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**WETLANDS, BIODIVERSITY, AND CLIMATE CHANGE**

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Wetland are an important ecological feature of any landscape which function as the basic habitat of a variety of faunal species like waterfowls, birds, mammals, fish and insects. They are also the meeting ground of migratory birds and hence prove to be interesting sites of speculation for naturalists as well as bird lovers and photographers. The DeeporBeel in Assam, India that covers over 10,000 acres of area, is one of the most significant wetland areas of the world. Besides being the breeding ground of around 17 globally threatened bird species, the most fascinating aspect of this wetland area is that it is a major 'staging ground' of migratory flyways. Not only this, the DeeporBeel is also the refuge for endangered species like the Asiatic elephant, the barking deer, the Chinese porcupine and the Sambar, Similarly the Wular Lake of Kashmir, once the largest lake in Asia, harbours migratory birds within the Central Asian Flyway.

Wetland areas are also a source of livelihood to the people who live in the villages in their periphery and catchment areas. Fishing and transportation are the two foremost contributions of these areas to human settlements around them. They also provide fodder for domestic cattle and aquatic seeds such as giant water lily.

Wetlands are ecotones or transitional zones that occupy an intermediate position between dry land and open water. Wetland ecosystems are dominated by the influence of water, they possess characteristics of both terrestrial and aquatic ecosystems and properties that are uniquely of their own. Wetlands support a wide array of flora and fauna and deliver many ecological, climatic and societal functions. Scientists often refer to wetlands as the "kidneys" of the earth and forests as the "lungs" of the earth. India by virtue of its extensive geographical stretch and varied terrain and climate, supports a rich diversity of inland and coastal wetlands.

**SIGNIFICANCE OF WETLANDS**

Wetland systems directly and indirectly support lakhs of people, providing goods and services to them. They help check floods, prevent coastal erosion and mitigate the effects of natural disasters like cyclones and tidal waves. They store water for long periods. Their capacity during heavy rainfall to retain excess floodwater that would otherwise cause flooding results in maintaining a constant flow regime downstream, preserving water quality and increasing biological productivity for both aquatic life as well as human communities of the region. Inundated wetlands are very effective in storing rainwater and are the primary source for recharging ground water aquifers.

The importance of wetlands was clearly demonstrated by 2004 Indian Ocean Tsunami. Wetlands may have provided a green barrier to protect coastlines and the coastal communities that live there.

There were localized and anecdotal report from around the Indian Ocean region of how the damaging impact of the Tsunami was reduced behind mangrove stands and coral reefs. Many wading birds and waterfowl like egrets, herons and cranes nest in wetlands. Of the 78 endangered species of birds in India, 55 depend on wetlands (37 threatened species such as the Sarus crane and the spot-billed polican and 18 near threatened species led by the lesser flamingo and the white ibis). Wetlands also provide food and shelter for mammals. They act as natural filters and help remove a wide range of pollutants from water, including harmful viruses from sewage and heavy metals from industries. Wetlands retain nutrients by



**Costal Zones**

- Coastal zones are extremely important.
- The ecosystems in the coastal zone are important for biological and economic productivity, storm protection and erosion control. The adjoining zone along the coastline contains some of the most productive and valuable habitats of the biosphere.
- A general estimates points that about 60% of world's population growth, migration and urbanization.
- Two thirds of cities with population over 2.5 million are situated near estuaries. Coastal zone supports many different types of livelihood that are sometimes at odds with each other.
- Fishing, tourism, manufacturing, farming, and other industries are all very important to the coastal areas, but without proper planning, damaging conflicts can emerge that can destroy the very resources that support these economic activities.

India's wetlands are extraordinarily diverse – ranging from lakes and ponds to marshes, mangroves, backwaters and lagoons- and play a vital role in maintaining water balance, flood prevention, biodiversity and support food security and livelihoods. Yet they are classed as “wastelands” by the government. Wetlands are systematically converted into “real estate” by vested interests or simply used as a dumping ground for sewage and garbage and are receptacles for toxic waste. While community court actions are in process across the country, the lack of a legally enforceable national regulation has hampered any real progress in many of these cases.

