



General Studies Manual for UPSC and State Public Services Examinations 2014

Environment, Biodiversity and Climate Change
Module-1: Framework around Biodiversity Protection

www.gktoday.in

First Published in 2010

Last Updated: June 2013

© 2010-2013 Suresh Soni | All Rights Reserved

No part of this publication may be reproduced or copied in any material form (including photo copying or storing it in any medium in form of graphics, electronic or mechanical means and whether or not transient or incidental to some other use of this publication) without written permission of the copyright owner.

Disclaimer

While all care has been taken in the preparation of this material, no responsibility is accepted by the author for any errors, omissions or inaccuracies. The material provided in this resource has been prepared to provide general information only. It is not intended to be relied upon or be a substitute for legal or other professional advice. No responsibility can be accepted by the author for any known or unknown consequences that may result from reliance on any information provided in this publication

Contents

Chapter 1. The Biodiversity Concepts	3
Concept of Mass Extinctions	4
The concept of Current Holocene Extinction	5
Value of Biodiversity & Ecosystem Services	5
Causes of biodiversity loss	6
Biodiversity Hotspots.....	7
Criticism of Biodiversity Hotspots	9
Concept of Ecosystem Approach	9
Chapter 2. Bioprospecting and Biopiracy.....	10
Bioprospecting.....	10
Biopiracy	10
Chapter 3. Convention on Biological Diversity.....	10
Objectives of CBD	10
Parties to the CBD	11
CBD – Important Provisions.....	11
Why US not ratified the CBD?	11
Bodies established by CBD	11
Importance of CBD and the National Action for implementation of provisions of CBD	11
Protocols to CBD	13
Chapter 4. Cartagena Protocol on Biosafety	13
Background to the Cartagena Protocol	13
Provisions of Cartagena Protocol	14
What is difference betewen LMO and GMO?	14
Can a country ban import of LMOs?	14
What is Advance Informed Agreement (AIA) procedure?	14
Chapter 5. Nagoya Protocol	15
What is sharing the benefits of genetic resources?	15
Outcome of COP 10 at Nagoya.....	15
Relevance & Scope of Nagoya Protocol.....	16
What are obligations of the countries under the Nagoya Protocol?.....	16
Important Questions on Nagoya Protocol for UPSC Examination.....	17
What is the Aichi Target?.....	18
India and Nagoya Protocol.....	19
What were the agendas of COP-11 at Hyderabad?	19
Outcome of the Hyderabad Summit.....	19
Agreements on Funding.....	20
Marine Biodiversity	20
National Biodiversity Plans	20
Chapter 6. Other Instruments to protect biodiversity	21
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).....	21
Convention on the Conservation of Migratory Species of Wild Animals (CMS).....	22
Chapter 7. The Biogeographic Regions of India	22
Trans-Himalayan Region	22
Himalayan Zone	23
Indian Desert Zone	23
Semi Arid Region	23
Western Ghats.....	23
Deccan Plateau	24
Gangetic Plain	24
North East Region.....	24
Coastal Region	24
Andaman and Nicobar Islands	25
Chapter 8. Biodiversity Hotspots in India.....	25
Eastern Himalaya.....	25
Western Ghats	26

Chapter 9. The Biodiversity Act 2002.....	27
Establishment of National Biodiversity Authority.....	27
Powers and Functions of NBA.....	27
Establishment of State Biodiversity Board	28
National Biodiversity Fund	28
State Biodiversity Fund.....	28
Biodiversity heritage sites.....	29
Biodiversity Management Committee.....	29
Other observations in Biodiversity Act.....	29
Chapter 10. National Biodiversity Action Plan (NBAP)	30
Chapter 11. Wildlife Protection Act 1972	31
How a Sanctuary is declared?	31
How a National Park is declared?	31
Chapter 12. Biosphere Reserves.....	32
Differentiating National Parks, Wildlife Sanctuaries & Biosphere Reserves.....	32
Selection Criteria of Biosphere Reserves.....	32
Number of Biosphere Reserves in India	33
Why Biosphere Reserves?	34
Legislation Framework around Biosphere Reserves	34
How a Biosphere Reserve is declared?	34
Role of Wildlife Protection Act in Biosphere Reserves	35
Chapter 13. Protection of Tiger	35
Project Tiger	35
National Tiger Conservation Authority	35
Parts of a Tiger Reserve.....	36
Alteration of Boundaries of Tiger Reserves	37
Can a state government denotify a tiger Reserve?	37
Special Tiger Protection Force (STPF).....	37
India's Tiger Reserves	37
Summary: All India Tiger Estimation (2010).....	39
How Tigers are counted.....	39
Chapter 14. Protection of Elephant	39
Major Activities:	40
India's Elephant Reserves	40
Elephant Corridors in India.....	41
Population of Wild Elephants in India	41
Elephant as National Heritage Animal of India.....	42
Chapter 15. Protection of Snow Leopard	42
Project Snow Leopard.....	42
Chapter 16. Protection of Hangul	43
Chapter 17. Protection of Vulture.....	43
Discovery of Decline in Vulture Population.....	43
Vulture Safe Zones	44
Vulture breeding facilities	45

Chapter 1. The Biodiversity Concepts

Biodiversity means the **diversity of life in all its forms**—the diversity of species, of genetic variations within one species, and of ecosystems. The importance of biological diversity to human society is hard to overstate. An estimated 40 per cent of the global economy is based on biological products and processes. Poor people, especially those living in areas of low agricultural productivity, depend especially heavily on

The United Nations designated 2011-2020 as the United Nations Decade on Biodiversity.

the genetic diversity of the environment.

- Terrestrial biodiversity tends to be highest at low latitudes near the equator, mainly because of the warm climate and high primary productivity. The increase in species richness or biodiversity that occurs from the poles to the tropics, often referred to as the **Latitudinal Diversity Gradient** (LDG). Kindly note that *Terrestrial biodiversity is up to 25 times greater than ocean biodiversity*.
- Marine biodiversity tends to be highest along coasts in the Western Pacific, where sea surface temperature is highest and in mid-latitudinal band in all oceans.

Concept of Mass Extinctions

Biodiversity is the result of 3.5 billion years of evolution. The current scientific theory says that the origin of life or **biopoesis** or the natural process by which life arises from simple organic compounds started around 3900 million years ago and the earliest known life on Earth existed between 3900-3500 million years ago (MYA), during the **Eoarchean Era** when sufficient crust had solidified.

Until approximately 600 million years ago, all life consisted of archaea, bacteria, protozoans and similar single-celled organisms. The **Cambrian explosion** which occurred around 542 million years ago, is considered to be a period during which nearly every phylum of multicellular organisms first appeared. This was followed by the dramatic rise of species of both invertebrates and vertebrates. The rise of diversity was marked by periodic, massive losses of diversity classified as **mass extinction events**. Since life began on Earth, five major mass extinctions and several minor events have led to large and sudden drops in biodiversity.

- **Ordovician-Silurian extinction event:** This was the first mass extinction of biodiversity which happened 450–440 Million Years Ago.
- **Late Devonian extinction:** This occurred 375–360 MYA.
- **Permian-Triassic extinction:** This event 251 MYA is called Earth's largest extinction. This event ended the primacy of mammal-like reptiles on land. The recovery of vertebrates took 30 million years.
- **Triassic-Jurassic extinction:** This event 200 MYA eliminated most of the non-dinosaurian archosaurs, most therapsids, and most of the large amphibians. Thus dinosaurs were left with little terrestrial competition.
- **Cretaceous-Paleogene extinction or K-T extinction, or K-Pg extinction:** This event occurred 65.5 MYA. Majority of non-avian dinosaurs became extinct during that time. *Mammals and birds emerged as dominant land vertebrates in the age of new life.*

There were several minor events also, for example the **Carboniferous (359.2 MYA), rainforest collapse** led to a great loss of plant and animal life. The fossil fuel which we are using today was the result of this collapse of life. The evolutionary termination of a species is caused by the failure to reproduce and the death of all remaining members of the species; the natural failure to adapt to environmental change.

The concept of Current Holocene Extinction

Holocene is a geological epoch which began around 12,000 to 11,500 years ago and continues to the present. The scientists propose that a **Sixth Extinction** of biodiversity is going on currently in this Holocene epoch, which started around 10,000 BC. The large number of extinctions span numerous families of plants and animals including mammals, birds, amphibians, reptiles and arthropods. The Holocene extinction includes the disappearance of large mammals known as megafauna, starting between 9,000 and 13,000 years ago, the end of the last Ice Age. Such disappearances are considered to be results of both climate change and the proliferation of modern humans. These extinctions are sometimes referred to as the **Quaternary extinction event**. All of us are witnessing this Holocene extinction.

