversity wealth and its importance in ecological balance. *BiCCI* aims to protect and promote traditional knowledge being practiced in farming, medicine, livestock keeping, food etc., impart training in the same, protect our ecosystem from invasion of non-native species of plants or animals and to work on eradication of the invasive alien species. BiCCI endeavours to support in-situ conservation, ex-situ and crypto preservation of native livestock, promote research in the indispensability of native livestock/plants in farming, food security of the country, economical freedom of rural households, and empowerment of women through sustainable means.

Process of Biodiversity Conservation

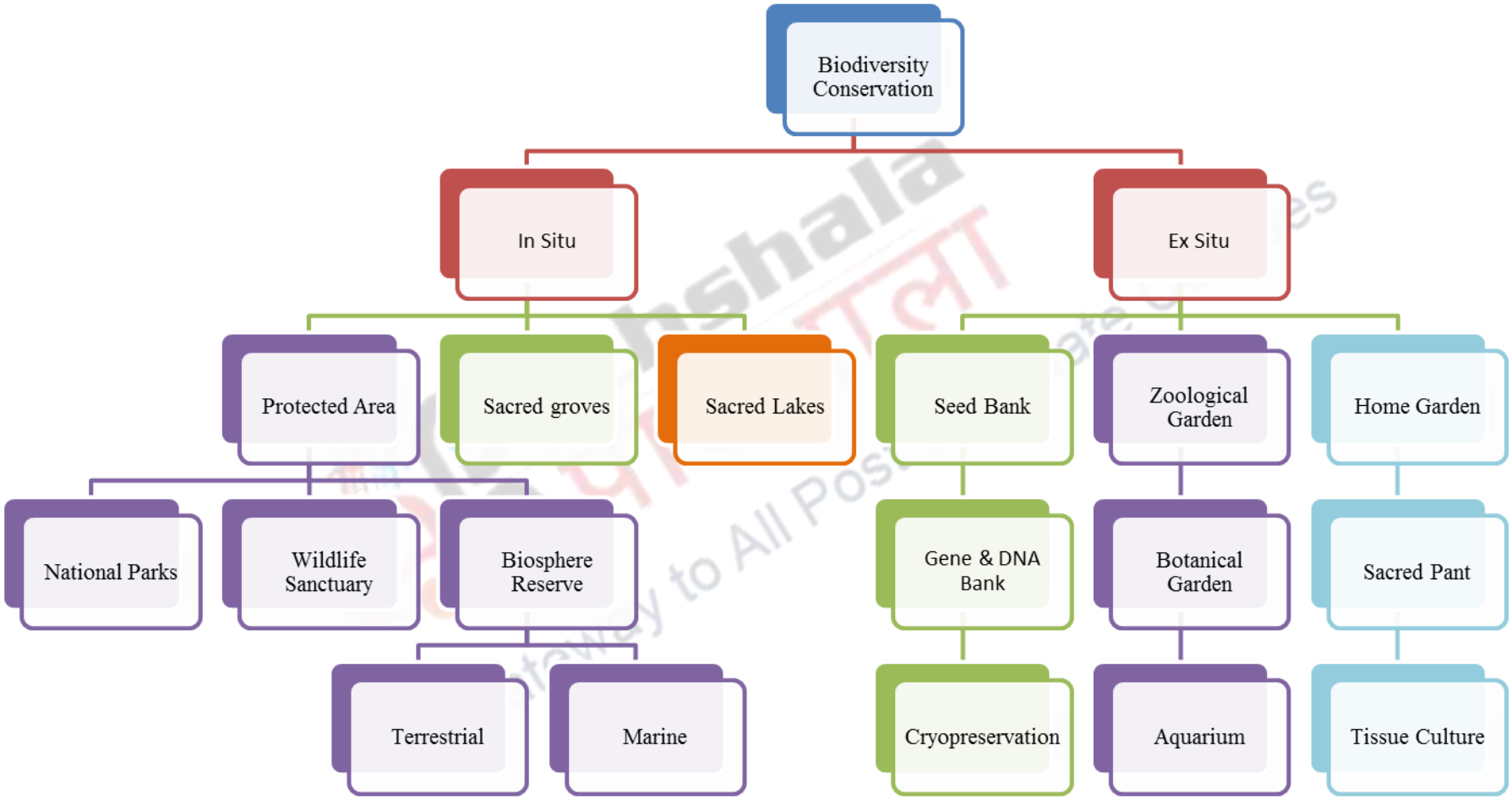

Fig. 1