**MEASURES TO AVOID FOR WETLAND LOSS**

- On the grassroot level too, measures can be taken to steadily reduce the negative impact or wetland loss. Intensive fishing should be curbed and local inhabitants must make it a point not to hunt animals found in these areas.
- Land cutting should be avoided and care must be taken not to encourage illegal human settlements of any sort in its periphery.
- The Government should also show sufficient interest and enthusiasm, and come forward to conserve these areas by promoting eco-restoration of the surrounding forest areas. Building of roads and railway should be preferably avoided, and sewage and effluents from industries must be treated before discharging them into the catchment area.
- Promotion of eco-tourism and the spread o awareness through education regarding the global status of environmental problems, at both the local and national levels, shall prove beneficial towards faster conservation.
- For the common man survives on the lap of nature, and for him the protection of mother earth attains supreme importance.
- About the DeeporBeel a member of the DeeporBeel Fishermen's Cooperative society, Bhupen Das, says- “Our forefathers protected this wetland and we are committed to do the same as we depend on the wetland for our livelihood. We will protect this wetland at all costs and against all odds.

**WORLDS WETLANDS DAY 2010**

Worlds Wetlands Day (WWD)2010 is being celebrated on 2 February around the theme “Wetlands, Biodiversity, and Climate Change.” The theme relates to 2010 being proclaimed the International Year of Biodiversity and to the impacts of climate change for present and future wetland ecosystem health. It marks the date of the signing of the Convention on Wetlands on 2 February, 1971, in the Iranian city of Ramsar on the shores of the Caspian Sea. WWD was celebrated for the first time in 1997 and made an encouraging beginning, each year, government agencies, non-governmental organizations, and groups of citizens at all levels for the community have taken advantage of the opportunity to undertake actions aimed at raising public awareness of wetland values and benefits in general and the Ramsar Convention in Particular.

## **SIGNIFICANCE OF BIO DIVERSITY**

Western Ghats of Peninsular India is one of the eighteen 'Global Hot Spots' of biodiversity. The diversity of climate, edaphic and biotic regimes have shaped the evolution of over 4000 taxa of angiosperms, 117 amphibians, 150 birds 79 mammals and an unknown number of taxa from less studies groups. By virtue of its unique location (sandwiched between the Arabian Sea on the west and the Western Ghats on the east), topography (ranging from the coastal lowlands to mountain regions intervened by vast expanse of undulating midlands) and high rain fall, Kerala provides a wide variety of aquatic habitats like rivers, streams, pools, ponds, lagoons, estuaries etc, harbouring unique types of vegetation of their own.

The wetlands of Kerala are treated as sites of exceptional biodiversity in the country and are characterized by several endemic species. The coastal plains have been ravaged since early times of human habitation and most of the land is now used for housing and agriculture. Even these disturbed habitats are potential location for rapid speciation has been amply proved from the long list of new taxa discover and described form here during the last two decades. Increased trade and commercial activity has brought with it a large number o aquatic and wetland weeds into this area. Moreover, such activities have also resulted in the creation of man-made reservoirs.abandond granite quarries and clay pits which, in course of time, have provided ideal habitats for aquatic biota.

## **FLORA**

Though the benthic algae and other macro vegetation also contribute significance to the primary production, in wetlands phytoplankton plays a major role and has received much attention. The phytoplankton in the wetland varies from freshwaters to truly estuarine and marine species. Phytoplankton in coastal wetlands has reproductive rates to offset their population, which is lost by the downstream drift.

## **FAUNA**

Zooplankton is a major group in the energy transfer at secondary level and plays an important role in the secondary production of wetlands. Long-term variability of zooplankton is significant to differentiate whether these fluctuations are due to natural causes or due to man made changes. Incidence of specific plankton may prove to play useful role in environment gradually management studies.

## **BIO SPHERE RESERVES**

The idea of 'Biosphere Reserves' was initiated by UNESCO in 1973-74 under its Man and Biosphere (MAB) Programme. The MAB, launched in 1970 by UNESCO is a broad based ecological programme aimed to develop within the natural and social sciences a basis for the rational use and conservation of the resources of the biosphere and for the improvement of the relationship between man and the environment; to predict the consequences of today's actions on tomorrows world and thereby to increase man's ability to manage efficiently the natural resources of the biosphere. The approach emphasizes the importance of the structure and functioning of ecological systems and their mode of reaction when exposed to human intervention including impact of man on the environment and vice-versa. MAB is primarily a programme of research and training and seeks scientific information to find solution of concrete practical problems of management and conservation.