Value of Biodiversity & Ecosystem Services

Humans cannot exist without biodiversity as we use it directly and indirectly in a number of ways.

- Direct use includes things like food, fibres, medicines and biological control, whilst indirect uses includes ecosystem services such as atmospheric regulation, nutrient cycling and pollination.
- There are also non-use values of biodiversity, such as **option value** (for future use or non-use), **bequest value** (in passing on a resource to future generations), **existence value** (value to people irrespective of use or non-use) and **intrinsic value** (inherent worth, independent of that placed upon it by humans).

Ecosystem services

Ecosystem services are processes by which the environment produces benefits useful to people, akin to economic services. They include:

- Provision of clean water and air
- Pollination of crops
- Mitigation of environmental hazards
- Pest and disease control
- Carbon sequestration

Accounting for the way in which ecosystems provide economic goods is an increasingly popular area of development. The concept of ecosystem services is similar to that of natural capital. The Millennium Ecosystem Assessment released in 2005 showed that 60% of ecosystem services are being degraded or used unsustainably

Many of these uses of biodiversity are not incorporated in economic accounts and this leads humans to under-value biodiversity. Ecosystem services and resources such as mineral deposits, soil nutrients, and fossil fuels are capital assets but traditional national accounts do not include measures of the depletion of these resources. This means a country could cut its forests and deplete

its fisheries, and this would show only as a positive gain in GDP (gross national product) without registering the corresponding decline in assets (wealth). The relationship between biodiversity and ecosystem function is clear but a major question in ecology is how much biodiversity is required to maintain ecosystem function.

Ecosystem services are the suite of benefits that ecosystems provide to humanity. The Ecosystem services enhanced by Biodiversity are as follows:

- ✓ Formation of Soil
- ✓ Fertility of the soil
- ✓ Increase in overall crop yield and fodder production
- ✓ Increase in soil nutrient remineralization
- ✓ Increases resistance to plant invasion
- ✓ Decreases disease prevalence on plants
- ✓ Increases soil organic matter

Causes of biodiversity loss

The Millennium Ecosystem Assessment identifies the following primary drivers leading to loss of biodiversity:

1. Habitat change
2. Climate change
3. Invasive species
4. Over-exploitation
5. Pollution

They have been discussed briefly here.

- **Habitat change:** Humans have had an effect on every habitat on Earth, particularly due to the conversion of land for agriculture. Cultivated systems (areas where at least 30% of the landscape is used in cultivation) now cover one quarter of Earth's terrestrial surface. Habitat loss also occurs in coastal and marine systems, though these changes are less documented. One example is the Trawling of the seabed, which can significantly reduce the diversity of benthic habitats.
- **Climate change:** Observed recent changes in climate, especially warmer regional temperatures, have already had significant impacts on biodiversity and ecosystems, including causing changes in species distributions, population sizes, the timing of reproduction or migration events, and an increase in the frequency of pest and disease outbreaks. By the end of the twenty-first century, climate change and its impacts are likely to be the dominant direct driver of biodiversity loss and changes in ecosystem services globally.

- **Invasive Species:** The spread of invasive alien species has increased because of increased trade and travel. While increasingly there are measures to control some of the pathways of invasive species, for example, through quarantine measures and new rules on the disposal of ballast water in shipping, several pathways are not adequately regulated, particularly with regard to introductions into freshwater systems.
- **Overexploitation of bioresources:** For marine systems, the dominant direct driver of change globally has been overfishing. 50% of the world's commercial marine fisheries are fully exploited whilst 25% are being overexploited.
- **Pollution and nutrient loading:** Since 1950, human mediated increases in nitrogen, phosphorus, sulphur, and other nutrients (nutrient loading) has emerged as one of the most important drivers of ecosystem change in terrestrial, freshwater, and coastal ecosystems, and this driver is projected to increase substantially in the future. For example, humans now produce more biologically available nitrogen than is produced by all natural pathways combined. Aerial deposition of reactive nitrogen into natural terrestrial ecosystems, especially temperate grasslands, shrub-lands, and forests, leads directly to lower plant diversity; excessive levels of reactive nitrogen in water bodies, including rivers and other wetlands, frequently leads to algal blooms and eutrophication in inland waters and coastal areas. Similar problems have resulted from phosphorus, the use of which has tripled between 1960 and 1990. Nutrient loading will become an increasingly severe problem, particularly in developing countries and particularly in East and South Asia.

Biodiversity Hotspots

Biodiversity hotspot is an area on earth with an unusual concentration of species, many of which are endemic to the area, and which is under serious threat by people. The concept was given by **Norman Myers**, who 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.

What are Invasive species?

Invasive species are those that are introduced—intentionally or unintentionally—to an ecosystem in which they do not naturally appear and which threaten habitats, ecosystems, or native species. These species become invasive due to their high reproduction rates and by competing with and displacing native species, that naturally appear in that ecosystem. Unintentional introduction can be the result of accidents (e.g. when species escape from a zoo), transport (e.g. in the ballast water of a ship); intentional introduction can be the result of e.g. importing animals or plants or the genetic modification of organisms.

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:

- **Endemism:** it must contain at least 1,500 species of vascular plants (> 0.5 percent of the world's total) as endemics, and
- **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.

North and Central America

1. California Floristic Province
2. Caribbean Islands
3. Madrean pine-oak woodlands
4. Mesoamerica

South America

5. Atlantic Forest
6. Cerrado
7. Chilean Winter Rainfall-Valdivian Forests
8. Tumbes-Chocó-Magdalena
9. Tropical Andes

Europe and Central Asia

10. Caucasus
11. Irano-Anatolian
12. Mediterranean Basin
13. Mountains of Central Asia

Africa

14. Cape Floristic Region
15. Coastal Forests of Eastern Africa
16. Eastern Afromontane
17. Guinean Forests of West Africa

18. Horn of Africa

19. Madagascar and the Indian Ocean Islands
20. Maputaland-Pondoland-Albany
21. Succulent Karoo

South Asia

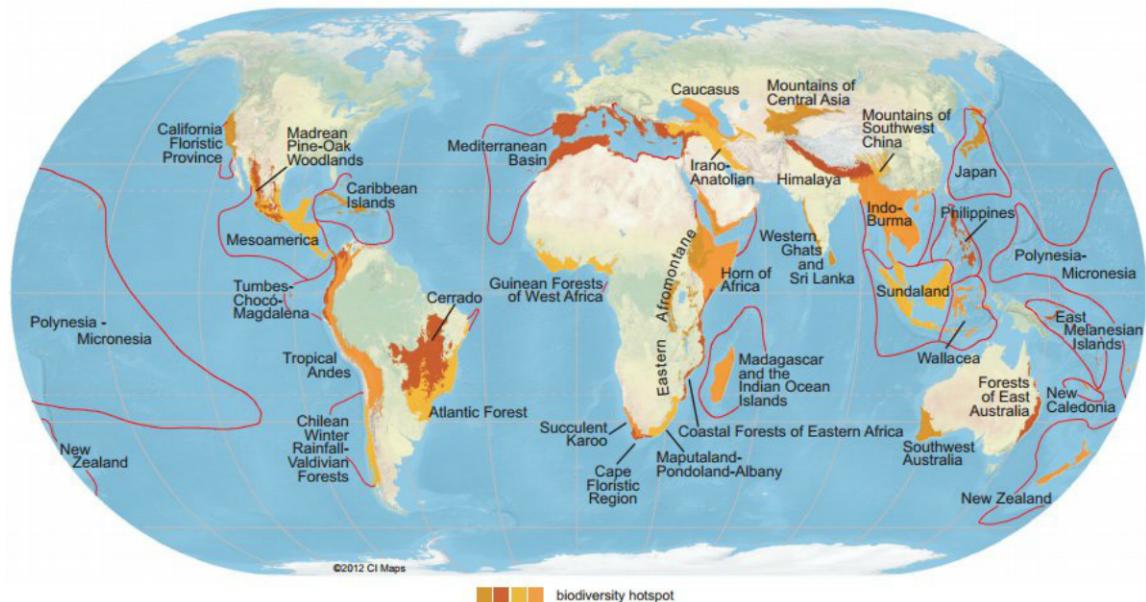
22. Eastern Himalaya, India
23. Indo-Burma, India and Myanmar
24. Western Ghats, India

South East Asia and Asia-Pacific

25. East Melanesian Islands
26. New Caledonia
27. New Zealand
28. Philippines
29. Polynesia-Micronesia
30. Southwest Australia
31. Sundaland
32. Wallacea

East Asia

33. Japan
34. Mountains of Southwest China



Criticism of Biodiversity Hotspots

The Biodiversity Hotspots are often criticized on the following arguments

- Do not adequately represent other forms of species richness (e.g. total species richness or threatened species richness).
- Do not adequately represent taxa other than vascular plants (e.g. vertebrates, or fungi).
- Do not protect smaller scale richness hotspots.
- Do not make allowances for changing land use patterns. Hotspots represent regions that have experienced considerable habitat loss, but this does not mean they are experiencing ongoing habitat loss. On the other hand, regions that are relatively intact (e.g. the Amazon Basin) have experienced relatively little land loss, but are currently losing habitat at tremendous rates.
- Do not protect ecosystem services
- Do not consider phylogenetic diversity.

