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**Wetlands**

The land area where soil is saturated with moisture either permanently or seasonally are called Wetlands. These wetlands may be marshes, swamps, bogs etc. The water in these wetlands may be saltwater, freshwater or brackish water. It may be running or stagnant.

- ✓ The wetlands are most **biologically diverse of all ecosystems** supporting numerous plant as well as animal lives.

The Ramsar convention on wetlands defines the wetland as follows:

wetlands are areas of marsh, fen, peatland or water, whether **natural or artificial**, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, **including areas of marine water** the depth of which at low tide **does not exceed six metres.**"

✍ **Study of Wetlands is called Paludology**

✍ World's **largest wetland is Pantanal**, which is spread in Brazil, Bolivia and Paraguay.

### **Why Wetlands are important?**

There are two important functions of Wetlands that make them so important in the climate change. One is the mitigation effect by which **they are able to sink carbon**. Another is adaptation by which **they are able to store and regulate water**. Wetlands have become a focal issue for conservation due to their biological production, ability to filter and store water, mitigate flood damages, importance in providing habitat and food for waterfowl, as well as the many other species they host.

### **Major Functions of the Wetlands**

The major functions of wetlands involve the **water filtration**, **water storage**, biological **productivity**, and **provide habitat** for wildlife.

#### **Water Filtration:**

Wetlands **remove the excess nutrients** and slow the water allowing particulates to settle out of the water which can then be **absorbed into plant roots**. It has been proved that up to up to 92% of phosphorus and 95% of nitrogen can be removed from passing water through a wetland. The pollutants get settled by sticking to the soil particles. Some wetlands accumulate the heavy metals and this **decrease** the **pollutant load of the surrounding waters**.

The wetlands **support a vast and intricate food web** and these complex food chains host various microbes and bacteria on which the invertebrates feed upon. These invertebrates can filter up to 90% of bacteria in this way.

#### **Water Storage:**

The wetlands are able to store around 1-1.5 million gallons of floodwater per acre. The water is stored and is slowed. This **allows the recharging of the groundwater**.

#### **Biological Productivity:**

The wetlands are able to absorb nutrients and are highly biologically productive **because they produce biomass very quickly, almost equivalent to the tropical rainforests**. The efficiency in creation of the biomass makes them important for the **development of alternate sources of energy**.

#### **Wildlife Habitat**

The wetlands are important wildlife habitats. Many species are dependent upon wetlands.

### **Ramsar Convention on Wetlands**

Formal title of the Ramsar Convention is "*The Convention on Wetlands of International Importance, especially as Waterfowl Habitat*".

Ramsar is a town in **Iran** and this international treaty aims the **conservation** and **sustainable utilization** of wetlands, to stem the **progressive encroachment** on and loss of wetlands now and in the future.

✍ It was signed in Ramsar on February 2, 1971, and came into force on December 21, 1975. To commemorate its signing date, February 2 is observed as World Wetland Day every year.

The meeting was invited by Mr Eskander Firouz, Director of Iran's Game and Fish Department, and held in the Caspian seaside resort of Ramsar in Iran, the text of the Convention was agreed on 2 February 1971 and signed by the delegates of 18 nations the next day.

Currently there are 1916 wetlands of international importance under sites under the Ramsar Convention known as *Ramsar Sites* covering around 1,86,993, 435 hectares km<sup>2</sup>.

- ✍ The maximum Ramsar sites are located in UK i.e. 168.
- ✍ The largest area covered by the Ramsar sites is in Canada.
- ✍ The number of parties to the Ramsar Convention is 160.
- ✍ They meet every three years.

### **Why Ramsar Convention?**

The Ramsar Convention on Wetlands was developed as a means to call international attention to the rate at which wetland habitats were disappearing in part due to a lack of understanding of their important functions, values, goods and services. Governments that join the Convention are expressing their willingness to make a commitment to helping to reverse that history of wetland loss and degradation.

Many wetlands are international systems lying across the boundaries of two or more countries, or are part of river basins that include more than one State. The health of these and other wetlands is dependent upon the quality and quantity of the transboundary water supply from rivers, streams, lakes, or underground aquifers. The best intentions of countries on either side of those frontiers can be frustrated without a framework for international discussion and cooperation toward mutual benefits.

### **Is Ramsar Part of UN Environment Conventions?**

Please note that United Nations Educational, Scientific and Cultural Organization (UNESCO) serves as Depository for the Convention, but the Ramsar Convention is NOT part of the United Nations and UNESCO system of environment conventions and agreements.

- ✍ The Ramsar Secretariat is hosted by IUCN-The World Conservation Union in Gland, Switzerland

### **Commitments under Ramsar Convention**

When the countries join the Ramsar Convention, they get enlisted in an international effort to ensure the conservation and wise use of wetlands. The treaty includes following commitments that the contracting parties agree before joining:

#### **Designation:**

The first obligation under the Convention is for a Party to designate at least one wetland at the time of accession for inclusion in the List of Wetlands of International Importance. This list is called Ramsar List. After that the country may continue to designate the suitable wetland subject to selection.

#### **Selection:**

Selection for the Ramsar List should be based on the wetland's significance in terms of ecology, botany, zoology, limnology, or hydrology. The Contracting Parties have developed **specific criteria** and guidelines for identifying sites that qualify for inclusion in the Ramsar List.

**Information:**

The Party has to commit itself "to arrange **to be informed at the earliest possible time if the ecological character of any wetland in its territory and included in the List has changed**, is changing or is likely to change as the result of technological developments, pollution or other human interference. Information on such changes shall be passed without delay" to the Ramsar Secretariat.

**Wise Use:**

There is a general obligation for the Contracting Parties **to include wetland conservation considerations in their national land-use planning**. They have committed themselves to formulate and implement this planning so as to promote, as far as possible, "the wise use of wetlands in their territory".

**Reserves:**

The contracting Parties undertake **to establish nature reserves in wetlands**, whether or not they are included in the Ramsar List, and they are expected to promote training in the fields of wetland research, management and wardening.

**International cooperation:**

The parties agree to consult with other Contracting Parties about implementation of the Convention, especially in regard to Transboundary wetlands, shared water systems, and shared species.

**3 pillars of Ramsar Convention:**

The 8th meeting of the parties to Ramsar Convention (COP8) was held in Valencia, Spain, 2002. It came out with a Strategic Plan, for 2003-2008, whereby the Contracting Parties seek to deliver their commitments to wetland conservation and wise use through **"three pillars" of action**. These are:

1. Working towards the **wise use of their wetlands** through a wide range of actions and processes contributing to human well-being.
2. Devoting particular attention to the **further identification, designation and management** of a coherent and comprehensive suite of sites for the List of Wetlands of International Importance (the Ramsar List) as a contribution to the establishment of a global ecological network.
3. **Cooperating internationally** in their delivery of wetland conservation.

**Montreux Record under Ramsar List**

✍ Montreux Record is a register of wetland sites on the List of Wetlands of International Importance **where changes in ecological character have occurred**, are occurring, or are likely to occur as a result of technological developments, pollution or other human interference. So, it is **maintained as part of the Ramsar List**.

For these sites, the Secretariat may **send a technical mission**, known as the **"Ramsar Advisory Mission"**, to analyse the situation at one or more particular Montreux Record sites, provide advice on the measures to be

taken, and assess the desirability of removing a site from the Montreux Record when measures have been implemented successfully.


### Ramsar Convention's International Organization Partners (IOPs)

The Ramsar Convention works especially closely with some global non-governmental organizations (NGOs) which have been associated with the treaty since its beginnings. They have been given the formal status of International Organization Partners (IOPs) of the Convention. The five IOPs are:

- ✍ BirdLife International (formerly ICBP)
- ✍ IUCN – The International Union for the Conservation of Nature
- ✍ IWMI – The International Water Management Institute
- ✍ Wetlands International (formerly IWRB, the Asian Wetlands Bureau, and Wetlands for the Americas)
- ✍ WWF (World Wide Fund for Nature) International


### India & Ramsar Convention

India has a wealth of wetland ecosystems distributed across various eco- geographical regions that range from Himalayas to Deccan plateau. Varied topography and climatic regimes support and sustain diverse and unique wetland habitats in our country.

- ✍ According to the Directory of Asian Wetlands (1989), India has totally 27,403 wetlands, of which 23,444 are inland wetlands and 3,959 are coastal wetlands. 
- ✍ Wetlands occupy 18.4% of the country's area of which 70% are under paddy cultivation.

Natural wetlands in India consist of high altitude wetlands in Himalayas; flood plains of the major river systems; saline and temporary wetlands of the arid and semi-arid regions; coastal wetlands such as lagoons, backwaters, estuaries, mangroves, swamps and coral reefs, and so on. In addition to these natural wetlands, a large number of man-made wetlands, which have resulted from the needs of irrigation, water supply, electricity, fisheries and flood control, are substantial in number. These wetlands can be classified into different categories on the basis of their origin, vegetation, nutrient status and thermal characteristics.

In India, out of an estimated 4.1 m ha (excluding irrigated agricultural lands, rivers, and streams) of wetlands,

 1.5 m ha are natural, while 2.6 m ha are manmade. The coastal wetlands occupy an estimated 6,750 sq km, and are largely dominated by mangrove vegetation. The Wildlife Institute of India's survey reveals that they are disappearing at a rate of 2% to 3% every year.

Efforts to conserve wetlands in India began in 1987 and the main focus of governmental efforts is on biological methods of conservation rather than adopting engineering options. A national wetland mapping project has also been initiated for an integrated approach on conservation.

- ✓ India became a contracting party to the Ramsar Convention in October 1981 and designated **Chilika Lake (Orissa) and Keoladeo National Park (Rajasthan)** as its first two Ramsar Sites.
- ✓ Four additional sites were designated in 1990: Sambhar Lake (Rajasthan), Loktak Lake (Manipur), Harike Lake (Punjab) and Wular Lake (Jammu & Kashmir).
- ✓ Right now, India has **25 Ramsar Sites** (November 2011).

## Types of Indian Wetlands

Wetlands in India are distributed in different geographical regions, ranging from the Himalaya to the Deccan plateau. The variability in climatic conditions and topography is responsible for significant diversity. Based on their origin, vegetation, nutrient status and thermal characteristics, they are classified into following different types:

1. **Glaciatic Wetlands** (e.g., Tsomoriri in Jammu and Kashmir, Chandertal in Himachal Pradesh)
2. **Tectonic Wetlands** (e.g., Nilnag in Jammu and Kashmir, Khajjiar in Himachal Pradesh, and Nainital and Bhimtal in Uttaranchal)
3. **Oxbow Wetlands** (e.g., Dal Lake, Wular Lake in Jammu and Kashmir and Loktak Lake in Manipur and some of the wetlands in the river plains of Brahmaputra and Indo- Gangetic region. Deepor Beel in Assam, Kabar in Bihar, Surahatal in Uttar Pradesh)
4. **Lagoons** (e.g., Chilika in Orissa)
5. **Crater Wetlands** (Lonar lake in Maharashtra)
6. **Salt Water Wetlands** (e.g., Pangong Tso in Jammu and Kashmir and Sambhar in Rajasthan)
7. **Urban Wetlands** (e.g., Dal Lake in Jammu and Kashmir, Nainital in Uttaranchal and Bhoj in Madhya Pradesh)
8. **Ponds/Tanks, Man-made Wetlands** (e.g., Harike in Punjab and Pong Dam in Himachal Pradesh)
9. **Reservoirs** (e.g., Idukki, Hirakud dam, Bhakra-Nangal dam)
10. **Mangroves** (e.g., Bhitarkanika in Orissa)
11. **Coral reefs** (e.g., Lakshadweep)
12. **Others - Creeks** (Thane Creek in Maharashtra), seagrasses, estuaries, thermal springs are some other types of wetlands in the country.

✓ There are in all **104** identified wetlands under the **National Wetland Conservation & Management Programme (NWCMP)**.

## India's Ramsar Sites

The 25 Ramsar Sites of India are listed here state wise:



Ramsar Site	Date of Designation	State		
Kolleru Lake	19-08-2002	Andhra Pradesh	90,100	ha
Deepor Beel	19-08-2002	Assam	4,000	ha
Chandertal Wetland	08-11-2005	Himachal Pradesh	49	ha
Pong Dam Lake	19-08-2002	Himachal Pradesh	15,662	ha
Renuka Wetland (smallest wetland)	08-11-2005	Himachal Pradesh	20	ha
Hokera Wetland	08-11-2005	Jammu & Kashmir	1,375	ha
Surinsar-Mansar Lakes	08-11-2005	Jammu & Kashmir	350	ha
Tsomoriri	19-08-2002	Jammu & Kashmir	12,000	ha
Wular Lake	23-03-1990	Jammu & Kashmir	18,900	ha
Ashtamudi Wetland	19-08-2002	Kerala	61,400	ha
Sasthamkotta Lake	19-08-2002	Kerala	373	ha

Vembanad-Kol Wetland (Largest Wetland of India)	19-08-2002	Kerala	151,250	ha
Bhoj Wetland	19-08-2002	Madhya Pradesh	3,201	ha
Loktak Lake MR	23-03-1990	Manipur	26,600	ha
Bhitarkanika Mangroves	19-08-2002	Orissa	65,000	ha
Chilika Lake	01-10-1981	Orissa	116,500	ha
Harike Lake	23-03-1990	Punjab	4,100	ha
Kanji	22-01-2002	Punjab	183	ha
Ropar	22-01-2002	Punjab	1,365	ha
Keoladeo National Park MR	01-10-1981	Rajasthan	2,873	ha
Sambhar Lake	23-03-1990	Rajasthan	24,000	ha
Point Calimere Wildlife and Bird Sanctuary	19-08-2002	Tamil Nadu	38,500	ha
Rudrasagar Lake	08-11-2005	Tripura	240	ha
Upper Ganga River (Brijghat to Narora Stretch)	08-11-2005	Uttar Pradesh	26,590	ha
East Calcutta Wetlands	19-08-2002	West Bengal	12,500	ha

### National Wetlands Conservation Programme

The Government of India has been implementing the National Wetlands Conservation Programme (NWCP) in close collaboration with the State/UT Governments since the year 1985-86. Under the programme, 115 wetlands have been identified till now by the Ministry which require urgent conservation and management interventions. The objective of this programme is the conservation of wetlands in the country so as to prevent their further degradation and ensuring their wise use for the benefit of local communities and overall conservation of biodiversity.