## **CHARACTERISTICS OF BIOSPHERE RESERVE**

The characteristic features of Biosphere Reserves are:

- Each Biosphere Reserves are protected areas of land and/or coastal environments wherein people are an integral component of the system.
- Together, they constitute a world wide network linked by International understanding for exchange of scientific information.
- The network of BRs includes significant examples of biomes throughout the world.
- Each BR includes one or more of the following categories:-

- BRs are representative examples of natural biomes.

BRs conserve unique communities of biodiversity or areas with unusual natural features of exceptional interest. It is recognized that these representative areas may also contain unique features of landscapes, ecosystems and genetic variations e.g. one population of a globally rare species; their representativeness and uniqueness may both be characteristics of an area.

- BRs have examples of harmonious landscapes resulting from traditional patterns of land-use.
- BRs have examples of modified or degraded ecosystems capable of being restored to more natural conditions.
- BRs generally have a non-manipulative core area, in combination with areas in which baseline measurements, experimental and manipulative research, education and training is carried out. Where these areas are not contiguous, they can be associated in a cluster.

## FUNCTION OF BIOSPHERE RESERVES

### Conservation

- To ensure the conservation of landscapes, ecosystems, species and genetic variations.
- To encourage the traditional resources use systems;
- To understand the patterns and processes of functioning of ecosystems;
- To monitor the natural and human-caused changes on spatial and temporal scales; development
- To promote, at the local level, economic development which is culturally, socially and ecologically sustainable.
- To develop the strategies leading to improvement and management of natural resources. Logistics support
- To provide support for research, monitoring, education and information exchange related to local, national and global issues of conservation and development.
- Sharing of knowledge generated by research through site specific training and education; and
- Development of community spirit in the management of natural resources

### Beneficiaries

Direct Beneficiaries of the Biosphere Reserves are the local people and the ecological resources and indirect beneficiaries are scientists, government decision makers and the world community.

## BIO-GEOGRAPHICAL REGIONS IN INDIA

The geographical location of India between 8° 4' N and 37° 6' N provides a wide latitudinal spread and permits a wide range of variations in temperature. The topographical diversity marked by mountainous regions covering an area close to 100 million hectares, arid and semi-arid zones spreading over 30 million hectare and the long coast line over 7000 kms, coupled with varied precipitation constitute a rich landscape diversity.

### INDIA CONSISTS OF:

- Two 'Realms'** - the Himalayan region represented by Palearctic Realm and the rest of the sub-continent represented by Malayan Realm.
- Five Biomes** - (i) Tropical Humid Forests (ii) Tropical Dry or Deciduous Forests (including Monsoon Forests) (iii) Warm deserts and semi-deserts (iv) Coniferous forests and (v) Alpine meadows.
- Ten Bio-geographic Zones** - 1. Trans Himalayan, 2. Himalayan, 3. Indian Desert, 4. Semi – Arid, 5. Western Ghats, 6. Deccan Peninsula, 7. Gangetic Plain, 8. North-East India, 9. Island, 10. Coasts and
- Twenty five Bio-geographic provinces**

## SUSTAINABLE DEVELOPMENT

Sustainable development is a pattern of resource use that aims to meet human needs while preserving the environment so that these needs can be met not only in the present, but also for future generations. The term was used by the Brundtland Commission which coined what has become the most often-quoted definition of sustainable development as development that “meets the needs of the present without compromising the ability of future generations to meet their own needs.

The concept has included notions of weak sustainability, strong sustainability and deep ecology. Sustainable development does not focus solely on environmental issues. In 1987, the United Nations released the Brundtland Report, which defines sustainable development as ‘development which meets the needs of the present without compromising the ability of future generations to meet their own needs. The United Nations 2005 World Summit Outcome Document refers to the “interdependent and mutually reinforcing pillars” of sustainable development as economic development, social development, and environment protection.

## ENVIRONMENTAL SUSTAINABILITY

Water is an important natural resource that covers 71% of the Earth’s surface. Image is the Earth photographed from Apollo 17. Environmental sustainability is the process of making sure current processes of interaction with the environment are pursued with the idea of keeping the environment as pristine as naturally possible based on ideal-seeking behavior. An “unsustainable situation” occurs when natural capital (the sum total of nature’s resources) is used up faster than it can be replenished. Sustainability requires that human activity only uses nature’s resources at a rate at which they can be replenished naturally. Inherently the concept of sustainable development is intertwined with the concept of carrying capacity. Theoretically, the long-term result of environment degradation is the inability to sustain human life. Such degradation on a global scale could imply extinction for humanity.

| Consumption of renewable resources      | State of environment      | Sustainability              |
|---|---------------------------|-----------------------------|
| More than nature’s ability to replenish | Environmental degradation | No sustainable              |
| Equal to nature’s ability to replenish  | Environmental equilibrium | Steady state economy        |
| Less than nature’s ability to replenish | Environmental renewal     | Environmentally sustainable |

## ENVIRONMENTAL IMPACT ASSESSMENT

Environmental Impact Assessment (EIA) is one of the proven management tools for incorporating environmental concerns in development process and also in improved decision making. The growing awareness, over the years, on environmental protection and sustainable development has further given emphasis on sound environmental management practices through preparation of Environmental Management Plans (EMPs) for minimizing the impacts from developmental activities.