Concept of Ecosystem Approach

Ecosystems are self-regulating communities of plants and animals interacting with each other and with their non-living environment— such as forest lands, wetlands, mountains, lakes, rivers, deserts and agricultural landscapes. Ecosystems are vulnerable to interference as pressure on one component can upset the whole balance.

The Ecosystem Approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. The Ecosystem Approach places human needs at the centre of biodiversity management. *It aims to manage*

the ecosystem, based on the multiple functions that ecosystems perform and the multiple uses that are made of these functions. The ecosystem approach does not aim for short-term economic gains, but aims to optimize the use of an ecosystem without damaging it.

Chapter 2. Bioprospecting and Biopiracy

Bioprospecting

Bioprospecting is the process of discovery and commercialization of new products based in biological resources. Bioprospecting often draws on indigenous knowledge about uses and characteristics of plants and animals. Thus, bioprospecting includes biopiracy, the exploitative appropriation of indigenous forms of knowledge by commercial actors, as well as the search for previously unknown compounds in organisms that have never been used in traditional medicine.

Biopiracy

Biopiracy is a situation where indigenous knowledge of nature, originating with indigenous peoples, is used by others for profit, without permission from and with little or no compensation or recognition to the indigenous people themselves.

Representing one of the most agriculturally bio-diverse nations in the world, India has become a primary target for biopiracy. In a first, in 1995, a firm in United States had successfully applied for a patent on a technique to extract an antifungal agent from the **neem tree** (*Azadirachta indica*), which grows throughout India and Nepal. This was a case of biopiracy as the Indian people have long understood the tree's medicinal value. The efforts on part of Government of India led to cancellation of the patent. Similarly, in 2000, US corporation RiceTec attempted to patent certain hybrids of basmati rice and semidwarf long-grain rice. The Indian government intervened and several claims of the patent were invalidated.

The most recent case of biopiracy is the first ever bio-piracy case by National Biodiversity Authority against the developers of Bt brinjal, which has been discussed later in these modules.

Chapter 3. Convention on Biological Diversity

Convention on Biological Diversity is a **legally binding treaty**, which came as an outcome of Earth Summit in Rio de Janeiro on 5 June 1992 and entered into force on 29 December 1993. It is commonly known as "Biodiversity Convention".

Objectives of CBD

- Conservation of biological diversity (or biodiversity);
- Sustainable use of its components; and
- Fair and equitable sharing of benefits arising from genetic resources

The idea is to develop national strategies for the conservation and sustainable use of biological diversity.

Parties to the CBD

193 countries / territories including India are parties to the CBD. The United States has signed but not ratified the convention. Why? Discussed later.

CBD – Important Provisions

The CBD has 23 preamble paragraphs and 42 articles. The preamble paragraphs inter alia recognize and reaffirm the following:

- Intrinsic value of biodiversity
- Biodiversity conservation as common concern of humankind
- **Sovereign rights of States** over their biological resources
- **Responsibility of States to conserve and sustainable use their biodiversity**
- Precautionary approach towards biodiversity conservation
- Vital role of local communities and women in conservation, and sustainable use of biodiversity
- Need for provision of new and additional financial resources and access to technologies to developing countries to address biodiversity loss.

Economic and social development and poverty eradication are the first and overriding priorities of developing countries.

Why US not ratified the CBD?

At present, US and Andorra are the only remaining countries that have not signed / ratified the CBD. Main concerns of United States are the CBD provisions, **which call for technology transfer to developing countries.** US thinks that it could threaten US intellectual property interests. Further, there is another reason that the obligations for financial aid under the CBD are vague. Strangely, the other developed countries have not shared these concerns.

Bodies established by CBD

The governing body of CBD is the **Conference of the Parties** (COP), consisting of all governments (and regional economic integration organizations) that have ratified the treaty. So far eleven meetings of COP have taken place. The last meeting was in 2012 in India.

The *CBD Secretariat is based in Montreal*, it operates under the United Nations Environment Programme. There is a Subsidiary body for Scientific, Technical and Technological Advice (SBSTTA), which has experts from member governments competent in relevant fields. It plays a key role in making recommendations to the COP on scientific and technical issues.

Importance of CBD and the National Action for implementation of provisions of CBD
CBD is comprehensive in its goals, and stands as a landmark in international law on environment.

- The CBD for the first time recognized that the conservation of biological diversity is "a common concern of humankind" and is an integral part of the development process.

- The agreement covers all ecosystems, species, and genetic resources. It links traditional conservation efforts to the economic goal of using biological resources sustainably.
- It sets principles for the *fair and equitable sharing of the benefits arising from the use of genetic resources, notably those destined for commercial use.*
- It also covers the rapidly expanding field of biotechnology, addressing technology development and transfer, benefit-sharing and biosafety.
- Since the Convention is legally binding; countries that join it are obliged to implement its provisions.
- The Convention reminds decision-makers that natural resources are not infinite and sets out a new philosophy for the 21st century, that of sustainable use. While past conservation efforts were aimed at protecting particular species and habitats, the Convention recognizes that ecosystems, species and genes must be used for the benefit of humans.
- The Convention also recognizes the *close and traditional dependence of indigenous and local communities on biological resources and the need to ensure that these communities share in the benefits arising from the use of their traditional knowledge and practices relating to the conservation and sustainable use of biodiversity.*

National action under the CBD

The Convention on Biological Diversity, as an international treaty, identifies a common problem, sets overall goals and policies and general obligations, and organizes technical and financial cooperation. However, the responsibility for achieving its goals rests largely with the countries themselves.

India after extensive consultative process had enacted **Biological Diversity Act in 2002** for giving effect to the provisions of the CBD. The same is true for many other developing countries also. *However, in the near absence of user country measures, once the resource leaves the country providing the resources, there is no way to ensure compliance of ABS provisions in the country where it is used.* Towards this, a protocol on access and benefit sharing was negotiated at Nagoya, Japan in October 2010. This is called Nagoya Protocol.

Under the Convention, governments undertake to conserve and sustainably use biodiversity. They are required to develop *national biodiversity strategies and action plans*, and to integrate these into broader national plans for environment and development. This is particularly important for such sectors as forestry, agriculture, fisheries, energy, transportation and urban planning.

Other treaty commitments include:

- Identifying and monitoring the important components of biological diversity that need to be conserved and used sustainably.
- Establishing protected areas to conserve biological diversity while promoting environmentally sound development around these areas.

- Rehabilitating and restoring degraded ecosystems and promoting the recovery of threatened species in collaboration with local residents.
- Respecting, preserving and maintaining traditional knowledge of the sustainable use of biological diversity with the involvement of indigenous peoples and local communities.
- Preventing the introduction of, controlling, and eradicating alien species that could threaten ecosystems, habitats or species.
- Controlling the risks posed by organisms modified by biotechnology.
- Promoting public participation, particularly when it comes to assessing the environmental impacts of development projects that threaten biological diversity.
- Educating people and raising awareness about the importance of biological diversity and the need to conserve it.
- Reporting on how each country is meeting its biodiversity goals

Protocols to CBD

There are two protocols to CBD as follows:

- ✓ Cartagena Protocol to Biosafety
- ✓ Nagoya Protocol.

Chapter 4. Cartagena Protocol on Biosafety

Background to the Cartagena Protocol

Since the domestication of the first crops and farm animals, humans have altered their genetic makeup through *selective breeding and cross-fertilization*. The results have been greater agricultural productivity and improved human nutrition.

In recent years, advances in biotechnology techniques have enabled us to cross the species barrier by transferring genes from one species to another. We now have transgenic plants, such as tomatoes and strawberries that have been modified using a gene from a cold water fish to protect the plants from frost. Some varieties of potato and corn have received genes from a bacterium that enables them to produce their own insecticide, thus reducing the need to spray chemical insecticides. Other plants have been modified to tolerate herbicides sprayed to kill weeds.