**Is there any specific Legal Framework in India regarding Wetlands?**

**No**, As of now there is no specific legal framework for wetland conservation, management and their wise use. Draft regulatory framework for conservation and management of wetlands is being finalized to be notified under the Environment (Protection) Act, 1986. At present conservation and wise use of wetlands is being ensured through various legal instruments, related to environment and forests.

### Biodiversity Hotspots

There are 25 Biodiversity Hotspots in the world **mostly located in the Tropics**. The loose definition is that it is a biogeographic region with a significant reservoir of biodiversity that is under threat from humans.

#### The Concept

✍ The concept was given by **Norman Myers**.

Norman Myers in 1988 had first identified ten **tropical forest** "hotspots" characterized both by exceptional levels of plant endemism and by serious levels of habitat loss, in one of his seminal papers. In 1990, he added a further eight hotspots, including four **Mediterranean-type ecosystems**.

Later, the Conservation International adopted Myers' hotspots as its institutional blueprint in 1989, and in 1996, the organization made the decision to undertake a reassessment of the hotspots concept, including an examination of whether key areas had been overlooked. Accordingly the **Conservation International** gave a broad definition / criteria of the Biodiversity Hotspot as follows:

**To qualify as a hotspot, a region must meet two strict criteria:**

1. **Endemism:** *it must contain at least 1,500 species of vascular plants (> 0.5 percent of the world's total) as endemics, and*
2. **Loss of Habitat:** *it has to have lost at least 70 percent of its original habitat.*

Accordingly, 25 biodiversity hotspots were identified.

- ✍ Collectively, these areas held as endemics no less than 44 percent of the world's plants and 35 percent of terrestrial vertebrates in an area that formerly covered only 11.8 percent of the planet's land surface.
- ✍ The habitat extent of this land area had been reduced by 87.8 percent of its original extent, such that this wealth of biodiversity was restricted to only 1.4 percent of Earth's land surface.

Later the list was expanded.

**Currently, there are 34 Biodiversity Hotspots.**

- ✍ Each of them holds at least 1,500 endemic plant species, and having lost at least 70 percent of its original habitat extent.
- ✍ Overall, the 34 hotspots once covered 15.7 percent of the Earth's land surface.
- ✍ In all, 86 percent of the hotspots' habitat has already been destroyed, such that the intact remnants of the hotspots now cover only 2.3 percent of the Earth's land surface.

### List of Biodiversity Hotspots

The Conservation International identifies the Biodiversity Hotspots as under

#### North and Central America

1. California Floristic Province
2. Caribbean Islands
3. Madrean Pine-Oak Woodlands
4. Mesoamerica

#### South America

1. Atlantic Forest
2. Cerrado
3. Chilean Winter Rainfall-Valdivian Forests Tumbes-Chocó-Magdalena
4. Tropical Andes

#### Europe and Central Asia

1. Caucasus
2. Irano-Anatolian
3. Mediterranean Basin
4. Mountains of Central Asia

#### Africa

1. Cape Floristic Region
2. Coastal Forests of Eastern Africa
3. Eastern Afromontane
4. Guinean Forests of West Africa



5. Horn of Africa
6. Madagascar and the Indian Ocean Islands
7. Maputaland-Pondoland-Albany
8. Succulent Karoo

**Asia-Pacific (Maximum)**

1. East Melanesian Islands
2. Himalaya
3. Indo-Burma
4. Japan
5. Mountains of Southwest China
6. New Caledonia
7. New Zealand
8. Philippines
9. Polynesia-Micronesia
10. Southwest Australia
11. Sundaland
12. Wallacea
13. Western Ghats and Sri Lanka

So accordingly, India has two biodiversity hot spots, namely:

1. **Himalaya (Eastern Himalayas)**
2. **The Western Ghat**



**Eastern Himalaya Biodiversity Hotspot**

Phyto-geographically, the Eastern Himalaya forms a distinct floral region and comprises of **Nepal, Bhutan, states of East and North-East India**, and a contiguous sector of Yunnan province in South-Western **China**.

- ✍ In the whole of Eastern Himalaya, there are an estimated 9,000 plant species, out of which **3,500** (i.e. 39 per cent) are endemic.
- ✍ In the **Indian portion**, there occurs some 5,800 plant species, roughly 2,000 (i.e. 36 per cent) of which are endemic.
- ✍ At least 55 flowering plants endemic to this area are recognized as rare, for example, the Pitcher Plant (*Nepenthes khasiana*).
- ✍ The area has long been recognized as a **rich centre of primitive flowering plants** and is popularly known as the '**Cradle of Speciation**'.
- ✍ Species of several families of monocotyledons, Orchidaceae, Zingiberaceae and Arecaceae are found in the area. Gymnorperms and Pteridophytes (ferns) are also well represented here.
- ✍ The area is also rich in wild relatives of **plants of economic significance** e.g. rice, banana, citrus, ginger, chilli, jute and sugarcane.

- ✍ It is also regarded as the **centre of origin and diversification of five palms of commercial importance**, namely coconut, arecanut, palmyra palm, sugar palm and wild date palm.
- ✍ Tea (*Thea sinensis*) has been cultivated in this region for the last 4,000 years. Many wild and allied species of tea, the leaves of which are used as a substitute for tea, are found in the North East, in their natural habitats.
- ✍ The **Taxol plant (*Taxus wallichiana*)** is sparsely distributed in the region and **is listed under the red data category** due to its overexploitation for extraction of a drug effectively used **against cancer**.
- ✍ As regards faunal diversity, **63** per cent of the **genera** of **land mammals** in India are found in this region. During the last four decades, two new mammals have been discovered from the region - Golden Langur from Assam-Bhutan region, and Namdapha Flying Squirrel from Arunachal Pradesh, indicating the species richness of the region. **The region is also a rich centre of avian diversity** - more than **60 per cent of the bird species found in India have been recorded in the North East**. The region also hosts two endemic genera of lizards, and 35 endemic reptilian species, including two turtles. Of the 240 Indian amphibian species, at least 68 species are known to occur in the North East, 20 of which are endemic.

From **Namdapha National Park** itself, a new genus of mammal, a new subspecies of a bird, six new amphibians' species, four new species of fish, at least 15 new species of beetles and six new species of flies have been discovered.

### **Western Ghats Biodiversity Hotspot**

The Western Ghats region, which is spread **into 6 states of India**, is considered to be one of the most important bio-geographic zones of India, as it is one of the richest centres of endemism.

**Due to varied topography and microclimatic regimes, some areas within the region are considered to be active zones of speciation.**

The region has 490 arborescent taxa, of which as many as 308 are endemic. About 1,500 endemic species of dicotyledonous plants are reported from the Western Ghats. 245 species of orchids belonging to 75 genera are found here, of which 112 species in ten genera are endemic to the region. As regards the fauna, as many as 315 species of vertebrates belonging to 22 genera are endemic, including 12 species of mammals, 13 species of birds, 89 species of reptiles, 87 species of amphibians and 104 species of fish.

**The extent of endemism is high amongst amphibian and reptile species.** There occur 117 species of amphibians in the region, of which 89 species (76 per cent) are endemic. Of the 165 species of reptiles found in Western Ghats, 88 species are endemic. Many of the endemic and other species are listed as threatened.

Nearly 235 species of endemic flowering plants are considered endangered. **Rare fauna of the region include - Lion Tailed Macaque, Nilgiri Langur, Nilgiri Tahr, Flying Squirrel, and Malabar Gray Hornbill.**

### **Biosphere Reserves**



- ✍ Biosphere reserves are **areas of terrestrial and coastal ecosystems which promote the conservation of biodiversity with its sustainable use.**

- ✗ They are internationally recognized within the framework of UNESCO's Man and Biosphere (MAB) programme and nominated by national governments.
- ✗ The Ministry of Environment and Forest provides financial assistance to the respective State governments for conservation of landscape and biological diversity and cultural heritage.
- ✗ Biosphere reserves serve in some ways as 'living laboratories' for testing out and demonstrating integrated management of land, water and biodiversity.
- ✗ There is a World Network of Biosphere Reserves (WNBR) under the MAB Programme. Within this network, exchanges of information, experience and personnel are facilitated.
- ✗ There are over 500 biosphere reserves in over 100 countries.

## Man & Biosphere Programme

UNESCO's Man and the Biosphere (MAB) Programme was launched in 1971 with the aim of promoting interdisciplinary research, training, and communications in the field of ecosystem conservation and the rational use of natural resources. The MAB Programme is suited to respond to the results of the 1992 United Nations Conference on Environment and Development (UNCED) and especially the objectives of the Convention on Biological Diversity.

## Differentiating National Parks, Wildlife Sanctuaries & Biosphere Reserves

- ✗ National Parks and Wild Life sanctuaries come under the category called "Protected Areas". The Protected Areas are declared under Wildlife (Protection) Act, 1972.
- ✗ The Wildlife (Protection) Act, 1972 provides for 4 types of protected areas viz. Wild Life Sanctuaries, National Parks, Conservation Reserves and Community Reserves.
- ✗ The boundaries of the all 4 kinds of Protected Areas are notified by legislation.
- ✗ The difference between a national park and a sanctuary is that no human activity is allowed inside a national park, while limited activities are permitted within the sanctuary.
- ✗ In Biosphere Reserve, limited economic activity (sand and stone mining) is permitted.

## Selection of Biosphere Reserves

### Primary Criteria:

A site that must contain an effectively protected and minimally disturbed core area of value of nature conservation and should include additional land and water suitable for research and demonstration of sustainable methods of research and management. (Kindly remember this)

The core area should be typical of a biogeographical unit and large enough to sustain viable populations representing all trophic levels in the ecosystem.

### Secondary Criteria

- ✓ Areas having rare and endangered species
- ✓ Areas having diversity of soil and micro-climatic conditions and indigenous varieties of biota.
- ✓ Areas potential for preservation of traditional tribal or rural modes of living for harmonious use of environment.

**Madrid Action Plan**

Madrid Action Plan was agreed at the 3rd World Congress of Biosphere Reserves which was held in Madrid in February 2008. It builds on **the Seville Strategy** and aims to capitalize on the strategic advantages of the Seville instruments and raise biosphere reserves to be the principal internationally-designated areas dedicated to sustainable development in the 21st century.

- ✓ The aim is to streamline the MAB (Men & Biosphere) and WNBR (World Network of Biosphere Reserves) activities during 2008–2013, the designated period of the plan.

**Number of Biosphere Reserves in India**

There are 17 notified Biosphere reserves in India. 3 more are yet to be notified. A list of the Biosphere reserves is given below.

- ✓ Please note that NOT all biosphere reserves are in the UNESCO Framework.
- ✗ As of now, only Seven viz. Nilgiri (2000), Gulf of Mannar (2001), Sunderban (2001), Nanda Devi(2004), Nokrek (2009), Pachmarhi(2009), Similipal (2009) are in the UNESCO's MAB world network.

India's Biosphere Reserves					
Rank	Year	Name	States	Type	Area
1	2008	Kachchh Biosphere Reserve	Gujarat	Semi-Arid	12454
2	1989	Gulf of Mannar	Tamil Nadu	Coasts	10500
3	1989	Sunderbans	West Bengal	Gigantic Delta	9630
4	1988	Nanda Devi	Uttaranchal	West Himalayas	5860
5	1986	Nilgiri Biosphere Reserve	Tamil Nadu, Kerala and Karnataka	Western Ghats	5520
6	1998	Dehang Debang	Arunachal Pradesh	East Himalayas	5112
7	1999	Pachmarhi	Madhya Pradesh	Semi-Arid	4926
8	1994	Similipal	Orissa	Deccan Peninsula	4374
9	2005	Achanakamar - Amarkantak	Chhatisgarh, Madhya Pradesh	Semi-Arid	3835
10	1989	Manas		East Himalayas	2837
11	2000	Kanchanjunga	Sikkim	East Himalayas	2620
12	2001	Agasthyamalai	Kerala	Western ghats	1701
13	1989	Great Nicobar	Andaman and Nicobar Islands	Islands	885
14	1988	Nokrek	Meghalaya	East Himalayas	820
15	1997	Dibru-Saikhowa	Assam	East Himalayas	765
16	2009	Cold Desert	Himachal Pradesh	West Himalayas	NA
17		The hill ranges spread in parts of Chittoor and Kadapa districts of Andhra Pradesh have been designated as <b>Seshachalam Biosphere Reserve</b> in Andhra Pradesh on 20th September, 2010. The decision is based on the proposal submitted by the Government of Andhra Pradesh. This biosphere reserve will cover an area of 4755.997 Km <sup>2</sup> .			
18.		<b>Tawang Wetscoming</b> Arunachal Pradesh, yet to be notified			
19.		<b>Blue Mountains in Mizoram</b> , yet to be notified.			

**Why Biosphere Reserves?**

It appears that the Biosphere reserves mean the duplication of the conservation efforts of the protected areas, but it is not so. The idea is the "Biosphere Reserves" is to **strengthen the "National Efforts"** in conformity to the **"International Practices"**.

The basic truth is that "most of the National parks in India were previously hunting grounds. Most of the wildlife sanctuaries are declared by the state governments out of a vague idea of protecting a particular species". The present domestic legislations don't represent a "systematic selection of the ecosystems". **Neither the wildlife sanctuaries nor the national parks focus on conservation of**

1. Plant species
2. Invertebrates
3. Biotic community as a whole.

This is the major shortcoming of the present system. Further



1. The focus of WS/NP is on conservation of mammals. No focus to the other species which may be ecologically more vital.
2. The focus of the MAB and Biosphere Reserves is to protect the "threatened Habitats" and not "a particular threatened species".
3. Through an Internationally recognized mechanism, the Research and Monitoring of the existing protected areas can be carried out on regular basis.

### Legislation Framework around Biosphere Reserves

✍ There is no comprehensive legislation dealing with all aspects of the Biosphere Reserves.