## IMPORTANCE OF ECOLOGY

Ecology is the study of interconnectedness. By their very nature, coral reef ecosystems are complex and are not always easy to understand. Ecological research provides valuable insights into the workings of coral reefs and how these can be disrupted.

Ecological research has helped identify some of the causes of reef degradation. Recent studies suggest that the loss of large predatory fish and other key components of the ecosystem, such as **snappers and lobsters, have caused major disruptions of reef food webs**. These disruptions have led to the loss of coral and increases in algae. Ecologists have discovered diseases such as black-band disease and white plague that can kill coral in less than 1/100<sup>th</sup> of the time it takes for coral to grow. The causative agents of these diseases are still not fully understood.

Alternatives to destructive fishing practices can be obtained through information collected on the life and breeding cycles of threatened reef species such as groupers can lead to reduced stress through commercial breeding.

- Ecological knowledge is key to reef management and restoration, and ongoing monitoring and evaluation of the status of reefs are essential components of these efforts.
- Ecology can play a role in the development of new environmental technologies that integrate ecology, economics, technology, and social science.
- Corals around the world have been adversely affected by sedimentation, bleaching and diseases such as cyanobacterial infections. These affect growth, reproduction, productivity and survival of coral. Recent studies indicate that both the variety and extent of coral diseases are increasing dramatically.

#### **Global Warming and Coral Reefs**

- Climate Change and Global warming are already affecting corals in many part of the world.
- Increase in temperatures and changes in sea level are causing the corals to bleach. Changes in sea level are detrimental to established corals and reefs.
- A rise in sea level decreases the amount of available sunlight and may inhibit growth. Added emissions of carbon dioxide and other trace gases (called greenhouse gases) into our atmosphere may be causing a gradual warming of our planet.
- This warming could cause the polar ice caps to melt, thereby raising sea level.
- Rises in sea level can also release nutrients trapped in soil.
- Coral diseases can wipe out entire strands of coral reefs. Diseases may be connected to the sea level rise and nutrient level increase.

#### **CORAL REEF HERITAGE OF INDIA**

The India coral reefs are world famous but least explored, studied and utilised. On the other hand, they are indiscriminately damaged by human exploitation mainly for the cement industry (calcium carbide), road and building material in certain areas like the Gulf of Mannar and the Gulf of Kutch. The other two regions, the Andaman and Nicobar Islands and the Lakshadweep, because of their far-flung location from the mainland, are comparatively less affected by human depredations, according to various surveys conducted by the Central Marine Fisheries Research Institute (CMFRI), Cochin in the 1980s and the 1990s. Coral reefs are in peril not only in this country but also in the oceans round the globe due to human interference, natural calamities, disease, etc. It is sad to note while even small island countries have taken adequate steps to protect and contain the damage to corals, mainly from human interference, India has paid practically no attention to the alarming deterioration of coral reefs. It is, however, understandable that this pathetic condition of the reefs and neglect is merely due to ignorance of the authorities concerned and lack of political will and action on such vital scientific issues.

#### **CONSERVATION MEASURES**

The world has woken up to the magnitude of the problem and has taken steps to halt this degradation of one of the richest eco systems. The Convention on International Trade in Endangered Species of Wild Fauna and Flora, or CITS, has classified many coral as threatened species.

The establishment of marine sanctuaries or preserves may help ensure the availability of this ecosystem in the years to come. The Great Barrier Reef Marine Park was established in 1975 and is the largest project undertaken to preserve the coral reef in the world. Initiatives for the preservation of coral reefs in India have been undertaken on a large scale in the Wandur Marine National Park in the Andaman Nicobar Islands. People on their part can play a role in preventing this depletion. Corals should not be collected, either alive or dead. All waste should be treated before it is released into the sea and no waste is to be dumped directly into the water.

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