Living Modified Organisms (LMOs) – often known as Genetically Modified Organisms (GMOs) – are becoming part of an increasing number of products, including foods and food additives, beverages, drugs, adhesives, and fuels. Agricultural and pharmaceutical LMOs have rapidly become a multi-billion-dollar global industry.

Biotechnology is being promoted as a better way to grow crops and produce medicines, but it has raised concerns about potential side effects on human health and the environment, including risks to biological diversity. In some countries, genetically altered agricultural products have been sold without much debate, while in others, there have been vocal protests against their use, particularly

when they are sold without being identified as genetically modified. In response to these concerns, governments negotiated a subsidiary agreement to the Convention to address the potential risks posed by cross-border trade and accidental releases of LMOs.

Provisions of Cartagena Protocol

Adopted in January 2000, the Cartagena Protocol on Biosafety allows governments to signal whether or not they are willing to accept imports of agricultural commodities that include LMOs by communicating their decision to the world community via a **Biosafety Clearing House**, a mechanism set up to facilitate the exchange of information on and experience with LMOs.

In addition, commodities that may contain LMOs are to be **clearly labeled** as such when being exported. Stricter **Advanced Informed Agreement** procedures now apply to seeds, live fish, and other LMOs that are to be intentionally introduced into the environment. In these cases, the exporter must provide detailed information to each importing country in advance of the first shipment, and the importer must then authorize the shipment.

Thus, the objective of the Cartagena Protocol is to ensure that recipient countries have both the opportunity and the capacity to assess risks involving the products of modern biotechnology.

What is difference between LMO and GMO?

Living modified organisms (known as LMOs) resulting from modern biotechnology are broadly equivalent to genetically modified organisms. The difference between an LMO and a GMO is that a Living Modified Organism means any biological entity **capable of transferring or replicating genetic material**, including sterile organisms, viruses and viroids and typically refers to agricultural crops. Genetically Modified Organisms include both LMOs and organisms which are not capable of growing, i.e. are dead. LMOs include all genetically modified organisms (GMOs) and also organisms produced by the fusion of cells from different taxonomic families.

Can a country ban import of LMOs?

The Biosafety Protocol makes clear that products from new technologies must be based on the precautionary principle and allow developing nations to balance public health against economic benefits. It will for example let countries ban imports of a genetically modified organisms if they feel there is not enough scientific evidence that the product is safe and requires exporters to label shipments containing genetically altered commodities such as corn or cotton.

What is Advance Informed Agreement (AIA) procedure?

The Cartagena Protocol on Biosafety establishes an advance informed agreement (AIA) procedure for ensuring that countries are provided with the information necessary to make informed decisions before agreeing to the import of such organisms into their territory.

Conference of the Parties (COP):

The Governing body of the CBD is the Conference of the Parties (COP), which consists of all governments (and regional economic integration organizations) that have ratified the treaty. This ultimate authority reviews progress under the Convention, identifies new priorities, and sets work plans for members. The COP can also make amendments to the Convention, create expert advisory bodies, review progress reports by member nations, and collaborate with other international organizations and agreements.

Till now 10 COP have held.

Chapter 5. Nagoya Protocol

What is sharing the benefits of genetic resources?

Most of the world's biodiversity is found in developing countries, which consider it a resource for fueling their economic and social development. Historically, plant genetic resources were collected for commercial use outside their region of origin or as inputs in plant breeding. Foreign bioprospectors have searched for natural substances to develop new commercial products, such as drugs and medicines. Often, the products such developed would be sold and protected by patents or other intellectual property rights, without fair benefits to the source countries.

The CBD recognizes national sovereignty over all genetic resources, and provides that access to valuable biological resources be carried out on "mutually agreed terms" and subject to the "prior informed consent" of the country of origin.

When a microorganism, plant, or animal is used for a commercial application, the country from which it came has the right to benefit. Such benefits can include the following:

- ✓ Cash
- ✓ Samples of what is collected from the source country
- ✓ The participation or training of national researchers
- ✓ The transfer of biotechnology equipment and know-how
- ✓ Shares of any profits from the use of the resources.

This is the basic foundation of the **Nagoya Protocol** to the Convention. 10th Conference of Parties to the Convention on Biological Diversity was held in October in Nagoya Japan, the Nagoya Protocol was adopted. On 29 October 2010, some 18,000 participants representing the 193 Parties to the Convention on Biological Diversity (CBD) and their partners closed the Nagoya Biodiversity Summit by adopting a package of measures that will ensure that the ecosystems of the planet will continue to sustain human well-being into the future.

Outcome of COP 10 at Nagoya

The meeting achieved its three inter-linked goals:

- ✓ Adoption of a new ten year Strategic Plan to guide international and national efforts to save biodiversity through enhanced action to meet the objectives of the Convention on Biological Diversity
- ✓ A resource mobilization strategy that provides the way forward to a substantial increase to current levels of official development assistance in support of biodiversity
- ✓ A new international protocol on access to and sharing of the benefits from the use of the genetic resources of the planet. This is called Nagoya Protocol.

"If Kyoto entered history as the city where the climate accord was born, Nagoya will be remembered as the city where the biodiversity accord was born."

Relevance & Scope of Nagoya Protocol

The intention of this protocol is to create **greater legal certainty and transparency** for both providers and users of genetic resources by:

- ✓ Establishing more predictable conditions for access to genetic resources.
- ✓ Helping to ensure benefit-sharing when genetic resources leave the contracting party providing the genetic resources
- ✓ By helping to ensure benefit-sharing, the Nagoya Protocol creates incentives to conserve and sustainably use genetic resources, and therefore enhances the contribution of biodiversity to development and human well-being.

The Nagoya Protocol applies to genetic resources that are covered by the CBD, and to the benefits arising from their utilization. The **Nagoya Protocol also covers traditional knowledge** (TK) associated with genetic resources that are covered by the CBD and the benefits arising from its utilization.

What are obligations of the countries under the Nagoya Protocol?

The Nagoya Protocol sets out core obligations for Parties to take measures in relation to access to genetic resources, benefit-sharing and compliance.

Obligations related to access to genetic resources

Under these obligations, each party is required to create unambiguous and clear legal processes related to access to the genetic resources. The party should notify fair and non-arbitrary rules and procedures and establish the procedures for prior informed consent and mutually agreed terms. Each party should create conditions to promote and encourage research contributing to biodiversity conservation and sustainable use. Further, if there are present or imminent emergencies that threaten human, animal or plant health, the party is liable to pay.

Obligations related to Benefit Sharing

Domestic-level benefit-sharing measures are to provide for the fair and equitable sharing of benefits arising from the utilization of genetic resources with the contracting party providing

genetic resources. Utilization includes research and development on the genetic or biochemical composition of genetic resources, as well as subsequent applications and commercialization. Sharing is subject to mutually agreed terms. Benefits may be monetary or non-monetary such as royalties and the sharing of research results.

Compliance obligations

Each party should take measures of making provisions that genetic resources utilized within their jurisdiction have been accessed in accordance with prior informed consent, and that mutually agreed terms have been established, as required by another contracting party. The party should cooperate in cases of alleged violation of another contracting party's requirements. It should encourage contractual provisions on dispute resolution in mutually agreed terms and ensure an opportunity is available to seek recourse under their legal systems when disputes arise from mutually agreed terms. The contracting party should be given access to justice.

Important Questions on Nagoya Protocol for UPSC Examination**Is Nagoya Protocol Legally Binding?**

- ✓ Yes. The Nagoya Protocol will only be legally binding for the countries that do sign and ratify it. In addition, only countries that have signed and ratified the CBD are able to sign the Nagoya Protocol. In other words, countries such as the United States, which has not ratified the CBD, cannot sign or ratify the Nagoya Protocol.
- ✓ United States is NOT among the signatories of the Access and Benefit Sharing rules of the Nagoya Protocol.

What is the meaning of use of Genetic Resources?

- ✓ The Nagoya Protocol applies only when genetic resources are accessed and 'used'. Under the Protocol, 'used' means to conduct research and development on the genetic and/or biochemical composition of genetic resources.

Do the antibodies, vitamins, enzymes, active compounds and metabolites come under Nagoya Protocol?