#### How a Biosphere Reserve is declared?

1. Department of Environment is nodal agency for Biosphere Reserve programmes. It carries out detailed scientific investigation, maps the biogeographical regions and vegetation types, identified the critical areas. Botanical Survey of India and Zoological Survey of India assist in this work.
2. Area is demarcated. The Biosphere Reserve is declared by a notification by the Central and State Governments.
3. The central Government assumes the responsibility of meeting the costs of set up while the state government would set up desired machinery.

#### Role of Wildlife Protection Act in Biosphere Reserves

There wildlife protection act is complementary to the set up of Biosphere Reserves to the extent that it has considerable flexibility and latitude to establish such reserves. It does not define a Biosphere Reserve. The local / state government may enact a fresh legislation if it needs so.

✍ The area is proposed to UNESCO's MAB which when accepts the proposal , is entered in the list of network of biosphere reserves.

### LEGISLATION & POLICY FRAMEWORK

#### Biological Diversity Act, 2002

To regulate access to genetic resources and associated sharing arrangements, apart from developing policies and programmes on long term conservation and protection of biological resources and associated knowledge, the Biological Diversity Act, 2002 was promulgated. The National Biodiversity Authority (NBA) set up at Chennai on 1st October 2003 as per the provisions of the Biological Diversity Act, 2002 is mandated to facilitate implementation of the Act.

#### Notable Points: Important

- ✍ All foreign national require approval from NBA for obtaining Biological Resources. (Section - 3)
- ✍ Indian individuals/entities to seek approval before transferring knowledge / research and material to foreigners. (Section - 4)

- ✍ Prior approval of NBA before applying for any kind of IPR based on research conducted on biological material and or associated knowledge obtained from India. (Section -6)
- ✍ Indians required to provide **prior intimation to State Biodiversity Boards** for obtaining biological material for commercial purposes. SBB can regulate such access. (Section -7)
- ✍ Growers and cultivators of Biological Diversity and vaidas and hakims **who are practicing Indian system of medicines and local people exempted.**

## National Biodiversity Action Plan (NBAP)

The National Environment Policy, 2006, seeks to achieve balance and harmony between conservation of natural resources and development processes and also forms the basic framework for the National Biodiversity Action Plan.

**The objectives of the NBAP are founded in the backdrop of the cardinal principles already set out in the NEP 2006.** The most important of these principles is that **human beings are at the centre of sustainable development concerns.** The other relevant principles on which the **objectives** are premised include the right to development, precautionary approach, economic efficiency, entities with 'incomparable value', equity, public trust doctrine, decentralization, integration, preventive actions, and environmental offsetting.

The objectives are broad-based and relate to current perceptions of key threats and constraints to biodiversity conservation and are as follows.

1. Strengthening and integration of **in situ, on-farm and ex situ** conservation
2. Augmentation of natural resource base and its sustainable utilization; Ensuring inter and intra-generational equity
3. **Regulation of introduction of invasive alien species** and their management
4. **Assessment of vulnerability**, and adaptation to climate change and desertification
5. Integration of biodiversity concerns in economic and social development
6. To prevent, minimize and abate impacts of pollution
7. Development and integration of biodiversity **databases**
8. **Strengthening implementation** of policy, legislative and administrative measures for biodiversity conservation and management
9. Building of national capacities for biodiversity conservation and appropriate use of new technologies
10. **Valuation of goods and services** provided by biodiversity and use of economic instruments in the decision-making processes
11. **International cooperation** to consolidate and strengthen bilateral, regional and multilateral cooperation on issues related to biodiversity

## Wildlife Protection Act 1972

Prior to Wildlife Protection Act of 1972, India only had five designated national parks. **This was the first umbrella act which established schedules of protected plant and animal species.** By this act, hunting or harvesting these species was largely outlawed.

- ✍ Extends to the whole of India, except the State of Jammu and Kashmir which has its own wildlife act.

- ✍ There are **six schedules** which give varying degrees of protection.
- ✍ Out of the six schedules, **Schedule I and part II of Schedule II** provide **absolute protection** and offences under these are prescribed the highest penalties.
- ✍ The penalties for **Schedule III** and **Schedule IV** are **less** and these animals are protected.
- ✍ **Schedule V** includes the **animals which may be hunted**. These are **Common crow, Fruit bats, Mice & Rats only**.
- ✍ **Schedule VI** contains the **plants**, which are **prohibited from cultivation and** planting. These plants are as follows
  1. Beddome's cycad (*Cycas beddomei*)
  2. Blue Vanda (*Vanda soerulec*)
  3. Kuth (*Saussurea lappa*)
  4. Ladies slipper orchids (*Paphiopedilum spp.*)
  5. Pitcher plant (*Nepenthes khasiana*)
  6. Red Vanda (*Rananchera inschootiana*)

### **Important Points:**

#### **How a Sanctuary is declared?**

The **State Government** may, by notification, declare its intention to constitute any area **other than** area comprised with any **reserve forest** or the territorial waters as a sanctuary if it considers that such area is of adequate ecological, faunal, floral, geomorphological, natural, or zoological significance, for the purpose of protecting, propagating or developing wildlife or its environment. The **boundary** of the Sanctuary will be **fixed** by the **state Government by a notification** specifying the limits of the area which shall be comprised within the sanctuary and declare that the said area shall be sanctuary on and from such date as may be specified in the notification.

- ✍ **No alteration of the boundaries of a Sanctuary shall be made except on a resolution passed by the Legislature of the State.**

#### **How a National Park is declared?**

Whenever it appears to the **State Government** that an area, **whether within a sanctuary or not**, is, by reason of its ecological, faunal, floral, geomorphological, or zoological association or importance, needed to be constituted as a National Park for the purpose of protecting & propagating or developing wildlife therein or its environment, it may, by notification, declare its intention to constitute such area as a National Park. The Government will define the limits of the area which is intended to be declared as a National Park by notification.

- ✍ **No alteration of the boundaries of a National Park shall be made except on a resolution passed by the Legislature of the State.**

#### **Coastal Regulation Zone (CRZ) Notification**

India has a long coastline of 7,500km, ranging from Gujarat to West Bengal, and two island archipelagos (Andaman Island and Lakshadweep). Our coastal ecosystems provide protection from natural disasters such

as floods and tsunamis to the 250 million people who live in our coastal areas. Coastal waters provide a source of primary livelihood to 7 million households. Our marine ecosystems are a treasure trove of biodiversity, which we are only beginning to discover and catalogue. Thus our coastline is both a precious natural resource and an important economic asset, and we need a robust progressive framework to regulate our coast.

The Ministry of Environment & Forests has released the CRZ Notification, 2011 which has now replaced the CRZ Notification, 1991. Apart from that, the Island Protection Zone Notification, 2011 has been notified for the first time covering the Andaman and Nicobar Islands and Lakshadweep.

**Objectives:**

1. Protection of livelihoods of traditional fisher folk communities
2. Preservation of coastal ecology
3. Promotion of economic activity that have necessarily to be located in coastal regions.

**Background:**

The CRZ Notification 1991 has been amended for 25 times up till now and among the new features, it includes Goa, Kerala, Greater Mumbai and critically vulnerable coastal areas (CVCAs) like Sunderban Mangrove Area, Chilka and Bhitarkanika (Orissa), Gulf of Khambat and Gulf of Kutchh (Gujarat), Malwan (Maharashtra), Karwar and Kundapur (Karnataka), Vembanad (Kerala), Coringa, East Godavari and Krishna Delta (Andhra Pardesh), Gulf of Mannar (Tamil Nadu).

**Definition of CRZ Area**

CRZ area now includes the water area up to 12 nautical miles in the sea and the entire water area of a tidal water body such as creek, river, estuary, etc.

**Restriction on Fishing?**

The CRZ Notification does not impose any restrictions of fishing activities.

**Coastal Zone Management Plan**

The CRZ notification 2011 enshrines that concept of a Coastal Zone Management Plan (CZMP). It will be prepared with the fullest involvement and participation of local communities.

**No development Zone**

The “no development zone” definition has been changed. It is reduced from 200 metres from the high-tide line to 100 meters only. This has been done to meet increased demands of housing of fishing and other traditional coastal communities.

**proposed enactment to protect the traditional rights of the Fishermen**

As per recommendation of the expert committee headed by Dr. M.S. Swaminathan, that Government should enact a law to protect the traditional rights and interests of fishermen and coastal communities, is under proposal. This law would be somewhat along the lines of the Forest Rights Act, 2006. Fishermen associations have supported this recommendation. The MoE&F has already prepared such a draft law in this regard and put it in the public domain for comments and suggestions.

**Regarding Coastal Zone Regulation law**



There has been a demand from fishermen associations that instead of having a Notification under Environment Protection Act, 1986, Government should enact a coastal zone regulation law to be passed by Parliament. This is because a notification does provide considerable flexibility to the Executive. The ministry acknowledges and appreciates that a law passed by Parliament will enhance public confidence and trust that amendments are introduced after adequate debate and

### **National Tiger Conservation Authority**

As per the recommendations of a special task-force of the Indian Board of Wildlife, Project Tiger was launched in 1973 with the following objectives:

1. To ensure maintenance of the available population of tigers in India for scientific, economic, aesthetic, cultural and ecological value.
  2. To preserve, for all times, the areas of such biological importance as a national heritage for the benefit, education and enjoyment of the people.
- ✍ The project tiger started with 9 reserves in 1973-74. **Currently there are 36 Tiger reserves.**
  - ✍ The project **started as a 'Central Sector Scheme'** with the full assistance of Central Government till 1979-80: **later, it become a 'centrally Sponsored Scheme'** from 1980-81, with **equal sharing** of expenditure between the center and the states.
  - ✍ In 2005, The **National Tiger Conservation Authority** was established in following a **recommendation** of the **Tiger Task Force**, constituted by the Prime Minister of India for reorganized management of Project Tiger and the Tiger Reserves of India.
  - ✍ For this purpose, **The Wildlife (Protection) Act, 1972 was amended** (Wild Life (Protection) Amendment Act, 2006) to provide for constituting of the National Tiger Conservation Authority responsible for **implementation of the Project Tiger Plan** to protect endangered tigers.

### **NTCA main Points**

- ✍ **Chairman** of the National Tiger Conservation Authority is **Minister for Environment & Forests.**
- ✍ It has eight experts or professionals having qualifications and experience in wildlife conservation and welfare of people including tribals, apart from **three Members of Parliament** (1 Rajya Sabha, 2 Lok Sabha).
- ✍ The Inspector General of Forests, in charge of project Tiger, will be ex-officio Member Secretary.

### **Special Tiger Protection Force (STPF)**

- ✍ The announcement for creation of Special Tiger Protection Force (STPF) was announced by the Finance Minister in Budget speech of **2008**. A onetime grant of Rs. 50 Crore was provided to the National Tiger Conservation Authority (NTCA) for raising, arming and **deploying a Special Tiger Protection Force** for **13 tiger reserves**. The rest of the reserves were to be taken up later.

## India's Tiger Reserves

There are **39 Tiger Reserves in India**, administered under the Project Tiger (National Tiger Conservation Authority).

SNo.	State	Name of Tiger Reserve	Year of Creation	Total area ^
1	Karnataka	Bandipur	1973-74	872.24
2	Uttarakhand	Corbett	1973-74	821.99
3	Madhya Pradesh	Kanha	1973-74	917.43
4	Assam	Manas	1973-74	840.04
5	Maharashtra	Melghat	1973-74	1500.49
6	Jharkhand	Palamau	1973-74	414.08
7	Rajasthan	Ranthambhore	1973-74	1113.364
8	Orissa	Similipal	1973-74	1194.74
9	West Bengal	Sunderbans	1973-74	1699.62
10	Kerala	Periyar	1978-79	881.00
11	Rajasthan	Sariska	1978-79	681.1124
12	West Bengal	Buxa	1982-83	390.5813
13	Chhattisgarh	Indravati	1982-83	1258.37
14	Andhra Pradesh	Nagarjunsagar	1982-83	2527.00
15	Arunachal Pradesh	Namdapha	1982.83	1807.82
16	Uttar Pradesh	Dudhwa	1987-88	1093.79*
17	Tamil Nadu	Kalakad-Mundanthurai	1988-89	895.00
18	Bihar	Valmiki	1989-90	840.00*
19	Madhya Pradesh	Pench	1992-93	411.33
20	Maharashtra	Tadoba Andheri	1993-94	625.82
21	Madhya Pradesh	Bandhavgarh	1993-94	716.903
22	Madhya Pradesh	Panna	1994-95	576.13
23	Mizoram	Dampa	1994-95	500.00
24	Karnataka	Bhadra	1998-99	492.46
25	Maharashtra	Pench	1998-99	257.26
26	Arunachal Pradesh	Pakke	1999-2000	683.45
27	Assam	Nameri	1999-2000	200.00
28	Madhya Pradesh	Satpura	1999-2000	1339.264
29	Tamil Nadu	Anamalai	2008-09	958.00
30	Chhattisgarh	Udanti-Sitanadi	2008-09	851.09
31	Orissa	Satkosia	2008-09	523.61
32	Assam	Kaziranga	2008-09	625.58
33	Chhattisgarh	Achanakmar	2008-09	626.195
34	Karnataka	Dandeli-Anshi	2008-09	814.884
35	Madhya Pradesh	Sanjay-Dubri	2008-09	831.25*
36	Tamil Nadu	Mudumalai	2008-09	321.00
37	Karnataka	Nagarhole	2008-09	643.35
38	Kerala	Parambikulam	2008-09	390.89
39	Maharashtra	Sahyadri	2009-10	Notification Awaited

^ of the Core/Critical Tiger Habitat (In Sq. Kms.)

The above list does not include the new tiger reserves for which in-principle approval has been given. Please note that in January 2011, In-principle approval was accorded for creation of five new tiger reserves. These include

1. Ratapani in Madhya Pradesh,
2. Sunabeda in Orissa,
3. Pilibhit in Uttar Pradesh,
4. Biligiri Ranganatha Temple in Karnataka and
5. Mukundara Hills in Rajasthan.