- ✓ Yes. The issue of derivatives was often raised in negotiations on scope as an attempt to expressly expand the applicability of access and benefit sharing principles to activities linked to naturally occurring compounds, such as antibodies, vitamins, enzymes, active compounds and metabolites.
- ✓ The Nagoya Protocol contains a definition of derivatives, as "a naturally occurring biochemical compound resulting from the genetic expression or metabolism of biological or genetic resources." The access and benefit sharing requirements in the Nagoya Protocol do not expressly refer to the term "derivatives," but the concept could be seen to complement the definition of "utilization of genetic resources."

On what kind of genetic materials Nagoya Protocol does not apply?

- ✓ The Protocol covers genetic resources within national jurisdiction - with some notable exceptions. For example, this Protocol does not apply to genetic resources covered by specialised access and benefit-sharing agreements such as the International Treaty on Plant Genetic Resources for Food and Agriculture, or the framework for pandemic preparedness of the World Health Organisation.
- ✓ Then, it also does not apply to human genetic material. It also does not cover the resources that were acquired before the Protocol comes into effect.

What are National rules on access and benefit sharing?

- ✓ The Nagoya Protocol requires countries to provide for legal certainty, clarity and transparency in their relevant legislation or regulatory requirements. In addition, countries should make information available on how to apply for prior informed consent and provide written, cost-effective and timely replies to requests for such consent.
- ✓ Finally, countries should provide, at the time of providing access, for the issuance of a permit or its equivalent as evidence of the decision to grant prior informed consent and of the establishment of mutually agreed terms.

Does Nagoya Protocol speaks about patents?

- ✓ There is **no reference to patents** or other intellectual property rights in the Nagoya Protocol. Nevertheless, the work of the World Intellectual Property Organization on traditional knowledge, for example, is to be considered in the context of the Nagoya Protocol insofar it does not run counter to the objectives of the Protocol - language similar to the CBD reference to intellectual property.

What are implications of Nagoya Protocol on economies such as India?

The new the Access and Benefit Sharing (ABS) rules mean that multinational companies will have to share their profits with local communities not only for using the original resource, but also any derivative products developed from it.

International drug firms will also have to pay to use human genetic material such as pathogens – the germs responsible for virus pandemics which are used to develop lucrative vaccines. “Otherwise, these companies just take our pathogens, make the vaccine, and then make us pay billions of dollars to buy it from them”.

What is the Aichi Target?

The strategic plan which is outcome of the Nagoya Protocol is "**Aichi Target**". It includes 20 headline targets, organized under five strategic goals that address the underlying causes of biodiversity loss, reduce the pressures on biodiversity, safeguard biodiversity at all levels, enhance the benefits provided by biodiversity, and provide for capacity-building.

The important agreements were as follows:

- ✓ At least halve and where feasible bring close to zero the rate of loss of natural habitats including forests
- ✓ Established a target of 17 per cent of terrestrial and inland water areas and 10 per cent of marine and coastal areas
- ✓ Through conservation and restoration, Governments will restore at least 15 percent of degraded areas
- ✓ Will make special efforts to reduce the pressures faced by coral reefs.
- ✓ Parties also agreed to a substantial increase in the level of financial resources in support of implementation of the Convention.

India and Nagoya Protocol

For India and other developing countries, it was a hard-fought triumph because this new international treaty ensures that the benefits of natural resources and their commercial derivatives were shared with local communities.

But, India says that national action alone is not sufficient to ensure realization of benefits to the country of origin or provider country. Thus, the demand of the developing countries of an international legislation for the realization of benefits to the country of origin or provider country, has not been fulfilled.

What were the agendas of COP-11 at Hyderabad?

The CBD press release on the event explained that "*The mobilization of resources for action on the 20 Aichi Biodiversity Targets will be at the top of the agenda.*" These targets were agreed at the last COP at Nagoya. They include commitments to conserve 17% of terrestrial and inland water areas and 10% of marine areas and coastal areas through establishing protected areas and to restore of at least 15% of degraded areas. Regarding where the money would come from, the CBD text includes a commitment by developed countries to provide new and additional resources to developing countries, but unfortunately most developed countries are in cash crunch these days. One more agenda was to focus on how more money for biodiversity can be brought out of the private sector.



Outcome of the Hyderabad Summit

The relevant outcomes are as follows:

- India has taken over as president of the COP.
- The countries of the world agreed on to increase funding in support of actions to halt the rate of loss of biodiversity. Developed countries agreed to **double funding** to support efforts in developing states towards meeting the internationally-agreed Biodiversity Targets, and the main goals of the Strategic Plan for Biodiversity 2011-2020.
- Special attention to be given to the **Saragasso Sea**, the **Tonga archipelago** and **key corals sites off the coast of Brazil**.

- The countries have agreed to take new measures to factor biodiversity into environmental impact assessments linked to infrastructure and other development projects in marine and coastal areas.

Agreements on Funding

- Developed countries agreed to increase funding to support efforts in developing states towards meeting the Aichi Biodiversity Targets.
- Using a baseline figure of the average annual national spending on biodiversity between 2006 and 2010, developed countries said they would double biodiversity-related international financial flows by 2015. The COP also set targets to increase the number of countries that have included biodiversity in their national development plans, and prepared national financial plans for biodiversity, by 2015.
- All Parties have agreed to substantially increase domestic expenditures for biodiversity protection over the same period.
- The developing countries at COP 11, including India and several African states, have pledged additional funds above and beyond their core funding towards the work of the CBD.
- Hyderabad Call for Biodiversity Champions was launched. The programme will accept pledges from governments and organizations in support of the Strategic Plan for Biodiversity. India has committed \$50 million (over Rs. 264 crore) for the so called the 'Hyderabad Pledge' as India takes over the two-year presidency of the Convention on Biological Diversity

Marine Biodiversity

- It was decided to classify a diverse list of marine areas, some renowned for containing 'hidden treasures' of the plant and animal world, as ecologically or biologically significant.
- To meet the Aichi Biodiversity Target of ensuring that 10 per cent of marine areas are protected by 2020, an additional 8 million square kilometres of marine and coastal areas would need to be recognized as protected - an area just over the size of Australia.
- The countries agreed to move forward for development of an international agreement for biodiversity conservation in marine areas beyond national jurisdiction.
- More research to be done into the potential adverse effects of underwater noise from ships on marine and coastal biodiversity.
- The growing concern on the adverse effects of marine litter was highlighted.
- Growing challenge of climate change impacts on coral reefs was recognized and it was agreed that it will require significant investment to overcome.

National Biodiversity Plans

Much of the COP 11 negotiations revolved around practical and financial support for countries in implementing national biodiversity plans to meet the Strategic Plan for Biodiversity and the 2020 Aichi Biodiversity Targets.

- Highlighted the need for enhanced technical and scientific cooperation among countries, while underlining the potential for enhanced cooperation among developing countries.

- A new National Biodiversity Strategies and Action Plans Forum (NBSAP Forum) was launched at COP11 by UNEP, CBD, The Global Environment Facility (GEF) and the UN Development Programme (UNDP). This is an online forum which provides easy-to-access, targeted information such as best practices, guidelines and learning tools for countries.
- Agreed to a number of measures to engage the main economic sectors, such as business and development organizations, to integrate biodiversity objectives in their plans and programmes.

Chapter 6. Other Instruments to protect biodiversity

The Convention on Biological Diversity (CBD) is the principal international instrument in developing sustainable conservation and use of biological resources as stipulated in chapter 15 of Agenda 21.

Other biodiversity-related conventions and processes include:

- ✓ Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- ✓ Convention on the Conservation of Migratory Species of Wild Animals (CMS)
- ✓ Convention on Wetlands of International Importance, Especially as Waterfowl Habitats (RAMSAR)

All of them have made significant contributions to the sustainable management and use of the world's biodiversity.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

This is also known as **Washington Convention** and it is one of the oldest conventions on protection of the biodiversity. **It is a legally binding treaty but does not affect the national legislations.** It came into force in 1975 and aims to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species in the wild. Roughly 5,000 species of animals and 29,000 species of plants are protected by CITES against over-exploitation through international trade. Each protected species or population is included in one of three lists, called Appendices. In order to ensure that the General Agreement on Tariffs and Trade (GATT) was not violated, the Secretariat of GATT was consulted during the drafting process.

- ✓ **Appendix 1** protects the 1200 species that are threatened with extinction. The international trade of these species is illegal.
- ✓ **Appendix 2** protects 21,000 species, that are not necessarily threatened with extinction, but may become so unless trade in specimens of such species is subject to strict regulation.
- ✓ **Appendix 3** lists about 170 species, are species that are listed after one member country has asked other CITES Parties for assistance in controlling trade in a species

Convention on the Conservation of Migratory Species of Wild Animals (CMS)

This is also known as Bonn Convention and it aims to conserve terrestrial, marine and avian migratory species throughout their range. It is an intergovernmental treaty, concluded under the aegis of the United Nations Environment Programme. It came into force in 1983.

Chapter 7. The Biogeographic Regions of India

India is one of the 17 identified mega diverse countries of the world. With respect to the biodiversity, 70% of the geographical area has been surveyed so far and this survey reveals that

- ✓ India is home to 45,500 plant species (including fungi and lower plants), this is 7% of world's flora.
- ✓ India is home to 91,000 animal species, this is 6.5 per cent of the world's fauna.

From the biodiversity standpoint, India has some 59,353 insect species (Maximum), 2,546 fish species, 240 amphibian species, 460 reptile species, 1,232 bird species and 397 mammal species, of which 18.4 per cent are endemic and 10.8 per cent are threatened.

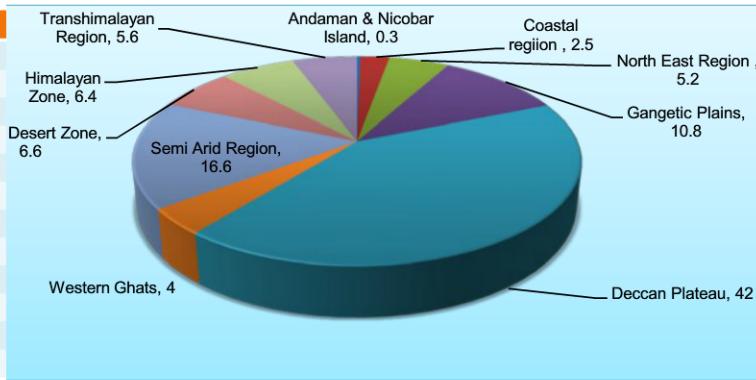
India is home to 18,664 species of vascular plants, of which 26.8 per cent are endemic.

- ✓ With only 2.4 per cent of the total land area of the world, the known biological diversity of India contributes 8 per cent to the known global biological diversity.

India has been divided into **ten recognizable biogeographic zones** as follows:

Biogeographic Region	%*
Andaman & Nicobar Island	0.3
Coastal region	2.5
North East Region	5.2
Gangetic Plains	10.8
Deccan Plateau	42
Western Ghats	4
Semi Arid Region	16.6
Indian Desert Zone	6.6
Himalayan Zone	6.4
Transhimalayan Region	5.6
Total	100

*Of total geographic area



Trans-Himalayan Region

- ✓ It constitutes 5.6 per cent of the total geographical area, includes the high altitude, cold and arid mountain areas of Ladakh, Jammu & Kashmir, North Sikkim, Lahaul and Spiti areas of Himachal Pradesh.
- ✓ This zone has sparse alpine steppe vegetation that harbours several endemic species and is a favourable habitat for the biggest populations of wild sheep and goat in the world and other rare fauna that includes Snow Leopard (*Uncia uncia*) and the migratory Blacknecked Crane (*Grus nigricollis*).
- ✓ The cold dry desert of this zone represents an extremely fragile ecosystem.

Himalayan Zone

- ✓ It constitutes 6.4 per cent of the total geographical area includes some of the highest peaks in the world.
- ✓ The Himalayan zone makes India one of the richest areas in terms of habitats and species.
- ✓ The alpine and sub-alpine forests, grassy meadows and moist mixed deciduous forests provide diverse habitat for endangered species of bovids such as **Bharal (*Pseudois nayaur*)**, **Ibex (*Capra ibex*)**, **Markhor (*Capra falconeri*)**, **Himalayan Tahr (*Hemitragus jemlahicus*)**, and **Takin (*Budoreas taxicolor*)**. Other rare and endangered species restricted to this zone include **Hangul (*Cervus eldi eldi*)** and **Musk Deer (*Moschus moschiferus*)**.

Indian Desert Zone

- Indian Desert Zone, constituting 6.6 per cent of the total geographical area, includes the Thar and the Kutch deserts and has large expanses of grassland that supports several endangered species of mammals such as Wolf (*Canis lupus*), Caracal (*Felis caracal*), Desert Cat (*Felis libyca*) and birds of conservation interest viz., Houbara Bustard (*Chamydotis undulata*) and the Great Indian Bustard (*Ardeotis nigriceps*).

Semi Arid Region

- Semi-arid Region, constituting 16.6 per cent of the total geographical area, is a transition zone between the desert and the dense forests of Western Ghats.
- Peninsular India has two large regions, which are climatically semi-arid. *This semi-arid region also has several artificial and natural lakes and marshy lands.*
- The dominant grass and palatable shrub layer in this zone supports the highest wildlife biomass. The cervid species of **Sambar (*Cervus unicolor*)** and **Chital (*Axis axis*)** are restricted to the better wooded hills and moister valley areas respectively. The Lion (*Leo persica*), an endangered carnivore species (restricted to a small area in Gujarat), Caracal (*Felis caracal*), Jackal (*Canis aureus*) and Wolf (*Canis lupus*) are some of the endangered species that are characteristic of this region.

Western Ghats

- Constitutes 4.0 per cent of the total geographical area.
- One of the major tropical evergreen forest regions in India.
- Represents one of the two biodiversity 'hot spots'.
- Home to viable populations of most of the vertebrate species found in peninsular India, besides an endemic faunal element of its own.
- Significant species endemic to this region include **Nilgiri Langur (*Presbytis johnii*)**, **Lion Tailed Macaque (*Macaca silenus*)**, **Grizzled Giant Squirrel (*Ratufa macroura*)**, **Malabar Civet (*Viverricula megaspila*)**, **Nilgiri Tahr (*Hemitragus bylocrius*)** and **Malabar Grey**

Hornbill (*Ocyceros griseus*). The Travancore Tortoise (*Indotestudo forstem*) and Cane turtle (*Heosemys silvatica*) are two endangered taxa restricted to a small area in central Western Ghats.

Deccan Plateau

- Constitutes 42 per cent of the total geographical area.
- It's a semi-arid region that falls in the rain shadow area of the Western Ghats.
- This bio-geographic zone of peninsular India is by far the most extensive zone, covering India's finest forests, particularly in the States of Madhya Pradesh, Maharashtra and Odisha.
- *Majority of the forests are deciduous in nature* but there are regions of greater biological diversity in the hill ranges. The zone comprising of deciduous forests, thorn forests and degraded scrubland support diverse wildlife species.
- Species found in this region are **Chital** (*Axis axis*), **Sambar** (*Cervus unicolor*), **Nilgai** (*Boselaphus tragocamelus*) and **Chousingha** (*Tetracerus quadricornis*), **Barking deer** (*Muntiacus muntjak*) and Gaur (*Antilope cervicapra*), Elephant (*Elephas maximus*) in Bihar-Orissa and Karnataka-Tamil Nadu belts, Wild Buffalo (*Bubalus bubalis*) in a small area at the junction of Orissa, Madhya Pradesh and Maharashtra and the hard ground Swamp Deer (*Cervus duvauceli*), now restricted to a single locality in Madhya Pradesh.

Gangetic Plain

- Constitutes around 10.8 per cent of the total geographical area. The Gangetic plain is topographically homogenous for hundreds of kilometers.
- The characteristic fauna of this region include Rhino (*Rhinoceros unicornis*), Elephant (*Elephas maximus*), Buffalo (*Bubalus bubalis*), Swamp Deer (*Cervus duvauceli*), Hog-Deer (*Axis porcinus*) and Hairy Hare (*Caprolagus hispidus*).

North East Region

- Constitutes 5.2 per cent of the total geographical area.
- This region represents the transition zone between the Indian, Indo-Malayan and Indo-Chinese bio-geographical regions as well as being a meeting point of the Himalayan mountains and peninsular India.
- The North-East is thus the biogeographical 'gateway' for much of India's fauna and flora and also a biodiversity hotspot. Many of the species contributing to this biological diversity are either restricted to the region itself, or to the smaller localized areas of the Khasi Hills.

Coastal Region

- Constitutes 2.5 per cent of the total geographical area with sandy beaches, mangroves, mud flats, coral reefs and marine angiosperm pastures make them the wealth and health zones of India.

- The coastline from Gujarat to Sunderbans is estimated to be 5,423 km long. A total of 25 islets constitute the Lakshadweep, which are of coral origin, and have a typical reef lagoon system, rich in biodiversity.
- However, the densely populated Lakshadweep islands virtually have no natural vegetation.