These all are **wildlife sanctuaries** which would be **converted as new tiger reserves**. Mukundara Hills include Darrah, Jawahar Sagar and Chambal Wildlife Sanctuaries.

Please note that :

- ✍ **Nagarjunsagar-Srisailam is the largest** tiger reserve in terms of Area.
- ✍ Pench Tiger Reserve in Maharastra is minimum in area.
- ✍ As per website of NTCA, **Sunderbans in West Bengal has the largest number of Tigers.**
- ✍ **Manas** (Assam) , **Similipal** (Orissa), **Sunderbans** (West Bengal) are **Biosphere Tiger reserves**
- ✍ **Manas** Tiger Reserve is the only tiger reserve which is also a **World Heritage Site**
- ✍ In 2002-03, Madhya Pradesh was home to maximum number of Tigers.

### Project Elephant

Project Elephant was launched in 1991-92 to **assist the States having free ranging populations of wild elephants** to ensure the long term survival of identified viable populations of elephants in their natural habitats . The project is being implemented in **the 13 states of** Andhra Pradesh, Arunachal Pradesh, Assam, Jharkhand, Karnataka, Kerala, Meghalaya, Nagaland, Orissa, Tamil Nadu, Uttaranchal, Uttar Pradesh and West Bengal.

#### Major Activities:

1. **Ecological restoration** of existing natural habitats and migratory routes of elephants
2. Development of **scientific and planned management** for conservation of elephant habitats and value population of wild Asiatic elephants in India
3. Promotion of measures for **mitigation of man-elephant conflict** in crucial habitats and moderating pressures of human and domestic stock activities in crucial elephant habitats
4. Strengthening of measures for **protection of wild elephants** from poachers and unnatural causes of death
5. Research on Project Elephant management related issues
6. Public education and awareness programmes
7. Eco-development
8. Veterinary care

### India's Elephant Reserves

**25** Elephant Reserves (ERs) extending over about 58,000 square kilometers (22,393.9 sq mi) have been formally **notified by various State Governments** till now and consent for establishment of Baitarini ER & South Orissa in Orissa and Ganga-Jamuna (Shiwalik) ER in U.P has been accorded by MOEF. Apart from that there are a few in pipeline. All of them have been listed here:

Elephant Reserve	State
Rayala Elephant Reserve	Andhra
Kameng Elephant Reserve	Arunachal
Deomali Elephant Reserve	Arunachal
Sonitpur Elephant Reserve	Assam
Dihing-Patkai Elephant Reserve	Assam
<b>Kaziranga</b> – Karbi Anglong Elephant Reserve	Assam
Dhansiri-Lungding Elephant Reserve	Assam
Chirang-Ripu Elephant Reserve	Assam
Singhbhum Elephant Reserve	Jharkhand
Mysore Elephant Reserve	Karnataka

Bhadra Elephant Reserve	Karnataka
Wayanad Elephant Reserve	Kerala
Nilambur Elephant Reserve	Kerala
Anamudi Elephant Reserve	Kerala
Periyar Elephant Reserve	Kerala
Garo Hills Elephant Reserve	Meghalaya
Khasi Hills Elephant Reserve	Meghalaya
Intanki Elephant Reserve	Nagaland
Mayurbhanj Elephant Reserve	Orissa
Mahanadi Elephant Reserve	Orissa
Sambalpur Elephant Reserve	Orissa
Baitarni Elephant Reserve	Orissa
South Orissa Elephant Reserve	Orissa
Nilgiri Elephant Reserve	Tamil Nadu
Coimbatore Elephant Reserve	Tamil Nadu
Anamalai Elephant Reserve	Tamil Nadu
Srivilliputtur Elephant Reserve	Tamil Nadu
Shivalik Elephant Reserve	Uttaranchal
Mayurjharna Elephant Reserve	W. Bengal
Eastern Dooars Elephant Reserve	W. Bengal

Apart from that the elephant corridors have also been notified. Details about **elephant corridors** is here : [http://envfor.nic.in/pe/ecorridors\\_glance.pdf](http://envfor.nic.in/pe/ecorridors_glance.pdf)

**India’s Ministry of Environment & Forests**



**Ministry of Environment and Forests**  
GOVERNMENT OF INDIA

In India, the nodal agency for implementation of policies and programmes relating to conservation of the country’s natural resources including lakes and rivers, its biodiversity,

forests and wildlife, ensuring the welfare of animals and prevention and abatement of pollution in India is Ministry of Environment & Forests, Government of India.

**Objectives**

The broad **objectives** of this ministry are as follows:

1. Conservation and survey of flora, fauna, forests and wildlife,
2. Prevention and control of pollution,
3. Afforestation and regeneration of degraded areas
4. Protection of the environment
5. Ensuring the welfare of animals

The Ministry works under the framework of domestic legislations and international agreements.

The **MOEF** also serves as the **nodal agency** in the country for the United Nations Environment Programme (**UNEP**), South Asia Co-operative Environment Programme (**SACEP**), International Centre for Integrated Mountain Development (**ICIMOD**) and for the follow-up of the United Nations Conference on Environment and Development (**UNCED**). The Ministry is entrusted with issues relating to multilateral bodies such as the Commission on Sustainable Development (CSD), Global Environment Facility (GEF) and of regional bodies

like Economic and Social Council for Asia and Pacific (ESCAP) and South Asian Association for Regional Co-operation (SAARC) on matters pertaining to the environment.

### Botanical Survey of India (BSI)

The Botanical Survey of India (BSI) is the apex research organization under the MOEF for carrying out taxonomic and floristic studies on wild plant resources of the country.

- BSI was established on 13th February, 1890 with the basic objective to explore the plant resources of the country and to identify the plants species with economic virtues.
- Sir George King, the then Superintendent of the 'Royal Botanic Garden' Calcutta was appointed as First ex-officio Honorary Director of the BSI.

After independence, the department was reorganized in 1954 by Government of India as a part of scientific development of the country. Its functional base was further expanded to include various new areas.

### Units of BSI: Indian Botanic Garden, Howrah

- ✓ Indian Botanic Garden was established in 1787 by Lieutenant Colonel Robert Kyd.
- ✓ Its 273 acres unique landscape design was initiated by Sir George King in 1872.

It is considered to be one of the best in the botanic gardens of the world with undulated land surfaces, artificial lakes and moats interconnected with underground pipes receiving water from the river Hooghly. It was known as East India Company's Garden or the 'Company Bagan' or Calcutta Garden and later as the Royal Botanic Garden which after independence was renamed as the 'INDIAN BOTANIC GARDEN' in 1950. It came under the management of the Botanical Survey of India on January 1, 1963.

#### Great Banyan Tree

The 260 years old Great Banyan Tree (*Ficus bengalensis L.*) is located in the Indian Botanic Garden, Howrah. It has 2800 prop roots and spread in 1.5 hectares.

### Units of BSI: Central National Herbarium, Howrah

- CNH is one of the oldest and one of the largest herbaria in the world, was established in 1795 by Dr. William Roxburgh.
- Dr. N. Wallich (1815 – 1846), the successor of William Roxburgh developed this herbarium to a great extent.
- Central National Herbarium possesses about 2.5 million of herbarium sheets belonging to nearly 350 families of plants, which are arranged according to **Bentham and Hooker's system of classification.**
- The area under the jurisdiction of Central National Herbarium is confined to the states of West Bengal, Bihar and Jharkhand.

### Zoological Survey of India (ZSI)

Zoological Survey of India (ZSI) is the apex institution under MOEF for research in Fauna. It has been undertaking exploration and research leading to the advancement of our knowledge on the exceptionally rich faunal diversity of the country since its inception in 1916, with its Headquarters at Kolkata and sixteen regional centres located in different parts of the country.

Apart from the traditional works, recently ZSI also started concentrating on development of ENVIS on Faunal diversity, CITES centres and AICOPTAX Programmes, Chromosomal Mapping, DNA finger printing, Trichotaxonomic and Acoustic studies and Participation in Antarctica Expedition.

### **AICOPTAX Programme**

AICOPTAX refers to **All India Coordinated Project on Taxonomy**. The ministry had launched this programme in 1999-2000 and it envisaged establishment of centres for research in identified priority gap areas (eg. virus, bacteria, microlepidoptera, etc.) in the field of taxonomy, education and training (fellowships, scholarships, chairs, career awards etc.) and strengthening of BSI and ZSI.

### **Forest Survey of India**

The Forest Survey of India is located at Dehradun and its four zonal offices are located at Shimla, Kolkata, Nagpur and Bangalore.

➤ Precursor to the FSI was “Pre-investment Survey of Forest Resources” (PISFR). The PISFR project was initiated in 1965 by the Government of India with the sponsorship of Food and Agriculture Organization (FAO) and United Nations Development Programme (UNDP).

On June 1, 1981, PISFR was reorganized and thus was established the Forest Survey of India. The Government redefined the mandate of FSI in 1986 in order to make it more relevant to the rapidly changing needs and aspirations of the country.

1. The FSI assesses the forest cover of the country through Remote Sensing technology, analyze the changes and prepare State of Forest Report. The state of Forest Report is published biennially.
2. It conducts inventory in forests and non forest areas at national level and develop database on wood volume and also estimates tree cover.

Forest Survey of India has been bringing out ‘State of Forest Reports’ since 1987 based on interpretation of satellite images. Last such report was the India State of Forest Report 2009, 11th in the series.

### **Botanic Garden of India Republic (BGIR), NOIDA**

➤ Botanic Garden of India Republic (BGIR) was set up in April 2002 as part of the Botanical Survey of India .

The scheme was identified as a “Green Channel” project under the *National Jai Vigyan Science & Technology Mission* of the Ministry of Science & Technology and approved by the Planning Commission. Its objective was the ex situ conservation and propagation of rare and indigenous plants, to serve as a ‘centre of excellence’ for research and training, and to build public awareness through environmental education.

### **ANIFPDCL**

Andaman & Nicobar Islands Forest and Plantation Development Corporation Ltd. was set up in 1977 for development and managing forestry plantations on the Islands. It has a forestry project, a Red Oil Palm project and a Katchal Rubber Project in operation. It is a loss making enterprise because the forest logging business was curtailed down by the Supreme Court.

### **Central Zoo Authority**

✓ In India, the Zoos are regulated as per the provisions of Wild Life (Protection) Act, 1972 and are guided by the National Zoo Policy, 1998.

The Wild Life Protection Act was amended in 1991 and via this amendment; the Central Zoo Authority was established. So **Central Zoo Authority is a statutory body** whose main objective was to enforce **minimum standards and norms for upkeep and health care of animals in India zoos** and restrain mushrooming of unplanned and ill-conceived zoos that were cropping up in the country as adjuncts to public parks, industrial complexes and way sides. Central Zoo Authority is headed by Minister of State for Environment & Forests (Forests & Wildlife), Government of India.

The authority has the following functions:

1. Recognition of the Zoos.
2. Evaluation of the Zoos.
3. Coordination in the planned conservation breeding programme for endangered species in Indian zoos.
4. Approval of the exchange proposals of animals between Indian zoos and between Indian and foreign zoos.
5. Preparing and maintaining the studbooks

### **Wildlife Institute of India, Dehradun**

Wildlife Institute of India (WII) was established in **1982**, a premier **training and research institution** in the field of wildlife and protected area management in South Asia, is an **autonomous institute** of the Ministry of Environment & Forests, with a 49 member WII Society as the apex body. **The Society is chaired by the Union Minister for Environment & Forests, Government of India.**

The Institute conducts various research projects, academic and training programmes.

### **National River Conservation Directorate**

The National River Conservation Directorate (NRCD), functioning under the Ministry of Environment and Forests is engaged in implementing the **River and Lake Action Plans under** the National River Conservation Plan (NRCP) and National Lake Conservation Plan (NLCP) by providing financial assistance to the State Governments.

### **National Ganga River Basin Authority**

The Central Government has given Ganga the status of a 'National River' and has constituted a 'National Ganga River Basin Authority' (NGRBA) on February 20, 2009. The NGRBA has been set up as an empowered planning, financing, monitoring and coordinating authority for the conservation of Ganga River with a holistic approach under the Environment (Protection) Act, 1986.

**The Authority is chaired by the Prime Minister** and has as its members, the Chief Ministers of the States through which Ganga flows, viz., Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal.



### **National Afforestation and Eco-Development Board (NAEB)**

National Afforestation and Eco-Development Board (NAEB) was set up in August **1992** for promoting the Afforestation, tree planting, ecological restoration and ecodevelopment activities in the country. It gives special attention to the **regeneration of degraded forest** areas and lands adjoining forest areas, national

parks, sanctuaries and other protected areas as well as the ecologically fragile areas like the Western Himalayas, Aravallis, Western Ghats etc.

Major function of the NAEB is to evolve mechanisms for **ecological restoration** of degraded forest areas and adjoining lands through systematic planning and implementation, in a cost effective manner. Another major function is to restore through natural regeneration or appropriate intervention the forest cover in the country for ecological security and to meet the fuel wood, fodder and other needs of the rural communities.

### **G.B. Pant Institute of Himalayan Environment and Development, Kosi-Katarmal, Almora**

G.B. Pant Institute of Himalayan Environment and Development (GBPIHED) was established in August **1988** by the Ministry of Environment and Forests, Government of India, as an **autonomous Institute**, with a mandate of **achieving sustainable development** and **environmental conservation** in the **Indian Himalayan Region (IHR)**.

Apart from the headquarters at Kosi-Katarmal, Almora (Uttarakhand), it has four regional Units located at Kullu (Himachal Pradesh), Srinagar-Garhwal Uttarakhand), Pangthang (Sikkim) and Itanagar (Arunachal Pradesh). This institute designs and implements **R&D activities** on priority environmental problems; develops and demonstrates **best practices** and **delivers technology packages** for improved livelihood options for the people of IHR.