Andaman and Nicobar Islands

- This constitutes 0.3 per cent of the total geographical area are one of the three tropical moist evergreen forests zones in India. *The islands house an array of flora and fauna not found elsewhere.*
- These islands are centres of high endemism and contain some of India's finest evergreen forests and support a wide diversity of corals. In India, *endemic island biodiversity is found only in the Andaman and Nicobar Islands.*

Chapter 8. Biodiversity Hotspots in India

India has two identified biodiversity hot spots viz. Eastern Himalayas and the Western Ghats.

Eastern Himalaya

- ✓ Eastern Himalaya forms a distinct phytogeographic region comprising Nepal, Bhutan, states of East and North-East India, and a contiguous sector of Yunnan province in South-Western China. The Eastern Himalayas harbor a staggering 10,000 plant species, 300 mammal species, 977 bird species, 176 reptiles, 105 amphibians and 269 types of freshwater fish. The region also has the highest density of Bengal tigers in the world and is the last bastion of the charismatic greater one-horned rhino.

Flora of Eastern Himalaya

- ✓ In the whole of Eastern Himalaya, out of the 10000 plant species, around 39% are endemic.
- ✓ At least 55 flowering plants endemic to this area are recognised as rare, for example, the **Pitcher Plant** (*Nepenthes khasiana*).
- ✓ Eastern Himalaya is a rich centre of primitive flowering plants and is popularly known as the '**Cradle of Speciation**'. The floral diversity in this region includes a vivid spectrum of diverse species including monocots and dicots.
- ✓ This region is also known as as the **centre of origin and diversification of five palms of commercial importance** viz. *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 or Himalayan Yew** (*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 various kinds of breast and ovarian cancer.

Fauna of Eastern Himalaya

- ✓ More than half (63%) of the genera of land mammals in India are found in Eastern Himalaya. During the last four decades, two new mammals have been discovered from the region viz. **Golden Langur** from Assam-Bhutan region, and **Namdapha Flying Squirrel from Arunachal Pradesh**.
- ✓ Not only that, a 100-million year-old gecko, the oldest fossil gecko species known to science, was discovered in an amber mine in the Hukawng Valley in the northern Myanmar.
- ✓ 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

- Western Ghats is one of the richest centres of endemism in the world. Due to varied topography and microclimatic regimes, some areas within the region are considered to be active zones of speciation.

Flora of Western Ghats

- 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.

Fauna of Western Ghats

- 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.

Chapter 9. The Biodiversity 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. Here, we study the provisions of this act.

Establishment of National Biodiversity Authority

- ✓ The Biodiversity Act 2002 empowers the Central Government to establish a National Biodiversity Authority with its office at Chennai. The NBA can open offices at other place after getting approval from the central government.
- ✓ The Chairman of NBA will be appointed by the central government. The chairman will be an eminent person having adequate knowledge and experience in the conservation and sustainable use of biological diversity and in matters relating to equitable sharing of benefits. The chairman can be removed by the Central government.
- ✓ The central government will appoint seven ex-officio members, who shall be officers of the following ministries:
 - (i) Agricultural Research and Education;
 - (ii) Biotechnology;
 - (iii) Ocean Development;
 - (iv) Agriculture and Cooperation;
 - (v) Indian Systems of Medicine and Homoeopathy;
 - (vi) Science and Technology;
 - (vii) Scientific and Industrial Research;

- ✓ Five non-official members will also be appointed. These will be persons with good domain knowledge in biodiversity.

Powers and Functions of NBA

- ✓ All foreign nationals require approval from NBA for obtaining Biological Resources.
- ✓ All Indian individuals/entities are required to seek NBA approval before transferring knowledge / research and material to foreigners.
- ✓ 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.

Establishment of State Biodiversity Board

- ✓ The act requires the state governments to notify the State Biodiversity Board. There is no provision for a Biodiversity Board for a Union Territory, whereby the National Biodiversity Authority shall exercise the powers and perform the functions of a State Biodiversity Board for that Union territory.
- ✓ The State Biodiversity Board shall advise the State Government on matters relating to the conservation of biodiversity, sustainable use of its components and equitable sharing of the benefits arising out of the utilization of biological resources.
- ✓ The state board also will regulate by granting of approvals or otherwise requests for commercial utilization or bio-survey and bio-utilization of any biological resource by Indians.
- ✓ All Indians are required to provide prior intimation to State Biodiversity Boards for obtaining biological material for commercial purposes in a state.
- ✓ Growers and cultivators of Biological Diversity and vaidas and hakims who are practicing Indian system of medicines and local people exempted.

National Biodiversity Fund

The act provides that there shall be constituted a Fund to be called the National Biodiversity Fund. Any grants and loans made to the National Biodiversity Authority and all charges and royalties received by the National Biodiversity Authority and all sums received by the National Biodiversity Authority from any other resource defined by Central government will be credited into this fund. The funds will be used to:

- Channeling Benefits To The Benefit Claimers;
- Conservation And Promotion Of Biological Resources And Development Of Areas From Where Such Biological Resources Or Knowledge Associated Has Been Accessed;
- Socio-Economic Development Of The Above Areas

State Biodiversity Fund

In each state, there shall be constituted a Fund to be called the State Biodiversity Fund and there shall be credited thereto-

- Any grants and loans made to the State Biodiversity Board by the National Biodiversity Authority;
- All sums received by the State Biodiversity Board from such other sources as may be decided upon by the State Government.

The State Biodiversity Fund will be used for

- The management and conservation of heritage sites;
- Compensating or rehabilitating any section of the people economically affected when an area is declared Biodiversity heritage site.

- Conservation and promotion of biological resources.

Biodiversity heritage sites

The State Government may, from time to time in consultation with the local bodies, notify the areas of biodiversity importance as biodiversity heritage sites under this Act. The State Government, in consultation with the Central Government, may frame rules for the management and conservation of all the heritage sites. The State Government shall frame schemes for compensating or rehabilitating any person or section of people economically affected by such notification.

Biodiversity Management Committee

Every local body shall constitute a Biodiversity Management Committee within its area for the purpose of promoting conservation, sustainable use and documentation of biological diversity including preservation of habitats, conservation of land races, folk varieties and cultivars, domesticated stocks and breeds of animals and microorganisms and chronicling of knowledge relating to biological diversity.

Explanation.- For the purposes of this sub-section,-

- "cultivar" means a variety of plant that has originated and persisted under cultivation or was specifically bred for the purpose of cultivation;
- "folk variety" means a cultivated variety of plant that was developed, grown and exchanged informally among farmers;
- "landrace" means primitive cultivar that was grown by ancient farmers and their successors.

The National Biodiversity Authority and the State Biodiversity Boards shall consult the Biodiversity Management Committees while taking any decision relating to the use of biological resources and knowledge jurisdiction of the Biodiversity Management Committee.

The Biodiversity Management Committees may levy charges by way of collection fees from any person for accessing or collecting any biological resource for commercial purposes from areas falling within its territorial jurisdiction

Other observations in Biodiversity Act

- ✓ If a dispute arises between the National Biodiversity Authority and a State Biodiversity Board, the said Authority or the Board, as the case may be, may prefer an appeal to the Central Government within such time as may be prescribed.
- ✓ National Biodiversity Authority shall have the same powers as are vested in a civil court under the Code.
- ✓ Violation of this act invites penalties viz. imprisonment for a term which may extend to five years, or with fine which may extend to ten lakh rupees and where the damage caused exceeds tend lakh rupees such fine may commensurate with the damage caused, or with both

Chapter 10. 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.

- ✓ Strengthening and integration of in situ, on-farm and ex situ conservation

"ex situ conservation" means the conservation of components of biological diversity outside their natural habitats;
"in situ conservation" means the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties.
- ✓ Augmentation of natural resource base and its sustainable utilization; Ensuring inter and intra-generational equity
- ✓ Regulation of introduction of invasive alien species and their management
- ✓ Assessment of vulnerability, and adaptation to climate change and desertification
- ✓ Integration of biodiversity concerns in economic and social development
- ✓ To prevent, minimize and abate impacts of pollution
- ✓ Development and integration of biodiversity databases
- ✓ Strengthening implementation of policy, legislative and administrative measures for biodiversity conservation and management
- ✓ Building of national capacities for biodiversity conservation and appropriate use of new technologies
- ✓ Valuation of goods and services provided by biodiversity and use of economic instruments in the decision-making processes
- ✓ International cooperation to consolidate and strengthen bilateral, regional and multilateral cooperation on issues related to biodiversity.