### **Indian Council of Forestry Research and Education (ICFRE), Dehradun**

Indian Council of Forestry Research and Education (ICFRE) is an **apex body in the national forestry research system**. It undertakes the holistic promotion of forestry research through need based planning, promoting, conducting and coordinating research, education and extension covering all aspects of forestry. Its **objectives** are:

1. To undertake, aid, promote and coordinate forestry education, research and their applications.
2. To develop and maintain a national library and information centre for forestry and allied sciences.
3. To act as a clearing-house for research and general information related to forests and wildlife.
4. To develop forestry extension programmes and propagate the same through mass media, audio-visual aids and extension machinery.

The ICFRE has **eight Regional Research Institutes** and **four** Research Centres located in different bio-geographical regions of the country to cater the forestry research needs of the nation.

The institutes are:

1. **Forest Research Institute (FRI), Dehradun**
2. **Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore**

Institute of Forest Genetics and Tree Breeding is a national institute formed in April, 1988 under the Indian Council of Forestry Research and Education (ICFRE), an autonomous council under the Ministry of Environment and Forests, Government of India. Its mandate is to **identify and evolve varieties of species**



used in **afforestation** and **social forestry** that will contribute to the national goal of achieving a growth of 3 to 4 cubic meters of biomass per ha per year within the ecological considerations applicable to the area.

**3. Institute of Wood Science and Technology (IWST), Bangalore**

The institute originally came into existence as Forest Research Laboratory (FRL) at Bangalore in 1938, instituted by the Government of Mysore. In 1956, this laboratory was organized as a regional centre of Forest Research Institute and Colleges, Dehra Dun. In 1977, Sandal Research Centre was set up to undertake research on wide-ranging aspects of genetics, silviculture and management of sandal, a valuable tree well distributed all over Southern India.

The Indian Council of Forestry Research and Education (ICFRE) upgraded the Forest Research Laboratory in 1988 and named it as Institute of Wood Science and Technology (IWST) merging Sandal Research Centre and Minor Forest Products Unit functioning in the same campus.

It conducts research on wood science and technology as a national objective and focuses its research problems to important forestry research needs of the States of Karnataka, Andhra Pradesh and Goa at a regional level.

**4. Tropical Forest Research Institute (TFRI), Jabalpur**

Tropical Forest Research Institute, Jabalpur came into existence in April 1988, although its origin goes back to 1973 when a Regional Centre of FRI, Dehradun was established at Jabalpur to provide research support to the problems of forest management in central India.

**5. Rain Forest Research Institute (RFRI), Jorhat**

Rain Forest Research Institute (RFRI), at Jorhat, central Assam, is one of the constituent institutes under Indian Council of Forestry Research and Education (ICFRE), an autonomous council under Ministry of Environment and Forests, Govt. of India. The Institute was established in 1988 to extend knowledge on forestry related issues through research, education and extension in general and to support forestry research of northeastern states viz., Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura, in particular.

**6. Arid Forest Research Institute (AFRI), Jodhpur**

**7. Himalayan Forest Research Institute (HFRI), Shimla**


Himalayan Forest Research Institute (HFRI), Shimla, Himachal Pradesh was established as High Level Conifer Regeneration Research Centre during May, 1977 for carrying out research on problem associated with natural regeneration of Silver Fir and Spruce. The institute made its humble beginning by starting functioning from a single room in "Kennedy House" and later with the increased research activities of this centre, an independent building "Press Villa" near U.S. club was allotted to it during 1978.

**8. Institute of Forest Productivity (IFP), Ranchi**


**Indian Institute of Forest Management (IIFM), Bhopal**

IIFM, as a sectoral management institute, imparts education in forest management, which is a judicious mixture of forestry, social, and management science. The Institute constantly endeavours to keep in touch with the problems of people, especially the forest dwellers and undertakes need-based research.

## India's Forest Cover

- ✓ The area recorded as “forests” in the Government records is called **Forest Area or Recorded Forest Area**.
- ✓ The patches within the forest area which have little or no trees are called “**Forest Blank**”.
- ✓ The cover of branches and Foliage formed by the crown of trees is called **Canopy**.
- ✓ The **percentage area of land covered by the canopy of trees** is called **Canopy density**.
- ✓ All lands which are more than 1 hectare in area and with a **Canopy density** of more than **10%** **irrespective** of the ownership and legal status is called **Forest Cover**. 
- ✓ A Forest Cover may or may not be a part of recorded **Forest Area**.
- ✓ The degraded forest lands which have a **Canopy density of less than 10%** are called **Scrubs**.
- ✓ The Lands with Canopy density of **10-40%** are called **Open Forests**.
- ✓ The Land with forest cover having a canopy density of **40-70%** is called the **Moderately dense Forest**.
- ✓ The Lands with forest cover having a canopy density of **70%** and more are called **Very Dense Forests**.

Forest Survey of India has been bringing out ‘State of Forest Reports’ since 1987 based on interpretation of satellite images. The 11th report was released in 2009.

- Forest cover mapping in this report was done by digital interpretation of satellite images of **LISS III sensor of Resourcesat-1**. 
- The scale used in these images is 1:50,000 and the minimum mappable area is 1 ha.
- India's forest cover in 2007 is 69.09 million ha which is **21.02%** of the geographical area.
- Of this, 8.35 million ha (2.54%) is very dense forest, 31.90 million ha (9.71%) is moderately dense forest, and the rest 28.84 million ha (8.77%) is open forest.
- The 28.84 million ha open forests also includes 0.46 million ha mangroves.
- Comparing to the 2005 data, there is a **net gain** of 728 km<sup>2</sup> during the period.
- **Largest Forest Cover**
- **Madhya Pradesh** has the **largest forest cover** (7.77 million ha) amongst states/UTs constituting 11.25% of the country's forest cover followed by **Arunachal Pradesh** (9.75%), **Chhattisgarh** (8.09%), **Maharashtra** (7.33%) and **Orissa** (7.07%).

### Forest Cover in North East India

- ✓ The Seven North-East States together account for about one fourth of the total forest covers of the country.
- ✓ The North-East region of the country comprising seven States namely, Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland & Tripura is only 7.76% of the geographic area of the country, but accounts for nearly one fourth of its forest cover. The total forest cover in the region is 170,423 km<sup>2</sup>, which is 66.81% of the geographic area as against the national average of 21.02%. **Compared with the previous assessment, there is a net gain** of 598 km<sup>2</sup>.

### Forest cover in hill districts

- ✓ The Hill District in India is defined as per the **criteria of Hill Taluka by the Planning Commission**. In India, a **Hill District is one with altitude over five hundred metre** from the mean sea level and with over half its area

under hill talukas. In India the number of Hill districts in India is 124. The total forest cover in these 124 Hill Districts was 281,841 km<sup>2</sup>, which is 39.82% of the total geographic area of these districts.

**Forest Cover in Tribal Districts:**

- ✓ The Tribal Districts are identified in India by the Integrated Tribal Development Programme. The number of identified Tribal districts is 188 and the total forest cover in these districts was 412,625 km<sup>2</sup>, which is 37.32% of the total geographic area of these districts.

**India's Mangrove Cover**

- ✓ Mangroves are evergreen, broad leaved trees having aerial roots like pneumatophores or stilt roots and viviparous germinated seedlings found mainly in tropical and subtropical inter-tidal regions of the world. In India, the Mangroves cover is 4,639 km<sup>2</sup>. From the previous estimates, this figure shows the net increase of 58 km<sup>2</sup> over the previous assessment figures. West Bengal has nearly half of the country's mangroves.

**Highest Tree Cover:**

Tree cover constitutes the largest area in Maharashtra (9,466 km<sup>2</sup>) followed by Gujarat (8,390 km<sup>2</sup>), Rajasthan (8,274 km<sup>2</sup>) and Uttar Pradesh (7,381 km<sup>2</sup>).

States/UTs	Geographical Area (GA)	Forest Cover				Percent to GA	Change in forest cover	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Andhra Pradesh	275,069	820	24,757	19,525	45,102	16.40	-129	10,372
Arunachal Pradesh	83,743	20,858	31,556	14,939	67,353	80.43	-119	111
Assam	78,438	1,461	11,558	14,673	27,692	35.30	-66	179
Bihar	94,163	231	3,248	3,325	6,804	7.23	-3	134
Chhattisgarh	135,191	4,162	35,038	16,670	55,870	41.33	-59	107
Delhi	1,483	7	50	120	177	11.94	0	1
Goa	3,702	511	624	1,016	2,151	58.10	-5	1
Gujarat	196,022	376	5,249	8,995	14,620	7.46	16	1,463
Haryana	44,212	27	463	1,104	1,594	3.61	-10	145
Himachal Pradesh	55,673	3,224	6,383	5,061	14,668	26.35	2	327
Jammu & Kashmir	222,236	4,298	8,977	9,411	22,686	10.21	-3	2,036
Jharkhand	79,714	2,590	9,899	10,405	22,894	28.72	172	683
Karnataka	191,791	1,777	20,181	14,232	36,190	18.87	-10	3,176
Kerala	38,863	1,443	9,410	6,471	17,324	44.58	40	58
Madhya Pradesh	308,245	6,647	35,007	36,046	77,700	25.21	-39	6,401
Maharashtra	307,713	8,739	20,834	21,077	50,650	16.46	-11	4,157
Manipur	22,327	701	5,474	11,105	17,280	77.40	328	1
Meghalaya	22,429	410	9,501	7,410	17,321	77.23	116	211
Mizoram	21,081	134	6,251	12,855	19,240	91.27	640	1
Nagaland	16,579	1,274	4,897	7,293	13,464	81.21	-201	2
Orissa	155,707	7,073	21,394	20,388	48,855	31.38	100	4,852
Punjab	50,362	0	733	931	1,664	3.30	4	20
Rajasthan	342,239	72	4,450	11,514	16,036	4.69	24	4,347
Sikkim	7,096	500	2,161	696	3,357	47.31	0	356
Tamil Nadu	130,058	2,926	10,216	10,196	23,338	17.94	24	1,206
Tripura	10,486	111	4,770	3,192	8,073	76.99	-100	75
Uttar Pradesh	240,928	1,626	4,563	8,152	14,341	5.95	-5	745
Uttarakhand	53,483	4,762	14,165	5,568	24,495	45.80	2	271
West Bengal	88,752	2,987	4,644	5,363	12,994	14.64	24	29
Andaman & Nicobar	8,249	3,762	2,405	495	6,662	80.76	-1	53
Chandigarh	114	1	10	6	17	14.91	0	1
Dadra & Nagar Haveli	491	0	114	97	211	42.97	-5	1
Daman & Diu	112	0	1	5	6	5.04	0	3
Lakshadweep	32	0	16	10	26	82.75	0	0
Puducherry	480	0	13	31	44	9.14	2	0
<b>Grand Total</b>	<b>3,287,263</b>	<b>83,510</b>	<b>319,012</b>	<b>288,377</b>	<b>690,899</b>	<b>21.02</b>	<b>728</b>	<b>41,525</b>

\*The change in the above table refers to change in the area with respect to revised assessment for 2005.

### **National Forest Certification Committee or Maharaj Muthoo Committee**

In Recent years, the Forest Certification has emerged as a voluntary market driven mechanism in support of the Sustainable Forest Management. The certification has its origin in the customer's choice in favor of the products labelled to have been forest origin. So, the Certification and Eco-labelling are the new mantras to enhance the product positioning for a premium price on one hand and ensuring better forest management practices on the other hand.

In this context, the MOEF had constituted a National Working Group / Governing Body to frame the policy guidelines for forest certification for timber and Non-timber forest products. Initially the Government created three committees and later these committees were mixed up and a single 'National Forest Certification Committee' for the development of Certification Criteria, Certification Process and Accreditation Criteria & Process towards Forest Certification of timber, Non-timber Forest Products was created. **The chairman of this committee was Prof. Maharaj Muthoo.**

### **T Haque Committee on Minimum Support Price for non-timber forest produce (NTFP)**

A Committee was constituted under the Chairmanship of Inspector General of Forests (NAEB), MOEF for evolving a mechanism for Minimum Support Price to the collectors of Non-Timber Forest Products (NTFP's). The committee submitted its report and recommended the future course of action. In August 2010, the Government set up another high-level committee to examine introduction of minimum support price (MSP) for non-timber forest produce is considering a national cooperative revolution similar to Operation Flood to empower tribals collecting sal seeds, gum kariah and other minor forest produce. Chairman of this committee was Mr T Haque.

This committee was to recommend introduction of a competitive multi-pronged system to empower tribals who do not get even minimum wages for collecting minor forest produce (MFPs). The committee was considering a national-level mechanism similar to National Dairy Development Board (NDDB), which had triggered Operation Flood and revolutionized milk production in India.

### **National Environment Policy**

✍ National Environment Policy 2006 is a response to our national commitment to a clean environment, mandated in the **Constitution in Articles 48 A and 51 A (g), (DPSP) strengthened by judicial interpretation of Article 21.**

It is recognized that the maintenance of the Healthy environment is not the responsibility of the state alone. It is the responsibility of every Citizen and thus a spirit of partnership is to be realized through the environment Management of the country. Here is the summary of the National Environment Policy 2006:

#### **Challenges:**

The key environmental challenges that India faces are related to the nexus of environmental degradation with poverty in its many dimensions, and economic growth. Challenges are intrinsically connected with the state of environmental resources, such as land, water, air, and their flora and fauna.

#### **Drivers of Degradation**

Proximate drivers of environmental degradation are population growth, inappropriate technology and consumption choices, and poverty, leading to changes in relations between people and ecosystems, and development activities such as intensive agriculture, polluting industry, and unplanned urbanization. Other drivers of degradation are the lack of clarity or enforcement of rights of access and use of environmental resources, policies which provide disincentives for environmental conservation (and which may have origins in the fiscal regime), market failures (which may be linked to shortcomings in the regulatory regimes), and governance constraints.

### **Impact on Health**

Poor environmental quality has adversely affected human health. Environmental factors are estimated as being responsible in some cases for nearly 20 percent of the burden of disease in India, and a number of environment-health factors are closely linked with dimensions of poverty (e.g. malnutrition, lack of access to clean energy and water). Interventions such as reducing indoor air pollution, protecting sources of safe drinking water, protecting soil from contamination, improved sanitation measures, and better public health governance, offer tremendous opportunities in reducing the incidence of a number of critical health problems.

### **Objectives of the Policy**

- ✓ Conservation of Critical Environmental Resources
- ✓ Intra-generational Equity: Livelihood Security for the Poor
- ✓ Inter-generational Equity
- ✓ Integration of Environmental Concerns in Economic and Social Development:
- ✓ Efficiency in Environmental Resource Use
- ✓ Environmental Governance
- ✓ Enhancement of Resources for Environmental Conservation

### **Principles of National Environment Policy 2006:**

The Policy evolved from the recognition that only such development is sustainable, which respects ecological constraints, and the imperatives of justice. The Objectives stated above are to be realized through various strategic interventions by different public authorities at Central, State, and Local Government levels. They would also be the basis of diverse partnerships. The principles followed in the policy are:

1. Human Beings are at the Centre of Sustainable Development Concerns:
2. Right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations.
3. In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it.
4. Where there are credible threats of serious or irreversible damage to key environmental resources, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

5. In various public actions for environmental conservation, economic efficiency would be sought to be realized

**“Polluter Pays” principle:**

Impacts of acts of production and consumption of one party may be visited on third parties who do not have a direct economic nexus with the original act. Such impacts are termed “externalities”. The National Environment Policy promotes the internalization of environmental costs, including through the use of incentives based policy instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest, and without distorting international trade and investment.

**Legal Liabilities in the Policy**

The environmental redressal mechanism based on doctrines of **criminal liability**, have not proved sufficiently effective, and need to be supplemented. **The policy adopts the civil liability for environmental damage** that would deter environmentally harmful actions, and compensate the victims of environmental damage.

The alternatives to Civil Liability may also apply viz. **Fault Based liability** and **Strict Liability**.

- ✘ In **Fault Based Liability** a party is held liable if it **breaches a preexisting legal duty**, for example, an environmental standard.

- ✘ **Strict liability** imposes an obligation to **compensate the victim** for harm resulting from actions or failure to take action, which may not necessarily constitute a breach of any law or duty of care.

**The Doctrine of Public Trust**

As per this doctrine, the **State is not an absolute owner, but a trustee of all natural resources**, which are by nature meant for public use and enjoyment, subject to reasonable conditions, necessary to protect the legitimate interest of a large number of people, or for matters of strategic national interest.

**Legislative Reforms**

A judicious mix of **civil and criminal processes** and sanctions will be **employed** in the legal regime for enforcement, through a review of the existing legislation. The policy calls for identification of the emerging areas for new legislation, due to better scientific understanding, economic and social development, and development of multilateral environmental regimes, in line with the National Environment Policy. It also calls for review the body of existing legislation in order to develop synergies among relevant statutes and regulations.

**Environment Impact Assessment:**

The policy focuses on encouraging the regulatory authorities, Central and State, to institutionalize regional and **cumulative environmental impact assessments** (R/CEIAs) to ensure that **environmental concerns** are identified and **addressed at the planning stage itself**.

**CRZ**

The **policy aims to revisit** the Coastal Regulation Zone (CRZ) notifications to make the approach to coastal environmental regulation more holistic, and thereby ensure protection to coastal ecological systems,

coastal waters, and the vulnerability of some coastal areas to extreme natural events and potential sea level rise.

✓ In pursuance with the Policy CRZ Notification 2011 was released recently.

### **The Problem of LMOs**

LMO refers to the **Living Modified Organisms**. Living modified organisms (known as LMOs) result from modern biotechnology is broadly equivalent to genetically modified organisms.

✍ The **difference between an LMO and a GMO** is that a Living Modified Organism is **capable of growing**, and typically refers to **agricultural crops**. Genetically Modified Organisms **include both LMOs** and organisms which are **not capable of growing**, i.e. are dead.


The National Environment **Policy** says that **Genetically Modified Organisms** **require evaluation** of their potential benefits and risks as part of relevant regulatory processes. The subset of **LMOs**, may, however, owing to their potential for replication, **involve environmental concerns in addition**. LMOs may pose significant risks to ecological resources, and perhaps, human and animal health. In order to ensure that development of biotechnology does not lead to unforeseen adverse impacts, the policy aims to review the regulatory processes for LMOs so that all relevant scientific knowledge is taken into account, and ecological, health, and economic concerns are adequately addressed.

### **Environmentally Sensitive Zones**

✍ The Environmentally Sensitive Zones are the areas with identified **environmental resources** having **"Incomparable Values"** which require special attention for their conservation.


In order to conserve and enhance these resources, without impeding legitimate socio-economic development of these areas, the **National Environment policy aims to identify and give legal status to Environmentally Sensitive Zones** in the country having environmental entities with **"Incomparable values" requiring special conservation efforts**. The policy also envisages formulating area development plans for these zones on a scientific basis, with adequate participation by the local communities.

### **Desert Habitats**

✍ The arid and semi-arid region of India covers 127.3 mha (**38.8%**) of India's geographical area and spreads over 10 states. 

The Indian desert fauna is extremely rich in **species diversity of mammals** and **winter migratory birds**. However the pressures of a rapidly increasing population on the natural resource base necessitate adoption of innovative and integrated measures for conservation of desert ecosystems. The policy aims at measures such as **Intensive water and moisture conservation** through practices based on traditional and science based knowledge, and relying on traditional infrastructure.

### **Panchayats & Women Participation**

The **policy aims** at working towards giving the legal recognition of the traditional entitlements of forest dependent communities taking into consideration the provisions of the **(PESA)**. This would remedy a serious historical injustice, secure their livelihoods, reduce possibilities of conflict with the Forest Departments, and **provide long-term incentives to these communities** to conserve the forests. 

## Wild life

The policy aims to expand the Protected Area (PA) network of the country, including Conservation and Community Reserves, to give fair representation to all bio-geographic zones of the country. In doing so, develop norms for delineation of PAs in terms of the Objectives and Principles of the National Environment Policy, in particular, participation of local communities, concerned public agencies, and other stakeholders, who have a direct and tangible stake in protection and conservation of wildlife, to harmonize ecological and physical features with needs of socio-economic development.

## SUSTAINABILITY & MISC. ENVIRONMENT TOPICS

### Brundtland Commission

The above definition of Sustainable Development was given by **Brundtland Commission**. Brundtland Commission was a commission established by the United Nations in 1983 as *World Commission on Environment and Development (WCED)*. The commission was created to address the growing concern "about the accelerating deterioration of the human environment and natural resources and the consequences of that deterioration for economic and social development."

The outcome of this commission was the "**Brundtland Report**". The title of this report was "**Our Common Future**". This report gave the definition:

*"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."* and this definition is quoted first of all when anybody discusses about the sustainability.

### Earth Charter

"**Our Common Future**" the report of the "Brundtland Commission" came out with a new guide to sustainable development. The "Brundtland Commission", called for "a universal declaration" and "new charter" to set "new norms" to guide the transition to sustainable development.

Maurice Strong was a distinguished member of the Commission.

The Earth Charter was proposed during the preparatory process to the UN Conference on Environment and Development -- best known as the Earth Summit -- held in Rio de Janeiro, Brazil, in 1992.

After the **Rio Summit or Earth Summit (Vasundhara Sammelan in Hindi)** in 1992, in 1994, Maurice Strong (Chairman of the Earth Summit) and Mikhail Gorbachev, working through organizations they each founded (the Earth Council and Green Cross International respectively), restarted the Earth Charter as a civil society initiative, with the help of the government of the Netherlands.

✍ Earth Charter is a 2,400 word document divided into 4 sections, called four pillars and sixteen main principles containing sixty-one supporting principles.

It starts with a Preamble and ends with a conclusion "The Way Forward". The earth Charter can be read here: <http://www.earthcharterinaction.org/content/pages/Read-the-Charter.html>



### 3 Pillars of Sustainability

At the 2005 World Summit it was noted that sustainable development requires the reconciliation of environmental, social and economic demands. These three are called the "three pillars" of sustainability viz. **Environment, Society & Economy.**

### Sustainability measurement

The measurement of sustainability in quantitative terms uses various parameters & reporting systems such as indicators, benchmarks, audits, indexes and accounting, as well as assessment, appraisal of the environmental, social and economic domains. Depending upon the tools and reporting methods they can vary. Some important measurements are

1. Corporate sustainability reporting,
2. Triple Bottom Line accounting
3. Environmental Sustainability Index
4. Environmental Performance Index.

The matrices and indices are called **Sustainable development indicators (SDI)**, which have the potential to turn the generic concept of sustainability into action. The **Tripple Bottom Line** accounting called TBL or 3BL" uses "**people, planet, profit**" or "**the three pillars**" for measurement of sustainability. The ESI and EPI are discussed here.

### Environmental Performance Index

Environmental Performance Index was first published in 2006 as a Pilot EPI. Up till now it has been published thrice and the last was published in 2010. It uses the objective parameters of ENVIRONMENTAL HEALTH and ECOSYSTEM VITALITY and is based upon 25 elements. These elements are listed here:

- |                                    |   |
|------------------------------------|---|
| 1. Environmental Burden of Disease | 14. Marine Protected Areas              |
| 2. Adequate Sanitation             | 15. Growing Stock                       |
| 3. Drinking Water                  | 16. Marine Trophic Index                |
| 4. Indoor Air Pollution            | 17. Trawling Intensity                  |
| 5. Urban Particulates              | 18. Irrigation Stress                   |
| 6. Local Ozone                     | 19. Agricultural Subsidies              |
| 7. Regional Ozone                  | 20. Intensive Cropland                  |
| 8. Sulfur Dioxide Emissions        | 21. Burnt Land Area                     |
| 9. Water Quality Index             | 22. Pesticide Regulation                |
| 10. Water Stress                   | 23. Emissions per capita                |
| 11. Conservation Risk Index        | 24. Emissions per electricity generated |
| 12. Effective Conservation         | 25. Industrial carbon intensity         |
| 13. Critical Habitat Protection    |   |

Please note that EPI is released at **World Economic Forum** by **Yale University** and **Columbia University**.

✂ The 2010 ranking is topped by Iceland.

### Why Iceland is on top?

Because, **Iceland** makes high scores on environmental public health, gets virtually all of its power from renewable sources (hydropower and geothermal energy) and its control of greenhouse gas emissions.

However, in 2008, Switzerland was on top and in 2006 New Zealand was on top slot.

The 2010, top 10 countries are as follows:

1. Iceland 93.5
2. Switzerland 89.1
3. Costa Rica 86.4
4. Sweden 86.0
5. Norway 81.1
6. Mauritius 80.6
7. France 78.2
8. Austria 78.1
9. Cuba 78.1
10. Colombia 76.8



India's EPI Rank was 123 with EPI score of 48.3. Pakistan follows India with 48.0 score and China precedes India with a score of 49.0.

### Green Investing

Green Investing or Eco-investing is a term applied to investing in companies that support or provide environmentally friendly products and practices. This includes but not limited to investments in Renewable Energy such as solar, wind, tidal current, wave and conventional hydro technology. The term has led to development of Exchange Traded Funds and Mutual Funds in many markets of the world that deal specially with the portfolio of such companies.

✎ Countries with strong and clear national policies, mandated energy quotas, a carbon market, and loans for green energy projects are leaders in the Green Investing.

One such example is China which has a strong national industrial policy, and has set aggressive carbon reduction targets, it also produces 700 000 engineering graduates a year, giving it an intellectual boost. The USA on the other hand has a disparate attitude towards green energy in every one of 50 states, and is still arguing over carbon legislation.

### India and Green Investing

The concept is new in India.

The Government is planning to set up a **green investment bank** to support renewable energy-based power plants. This bank will be powered by the coal tax that the government introduced in 2010.

✎ In the Budget 2010, the Indian finance minister unveiled a \$1 per ton tax on coal mined domestically or imported into the country.

The finance ministry expects to collect 5,000 Crore (about \$1.1 billion) this fiscal year. This fund would be used for providing financial incentives to the project developers who wish to set up power plants based on renewable energy. The Indian government has announced several financial aid packages to spur investment in the renewable energy sector. Subsidies are being offered at various stages of the project execution.

There is huge demand for clean energy investments in our country, but there is no single entity to provide easy financing options to the project proponents. At present, financial support for the renewable energy

power plants is provided by the **Indian Renewable Energy Development Agency (IREDA)** which has access to tax-free bonds worth \$55 million and loans from banks through direct collaborations. The new entity would either originate from IREDA or would complement it.

## Green GDP

Green Gross Domestic Product is the index of the Economic growth of a particular country which enshrines the environment consequences of the economic growth.

- ⊗ Green GDP **does not mean** the **monetary value of the Forests** etc.
- ⊗ Green GDP **does not mean** the **growth of Green Investments**.
- ✎ Green GDP means that **it accounts the monetized loss of biodiversity, costs caused by climate change**.
- ✎ Green GDP is **conventional gross domestic product figures adjusted for the environmental costs of economic activities**. It's a measure of how a country is prepared for sustainable economic development. This means that GDP may have some indicators such as Waste per capita or CO<sub>2</sub> emissions growth/ decline.
- ✎ It was China which announced as early as 2004 that a Green GDP with Chinese GDP Index will be released.
- ✎ China, a pioneer in the factoring in costs of environmental degradation into economic growth estimates, **first published its green GDP data for the year 2004** in 2006.

But it is India which has given the most promising national activity on the Green GDP. In 2009, India's Environmental Minister, Jairam Ramesh had announced that "It is possible for scientists to estimate green GDP" As a consequent to this, an exercise was started under the country's chief statistician Pronab Sen. **India's GDP numbers will be adjusted with economic costs of environmental degradation by 2015.**

## Ecological debt

Ecological debt refers to the **consumption of resources** from within an ecosystem **that exceeds the system's regenerative capacity**. This is the overall depletion of the Global resources beyond the Earth's ability to regenerate them. The term is closely related to the **Carrying Capacity**.

- ✎ The concept of Ecological Debt has given rise to observation of **Ecological Debt Day**.

## Carrying Capacity

In context with environment, **the Carrying Capacity of a biological species in an environment refers to the population size of the species that the environment can sustain indefinitely**, given the food, habitat, water and other necessities available in the environment.

- ✎ The population of this species will increase below carrying capacity and will decrease above carrying capacity.

### How does it work?

Usually, the birth rate is higher than the death rate for organisms. This is known as **Natural Increase**. The carrying capacity is the number of individuals an environment can support without significant negative impacts to the given organism and its environment. When the population grows above the carrying capacity, the population tends to decrease. However, at that point there are regulating factors that keep equilibrium in the population.

- ✎ Carrying capacity of an environment varies for different species is affected by food availability, water supply, environmental conditions and living space.

## Ecological Foot print & Biocapacity

Idea of ecological Footprint was given by William Rees in 1992. It is a measure of **human demand on the Earth's ecosystems** and its **ecological capacity to regenerate the resources consumed by Human**. There are two closely related concepts.

1. Humanity's Ecological Footprint
2. Earth's biocapacity

✍ **Ecological Foot print** represents the impact that entity (nation/ town/ individual/ entire world) made on the Earth that year by **consuming a set amount of the Earth's resources**.

✍ So, the over-consumption of the Earth's natural resources is unsustainable as the Earth's **biocapacity will eventually collapse** should this behavior continue.

In other words, Ecological Footprint is the **measure** of how much biologically productive **land and water** an individual, population or activity requires to produce all the resources it consumes and to absorb the waste it generates using prevailing technology and resource management practices.

The Ecological Footprint is **measured** in **global hectares**. Because trade is global, an individual or country's Footprint includes land or sea from all over the world.

### What is a Global Hectare?

Global hectare is used to measure the ecological foot print **as well as biocapacity** of entire Earth. When we understand both the terms, we can arrive at **ecological deficit**.

✍ In terms of **Ecological Footprint**, One global hectare refers to average productive land and water an individual, population or entity requires producing all the resources it consumes.

✍ When we say that **world-average ecological footprint** in 2007 was **2.7 global hectares** per person (18.0 billion in total), this means that **this was the** per person productive land and water **required for producing** all the resources he / she consumed.

In terms of **Biocapacity**, the Global Hectare refers to **average biocapacity** of any biologically productive areas on the planet. When we say, that the world-average biocapacity in 2007 was **1.8** global hectares per person (12 billion in total), this means that it is the amount of biologically productive land and water available per person on the planet.

### Impact of Population on Biocapacity

In 2005 there were 13.4 billion hectares of biologically productive land and water available and 6.5 billion people on the planet. This is an average of **2.1 global hectares per person**. Since the world's population is growing rapidly, this number is **rapidly decreasing**. In 2008, it became 1.8 Global Hectare Per person. In 2011, it may be even lesser than that.

✍ **Thumb rule:** **Increasing population** leads to **decrease in the amount of biologically productive land** and water available per person on the planet.

## Ecological Deficit

The world-average **ecological footprint** in 2007 was 2.7 global hectares per person. In the same year, the world-average **biocapacity** was 1.8 global hectares per person. So, the difference between the Ecological Footprint and Biocapacity **was 0.9 Global hectares per person**. This is known as **Ecological Deficit**.

This means that **ecological deficit occurs when the Footprint of a population exceeds the biocapacity of the area available to that population**.

✂ **Most of the countries in the world are ecologically deficit.**

When a country does not have enough ecological resources within its own territory, then there is a local ecological deficit and it is called an **ecological debtor country**. If the country has enough ecological resources in its territory, it has ecological remainder and it is called an **ecological creditor country**.

Here, we take example of some countries. First we take example of India.

✂ As per the 2007 **Global Footprint Network** publication, **India's Ecological Footprint was 0.91 Global Hectare Per Person**. However, the **biocapacity was 0.51 Global Hectare Per Person**. So India's **Ecological deficit was -0.40 Global Hectare Per Person**. So India is a ecological debtor country.

✂ When we take example of Guyana, its Ecological Footprint was 2.38 Global Hectare Per Person. But its biocapacity was 62.13 Global Hectare Per Person. This country had Ecological deficit of +59.75. This is an example of ecological creditor country. **Guyana had the largest biocapacity in the world**.

✂ The country with **largest Ecological Footprint** in 2007 was **UAE**. Its Ecological Footprint was 10.68 Global Hectare per Person. But the biocapacity was only 0.85 Global Hectare Per person. So, the ecological deficit of UAE was -9.83 Global Hectares per Person, which is **highest in the world**.

The latest Ecological Footprint Atlas was published by Global Footprint Network in October 2010.

## Ecological Debt Day

✂ **Ecological Debt Day** is also known as "**Earth Overshoot Day**".

**The Ecological debt date refers to the calendar date in which the total resources consumed by humanity will exceed the capacity for the Earth to generate those resources that year.**

It is arrived by dividing the world biocapacity, the number of natural resources generated by the earth that year, divided by the world Ecological Footprint, humanity's consumption of the Earth's natural resources for that year, and multiplied by 365. It is shown in the **following** formula:

**World biocapacity ÷ World Ecological Footprint x 365 = Ecological Debt Day**

✂ The first Ecological Debt Day was observed on **December 19, 1987**.

✂ Latest Ecological Debt Day was observed on **August 21, 2010**.

Before that date, humanity's consumption of the Earth's natural resources was outweighed by the Earth's ability to regenerate its resources in that particular year.

### How does it work?

In 2010, August 21 was seen as the **Ecological Overshoot Day** or **Ecological Debt Day**. This means that the from that day onwards till the end of year, the humanity enters **deficit spending**.

### Who decides the Ecological Debt Day?

The **New Economics Foundation (NEF)**, which is an independent British think-tank, marks the Ecological Debt Day.

### Carbon Footprint

**Carbon Footprint** refers to the GHG emission by an entity, event, product or person. It is expressed in terms of the amount of carbon dioxide, or its equivalent of other GHGs, emitted. Most common used unit is CO<sub>2</sub> equivalent. The carbon footprint is seen as a subset of the ecological footprint.

- When we compare various forms of energy generation: Nuclear, Hydro, Coal, Gas, Solar Cell, Peat and Wind generation technology, we find that **Coal has the largest Carbon footprint among others**. Coal is followed by Oil, Natural Gas and Geothermal Energy. The hydroelectric, wind, and nuclear power always produce the least CO<sub>2</sub> per kilowatt-hour of any other electricity sources. That too in construction only and not in operation.

### Water Footprint

Water Footprint is defined as **the total volume of freshwater** that is **used to produce** the goods and services **consumed by** the individual or community or produced by the business. As per the use and source, it is of three kinds viz **blue, green** and **grey** water footprint.

- The **Blue Water Footprint** means volume of freshwater that **evaporated** from the global **blue water resources** such as **lakes, rivers, ponds, reservoirs and wells** in producing the goods and services consumed by the individual or community.
- Green Water Footprint** means volume of **freshwater** that **evaporated** from the global green water resources such as **moist lands, wetlands, soil, farms** etc. in producing the goods and services consumed by the individual or community.
- Grey Water Footprint** means volume of freshwater that **was polluted** in producing the goods and services consumed by the individual or community.

The water footprint is measured in terms of Cubic Meter / per person/ per year. Approximate Global Water Footprint is 1240 m<sup>3</sup> water/person/year.

### Green Highway

The highway constructed keeping in view the integration of transportation functionality and ecological sustainability is called Green Highway. In USA, Green Highways Partnership (GHP) is an alliance of Federal Highway Administration (FHWA), U.S. Environmental Protection Agency (EPA), other Federal agencies, State transportation and environmental agencies, industry, trade associations, members of academia, and contractors to encourage environmentally friendly road building.

### Green Brands

**The Brands that are associated with the environmental conservation and sustainable business practices are green brands.** It's a relatively new concept. Now a days, Indian consumers are concerned about the environment and prefer to spend more on green products but don't know how to. One reason is of limited choice, limited distribution and limited labelling. This implies a huge latent opportunity for brands to tap into the power of green and create greater relevance for consumers.

## Green Benches

Green Benches refers to the **benches of the National Green Tribunal**. The National Green Tribunal (NGT) Bill was recently passed to quickly dispose of environmental protection cases.

Its worth note that the **National Green Tribunal (NGT) Bill, 2009** was introduced by Minister of Environment and Forests in July 2009 with the following objective:

to provide for the establishment of a National Green Tribunal for the effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental thereto.

The bill was passed by Lok Sabha in **May 2010** as **National Green Tribunal Bill 2010** and got president's assent as **National Green Tribunal Act of 2010** on June 2, 2010. This act envisages the setting up of a national tribunal, a **judicial body** exclusively to deal with environmental laws and to provide citizens a right to environment.

☞ The **main Bench of the tribunal is to set up in Bhopal,**

On October 19, 2010, the National Green Tribunal (NGT) has officially been notified by the Chairperson of the Tribunal, **Justice Lokeshwar Singh Pant**. Justice Pant took charge as Chairman of National Green Tribunal on October 19, 2010.

It would **deal with all environmental laws on air and water pollution**, the **Environment Protection Act**, the **Forest Conservation Act** and the **Biodiversity Act**.

👉 With this effort, India would join Australia and New Zealand, which have such specialized environment tribunals.

👉 The National Green Tribunal is exclusively dedicated to environmental issues.

☞ This Body, established by an Act of Parliament (being the National Green Tribunal Act of 2010) will have **circuit benches also known as Green benches across the country** to try all matters related to and arising out of environmental issues.

The Tribunal which shall also consist of members, who are experts in the field of environmental and related sciences, has been empowered to issue directions for the compensation and restitution of damage caused from actions of environmental negligence. In doing so, this is the first body of its kind that is required by its parent statute; to apply the polluter pays principle and the principle of sustainable development.

With this, the erstwhile **National Environment Appellate Authority** has **seized to exist** and all its the functions will be transferred to NGT.

☞ After Australia and New Zealand, India has this important institution. The NGT will follow various decisions of the Supreme Court and 186 Reports of the Law Commission. There are 5000 cases today in various High Courts and District Courts.

☞ Please note that earlier the Government had declared that **National Environmental Protection Authority (NEPA)** will be constituted soon. With this, **NGT** and **NEPA** will constitute the **pillars of reformed system** of Environmental Governance.

## Desertification

Desertification refers to **degradation of land in arid, semi-arid, and dry sub-humid areas** due to an array of factors. **The direct impact of desertification is reduced biodiversity.** The reasons are many such as climatic changes such as drought, or human such as overgrazing. Desertification is recognized as a major threat to biodiversity and consequently leads the countries to develop plans to counter its impacts.

**The opposite term (antonym) of Desertification is Oasification.** In oasification, soil and nutrient harvesting are regarded as fundamental component parts in the reclamation process of a degraded land. This

is a limited application technique and does not work to combat desertification as the area threatened is usually very large.

### **United Nations Convention to Combat Desertification**

Desertification is a major economic, social and environmental problem of concern to many countries in all regions of the world. In 1977, the **United Nations Conference on Desertification** (UNCOD) adopted a Plan of Action to Combat Desertification (PACD).

In 1991, the United Nations Environment Programme (UNEP) concluded that the problem of land degradation in arid, semi-arid and dry sub-humid areas had intensified, although there were "local examples of success". So the question of **how to tackle desertification** was still a **major concern** for the United Nations Conference on Environment and Development (UNCED), which was held in Rio de Janeiro in **1992**.

The Rio Summit supported a new, integrated approach to the problem, emphasizing action to **promote sustainable development** at the **community level**. It also called on the United Nations General Assembly to establish an Intergovernmental Negotiating Committee (INCED) to prepare, by June 1994, a Convention to Combat Desertification, particularly in Africa. In December 1992, the General Assembly agreed and adopted resolution 47/188.

On 17 June 1994, on the basis of **direct recommendation of Agenda 21**, "United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa" was adopted in Paris.

- ✍ **UNCCD** is the **only convention** that was **directly recommended by Agenda 21** of the Earth Summit.
- ✍ It was adopted on June 17, **1994** and came into force in December 1996. June 17 is observed as **world day to combat desertification and drought**
- ✍ Its first COP was held in 1997. Ninth COP was held in Argentina in 2009.
- ✍ It has 193 parties.
- ✍ The permanent Secretariat of the UNCCD was established during the first Conference of the Parties (COP 1) held in Rome in 1997. It has been located in Bonn, Germany since January 1999.

### **India & Desertification**

**India is a party** to the United Nations Convention to Combat Desertification (UNCCD), and the Government of India in fulfillment of one of the obligations of the parties to the convention, submitted a **National Action Programme to Combat Desertification** to the Secretariat of the UNCCD in 2001.

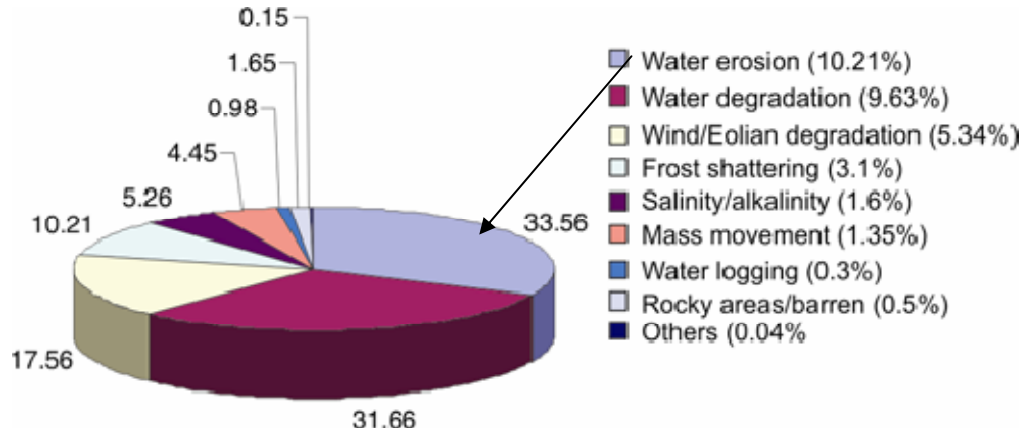
- ✍ In India, the total area under desertification is **81.45** mha.
- ✍ **Water erosion** (26.21 mha), **wind erosion** (17.77 mha), **vegetal degradation** (17.63 mha) and **frost shattering** (9.47 mha) are the major processes of desertification.
- ✍ Nearly **one third of the country's land area (32.07%) is undergoing processes of land degradation**.
- ✍ There are about **eight major processes of land degradation active in the country**.
- ✍ **Water erosion is the most pronounced process**, followed by vegetal degradation and aolian processes. Total area under land degradation is 105.48 mha.



✍ Area-wise **Rajasthan, J&K, Gujarat and Maharashtra** have high proportions of land undergoing degradation.

✍ 81.45 mha land area of the country is undergoing the process of desertification.

The following picture shows the processwise Land Degradation status of India



### Importance of Jojoba Plant



In India, the **Jojoba plant** has also been used to combat and prevent desertification in the **Thar Desert** and has proved to be quite **successful**. The Jojoba Plant (*Simmondsia chinensis*) is native to the Sonoran and Mojave deserts of Arizona, **California**, and **Mexico**. Jojoba is grown commercially for its **oil**, a liquid wax ester, expressed from the seed. Jojoba oil is similar to human sebum and whale oil than to traditional vegetable oils. It is of commercial importance.

Thus, Jojoba serves the **dual purpose** of **fighting desertification** as well as playing role as a crop of **Industrial Importance**.

The shrub can live up to 150 years and can attain a height of about 3-5 meters; it can tolerate high and low temperatures.

✍ The commercial production of Jojoba require only about 450-650mm annual rainfall.

The oil makes up approximately 50% of jojoba seed by weight. Jojoba oil is a mixture of wax esters which have 36 to 46 carbon atoms in length. **Jojoba Oil Consists of Wax esters** and the **wax esters** are made up of **fatty acid and a fatty alcohol**. It is used majorly in personal care products, in moisturizers, face creams, shampoos, hair oil, lipstick, conditioners, anti-aging and sun care products. It can also be used in lubricants or additive to other lubricant, it is also considered as good substitute for sperm whale oil. It can also be used in preparation of other chemicals and in pharmaceuticals applications.

✍ The worldwide production of jojoba seeds is approximately 5800 tons and jojoba oil is 2700 tons.

✍ **Argentina** accounts for nearly **50%** of all the seeds produced.

✍ North America is the leading region as a consumer for Jojoba oil applications in the cosmetics followed by Europe

### How it is beneficial to India?

The **cost of production** of Jojoba oil in **India** is almost **one fifth times** than that of other countries. Presently of all the oil that is produced in India 99 % is consumed in domestic market. The market has not reached maturity level in India, also has got huge potentials for exports.

#### **Area Producing:**

600-700 hectares of land is under jojoba cultivation in all over India. Out of it **85-90 % is in Rajasthan**, approx 100 hectares in **Gujarat** & 50 hectares in **Maharashtra**. **Rajasthan is perfectly suitable as the climatic conditions favor the cultivation**. There is also good potential for jojoba cultivation in Punjab, Haryana Orissa, Tamil Nadu, Andhra Pradesh and Karnataka.

In 1995, Government of India has set up an association of Rajasthan Jojoba Plantation and Research Project (AJORP) with 100% **funding from the Department of Land Resources, under Ministry of Rural Development**. As technical know-how was limited in the beginning, an **MOU** was signed between **AJORP and HAIGUD Israel** to facilitated transfer of technology in promoting jojoba plantation. This included import of a green house which was commissioned in the year 1997.

#### **Biodegradation**

The biochemical breakdown of the materials is Biodegradation. It is different from **Biomineralization**, which refers to production of minerals by the living organisms. All kinds of animals are able to form minerals. 6 taxonomic Kingdoms *Plantae* and *Animalia* have members that produce minerals.

However, Biodegradation involves the degradation of the material. The degradation can be either aerobic or anaerobic.

#### **Biodegradable Plastics**

The **plastics that decompose in aerobic and anaerobic environment are called biodegradable plastics**. They are of mainly two types, viz. **bioplastics**, which are plastics whose components are derived from renewable raw materials, or **petroleum-based plastics** which utilize an additive.

Bioplastics are derived from renewable biomass sources, such as vegetable oil, corn starch, pea starch or microbiota. Some notable **examples** are given here:

- 👉 **Plastarch Material (PSM)** is a biodegradable, thermoplastic resin composed of starch combined with several other biodegradable materials.
- 👉 **Cellulose Bioplastics**, which are mainly the cellulose esters.
- 👉 **Polylactic acid (PLA)** is a transparent plastic produced from cane sugar or glucose
- 👉 **PA 11**, which is also known as **Nylon 11** is a biopolymer derived from vegetable oil (mostly castor). However, **Nylon 12** is a petroleum-based plastic with similar properties and applications. It is being eclipsed by Nylon 11 due to the increasing value of its non-petroleum origin.

#### **Renewable Polyethylene**

Renewable Polyethylene is also known as **Biopolyethylene**. It is **made by Ethanol** by dehydration. By Dehydration, the Ethanol becomes Ethylene which gets polymerized to give Renewable Polyethylene. The sources of making this material are sugarcane, sugar beat and even wheat. The product is similar to Naphta or Gas based Polyethylene.

## Biofuels

Biofuels are fuels which are in some way derived from biomass. The term covers solid biomass, liquid fuels and various biogases.

## Bioalcohols

Bioalcohols are the biologically produced alcohols. Ethanol fuel is the most common biofuel worldwide, particularly in Brazil, because of its Sugar Industry.

The Bioalcohols are produced by fermentation of sugars derived from wheat, corn, sugar beets, sugar cane, molasses and any sugar or starch. Ethanol is used in petrol engines as a replacement for gasoline; mostly blended up to 15%. But please note that it can be mixed with gasoline to any percentage.

## Ethanol v/s Gasoline

- Please note that Ethanol has smaller energy density than gasoline. This means that it takes more fuel by volume and mass to produce the same amount of work. This is the major reason why we don't use 100% Ethanol and use only a blend of Ethanol.
- The major advantage of Ethanol is that it has a higher octane rating than ethanol-free gasoline. The Ethanol increases engine's compression ratio for increased thermal efficiency. Further, at higher altitude locations, a few countries a a mandatory mix of gasoline and ethanol to reduce atmospheric pollution emissions.
- However, higher octane ratio makes higher compression ratios that will make gasoline engines subject to engine knocking. This can reduce efficiency or damage the engine if knock sensors are not present to retard the timing. So both the above are the reasons that Ethanol is blended in Gasoline.

## India and Ethanol blending

The Ethanol Blended Petrol (EBP) programme earlier launched by the Government **could not sustain owing to non-availability of ethanol** in required quantity and other state specific issues. Later, to give fillip to the programme, Government gave fresh relook and decided on 16.8.2010 to implement the EBP programme to the extent of the ethanol made available by the domestic ethanol producers at the ex-factory declared price decided by the Government.

- As per the Government decision, after ascertaining the actual availability of ethanol in the country, percentage of blend from 0-10% would be recommended area-wise by the working group of officers constituted for the purpose.
- Government fixed provisional price of ethanol at Rs. 27 per litre.
- The programme was re-launched in November, 2010 after fresh tenders issued by the OMCs for sourcing ethanol.

## Biodiesel

Biodiesel is vegetable oil- or animal fat-based diesel fuel consisting of long-chain alkyl esters. It is used as a blend to Petro Diesel and **denoted by B factor**. This means that 100% biodiesel is referred to as **B100**, while 20% biodiesel, 80% petro diesel is labeled **B20**. Similarly 5% biodiesel, 95% petro diesel is labeled **B5**.

- Global biodiesel production was around 4 million tons in 2006 and around 85% of biodiesel production came from the **European Union**.

## **Jatropha and Biodiesel**

There are 175 species of Jatropha plant that belongs to family Euphorbiaceae. In 2007 Goldman Sachs cited **Jatropha curcas** as one of the best species for future biodiesel production and from here it began getting popular. The **Jatropha plant is resistant to drought and pests, and produces seeds containing 27-40% oil**. In India, **Jatropha is known as Ratanjot** shows resemblance with castor. Apart from Ratanjot, about nine species are reported out of which **Jatropha Curcus** has economic value by virtue of oil present in its seed. The Govt. of India and Planning Commission are emphasizing on alternative fuels as a result the area under Jatropha cultivation is catching up. The oil finds many applications in various industries like soaps, illuminants and paints.

### **SDAUJ-I (Chatrapati)**

In **2006**, the Indian Council of Agricultural Research identified **first ever Jatropha variety, SDAUJ I (Chatrapati) with higher oil content and yield for commercial cultivation. The seeds contain 49.2 per cent oil and the non-edible protein in defatted seed case is 47.8 per cent.**

Farmers can get an average yield of 1000-1100 kg per hectare under rainfed conditions. The **ICAR recommended it for the semi-arid and arid regions of Gujarat and Rajasthan**. It is drought resistant and can be raised successfully in areas where annual rainfall is 300-500mm. The plant attains a height up to 8 feet and shows resistance to all major pests.

SDAUJ I (Chatrapati) is developed by Sardarkrushinagar based Sardarkrushinagar Dantiwada Agricultural University (SDAU). The other parts of Jatropha i.e. leaves, roots and latex are also useful in traditional medicine.

➤ An alkaloid derived from Jatropha plant i.e. crucin shows anticancer properties.

### **National Policy on Biofuels**

Union Cabinet of India had approved the National Policy on Bio-fuels & its implementation in **2009**. The Union Cabinet has also approved the setting up of a **National Biofuel Coordination Committee** and a **Biofuel Steering Committee**.

#### **Objective:**

The Policy will bring about accelerated development and promotion of the **cultivation, production and use** of Biofuels to increasingly substitute petrol and diesel for transport and be used in stationary and other applications, while contributing to **energy security, climate change mitigation**, apart from creating new **employment opportunities** and leading to environmentally **sustainable development**. The Policy endeavors to facilitate and bring about optimal development and **utilization of indigenous biomass** feedstocks for production of bio-fuels.

*Bio-fuels provide a strategic advantage to promote sustainable development and to supplement conventional energy sources in meeting the rapidly increasing requirements for transportation fuels associated with high economic growth, as well as in meeting the energy needs of India's vast rural population.*

*Bio-fuels can increasingly satisfy these energy needs in an environmentally benign and cost-effective manner while reducing dependence on import of fossil fuels and thereby providing a higher degree of National Energy Security. The **Indian approach** to bio-fuels is based solely on **non-food feedstocks to be raised on degraded or wastelands** that are not suited to agriculture, thus avoiding a possible conflict of fuel vs. food security.*

The salient features of the National Policy on Bio-fuels are:-

1. Bio-diesel production will be taken up from **non-edible oil seeds** in waste /degraded / marginal lands.
2. An **indicative target of 20% blending of bio-fuels, both for bio-diesel and bio-ethanol, by 2017 has been proposed.**
3. Minimum Support Price (**MSP**) for non-edible oil seeds would be announced with periodic revision to provide fair price to the growers.
4. Minimum Purchase Price (**MPP**) for purchase of bio-ethanol and bio-diesel would be announced with periodic revision.
5. Major thrust will be given to **research, development and demonstration** with focus on plantations, processing and production of bio-fuels, including Second Generation Bio-fuels.
6. Financial incentives, including subsidies and grants, may be considered for second generation bio-fuels. If it becomes necessary, a National Bio-fuel Fund could be considered.
7. A **National Biofuels Coordination Committee, headed by the Prime Minister**, will be set up to provide policy guidance and coordination.
8. A **Biofuel Steering Committee**, chaired by **Cabinet Secretary**, will be set up to oversee implementation of the Policy.
9. **The Ministry of New & Renewable Energy** has been designated as the co-ordinating Ministry for Biofuels development and utilization while specific roles have been assigned to other concerned Ministries.
10. MNRE has taken several initiatives on various aspects of biofuel development. An exercise has been initiated with **scientific agencies** – ICAR, CSIR, DBT, DRDO, NOVOD Board on collection, screening and identification of elite germplasms of jatropha and on processing and end use technologies.
11. The objective is to generate and make available elite **planting materials for plantations**. The scientific agencies and the private sector have identified **25 superior genotypes/accessions of Jatropha for further multiplication** for demonstration at various sites in potential States.
12. Another exercise has been taken up on realistic costing of biodiesel which will provide guidance on review and revision of the purchase price for biodiesel.
13. A survey has been undertaken to assess the status of Jatropha plantations in nine States. Major thrust is being given to development of **second generation Biofuels**.
14. An **Indo-US MoU** has been signed on **Biofuels** with focus on joint R&D, particularly on **second generation biofuels** such as, **cellulosic ethanol** and **algal biodiesel**.
15. Another initiative with research institutes and industry is on for development of high efficiency engines for use of SVO for stationary applications.

## Green Diesel

- 👉 The major **difference** between the Biodiesel and Green Diesel is the "**Process of making them**".
- 👉 **Green diesel** is derived from renewable feedstock by using **biomass to liquid** or **vegetable oil refining technologies**.
- 👉 Biodiesel is processed using **transesterification**, while green diesel is processed by the traditional **fractional distillation like fossil origin** diesel fuel (petrodiesel).
- 👉 So, both of them have a **different chemical composition** too.

## Tobacco as source of Bio Fuel:

In December 2009, it was published in the Plant Biotechnology Journal, that some researchers have identified a way of increasing oil content in tobacco leaves to be used as a bio fuel. According to this report, Tobacco can generate bio fuel more efficiently than other agricultural crops. The scientists have found ways to genetically engineer the plants so that their leaves express more oil. In some instances, the modified plants produced 20-fold more oil in the leaves. In their view, Tobacco represents an attractive and promising 'energy plant' platform, and could also serve as a model for the utilization of other high-biomass plants for bio fuel production.

## Environmental Sustainability Index

Environmental Sustainability Index was published from **1999 to 2005** and was **based upon 21 parameters** of sustainability. In **2006**, it was superseded by the **Environmental Performance Index**. So, now it is of only historical importance. It was published between 1999 to 2005 by Yale University's by Yale University's Center for Environmental Law and Policy in collaboration with Columbia University's Center for International Earth Science Information Network (CIESIN), and the World Economic Forum.

✍ It was designed to supplement the targets fixed in the Millennium Development Goals.