Chapter 11. 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
 - Beddomes' cycad (Cycas beddomei)
 - Blue Vanda (Vanda soerulec)
 - Kuth (Saussurea lappa)
 - Ladies slipper orchids (Paphiopedilum spp.)
 - Pitcher plant (Nepenthes khasiana)
 - Red Vanda (Rananthera inschootiana)]

How a Sanctuary is declared?

- By the State Government via a Notification. There is no need to pass a legislation (act) by the state assembly to declare a wildlife sanctuary.
- Sanctuary is declared when the government 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 Sanquary 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. Again, here please note that a resolution is passed and no need to pass an act for alternation of the boundaries.

How a National Park is declared?

- By the state government via notification.

- Declared when the State Government believes 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 protection & propagating or developing wildlife therein or its environment.
- 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. No need for a legislation (act).

Chapter 12. 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 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 Criteria of Biosphere Reserves

The concept of Biosphere Reserves, especially its **zonation**, into Core Area(s) (dedicated to conservation), Buffer Area(s) (sustainable use) and Transition Area(s) (equitable sharing of

benefits) were later broadly adopted under the Convention on Biological Diversity (CBD) process which entered into force on 29th December, 1993.

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.

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.*

Number of Biosphere Reserves in India

There are 18 notified Biosphere reserves in India. As of now, only Eights viz. Nilgiri (2000), Gulf of Mannar (2001), Sunderban (2001), Nanda Devi(2004), Nokrek (2009), Pachmarhi(2009), Similipal (2009) and Great Nicobar (2013) 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	Chhattisgarh, 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	765

16	2009	Cold Desert	Himachal Pradesh	Himalayas West	NA
17	2010	Sheshachalam Hills	The hill ranges spread in parts of Chittoor and Kadapa districts of Andhra Pradesh have been designated as Seshachalam Biosphere Reserve in Andhra Pradesh on 20th September, 2010.	Himalayas Eastern	4755
18	2011	Panna Biosphere Reserve	Part of Panna and Chhattarpur districts in Madhya Pradesh	Ghats	NA

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 –

- The focus of WS/NP is on conservation of mammals. No focus to the other species which may be ecologically more vital.
- The focus of the MAB and Biosphere Reserves is to protect the "threatened Habitats" and not "a particular threatened species".
- 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?

- 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.
- Area is demarcated. The Biosphere Reserve is declared by a notification by the Central and State Governments.
- 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

The 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.

Chapter 13. Protection of Tiger

Project Tiger

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:

- ☛ To ensure maintenance of the available population of tigers in India for scientific, economic, aesthetic, cultural and ecological value.
- ☛ 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 42 approved Tiger reserves.** The project **started as a 'Central Sector Scheme'** with the full assistance of Central Government till 1979-80: **later, it became a 'centrally Sponsored Scheme'** from 1980-81, with equal sharing of expenditure between the center and the states.

National Tiger Conservation Authority

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)

Kindly note that the Central Government causes the annual report of the National Tiger Conservation Authority to be laid before each House of Parliament.

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.

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.

[Functions](#)

- To approve the Tiger Conservation Plan prepared by the State Governments and then evaluate and assess various aspects of sustainable ecology and disallow any ecologically unsustainable land use such as, mining, industry and other projects within the tiger reserves. *Kindly note that under section 38V of the Wildlife (Protection) Act, 1972, every State Government has the authority to notify an area as a tiger reserve. However, the notable observation is that while the wildlife sanctuaries and national parks can be declared by the state governments, in context with the Tiger Reserves, the Tiger Conservation Plans sent by state government need to be approved by the NTCA first.*
- However, things can go in other way also. Central Government via NTCA may advise the state governments to forward a proposal for creation of Tiger Reserves. In recent times, it has happened and we even see that the states like Karnataka have opposed the Centre Government's initiation of declaring a tiger reserve due to many reasons including political ones.
- Regulation and standardization of tourism activities
- Provide for management focus and measures for addressing conflicts of men and wild animals.
- Provide information on protection measures.
- Ensure that the tiger reserves and areas linking one protected area or tiger reserve with another protected area or tiger reserve are not diverted for ecologically unsustainable uses, except in public interest and with the approval of the National Board for Wild Life and on the advice of the Tiger Conservation Authority.
- Facilitate and support the tiger reserve management in the State.
- Ensure critical support including scientific, information technology and legal support for better implementation of the tiger conservation plan.

Parts of a Tiger Reserve

Kindly note that while making the proposal (Tiger Conservation Plan), a state government needs to ensure the agricultural, livelihood, developmental and other interests of the people living in tiger bearing forests or a tiger reserves. With this, reference the following areas are to be defined clearly.

- **Core or critical area:** The core or critical tiger habitat areas of National Parks and sanctuaries are required to be kept as inviolate for the purposes of tiger conservation, *without affecting the rights of the Scheduled Tribes or such other forest dwellers.*
- The buffer or peripheral area is consisting of the area peripheral to critical tiger habitat or core area. It has a lesser degree of habitat protection to ensure the integrity of the critical tiger habitat with adequate dispersal for tiger species, and which aim at promoting co-existence between wildlife and human activity with due recognition of the livelihood, developmental, social and cultural rights of the local people, wherein the limits of such areas

are determined on the basis of scientific and objective criteria in consultation with the concerned Gram Sabha and an Expert Committee constituted for the purpose.

The above two definition imply that_:

- No human activity is allowed in core areas except anything that affects the rights of the scheduled tribes or forest dwellers.
- The buffer area is allowed for limited non-commercial activity such as development, co-existence of man and wild animals and scientific research.
- Gram Sabha is consulted in management of buffer areas.

Alteration of Boundaries of Tiger Reserves

No alteration in the boundaries of a tiger reserve shall be made except on a recommendation of the Tiger Conservation authority and the approval of the National Board for Wild Life.

Can a state government denotify a tiger Reserve?

Yes. The state Government can de-notify a tiger reserve in public interest but only with the prior approval of the Tiger Conservation Authority and the National Board for Wild Life.

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

As of March 2013, there are **42 approved Tiger Reserves in India**, administered under the Project Tiger.

N.o.	State	Tiger Reserve	Year Estd.	Est. No. of Tigers	Total (km2)	Area
1	Assam	Manas Tiger Reserve	1973-74	15	2840	
2	Jharkhand	Palamu Tiger Reserve	1973-74	6	1026	
3	Karnataka	Bandipur Tiger Reserve	1973-74	79	866	
4	Madhya Pradesh	Kanha Tiger Reserve	1973-74	60	1945	
5	Maharashtra	Melghat Tiger Reserve	1973-74	5	1677	
6	Odisha	Simlipal Tiger Reserve	1973-74	8	2750	
7	Rajasthan	Ranthambore Tiger Reserve	1973-74	45	1334	
8	Uttarakhand	Corbett Tiger Reserve	1973-74	134	1316	
9	West Bengal	Sunderbans Tiger Reserve	1973-74	256	2585	
10	Karnataka	Bannerghatta tiger and lion reserve	1978	NA	104	
11	Kerala	Periyar Tiger Reserve	1978-79	10	925	
12	Rajasthan	Sariska Tiger Reserve	1978-79	4	866	
13	Arunachal Pradesh	Namdapha Tiger Reserve	1982-83	15	1985	
14	Andhra Pradesh	Nagarjunsagar-Srisailam Tiger Reserve	1982-83	14	3568	
15	Chhattisgarh	Indravati Tiger Reserve	1982-83	13	2799	

General Studies Manual for UPSC and State Public Service Examinations

Environment-1: Framework Around Biodiversity Protection

16	West Bengal	Buxa Tiger Reserve	1982-83	12	759
17	Uttar Pradesh	Dudhwa Tiger Reserve	1987-88	101	811
18	Tamil Nadu	Kalakad-Mundathurai Tiger Reserve	1988-89	73	800
19	Bihar	Valmiki Tiger Reserve	1989-90	18	840
20	Madhya Pradesh	Pench Tiger Reserve	1992-93	19	758
21	Madhya Pradesh	Bandhavgarh Tiger Reserve	1993-94	63	1162
22	Maharashtra	Tadoba-Andhari Tiger Reserve	1993-94	20	620
23	Madhya Pradesh	Panna Tiger Reserve	1994-95	22	542
24	Mizoram	Dampa Tiger Reserve	1994-95	23	500
25	Karnataka	Bhadra Tiger Reserve	1998-99	24	492
26	Maharashtra	Pench Tiger Reserve	1998-99	25	257
27	Assam	Nameri Tiger Reserve	1999-2000	27	344
28	Arunachal Pradesh	Pakhui Tiger Reserve	1999-2000	26	862
29	Karnataka	Nagarhole (extension) Tiger Reserve	1999-2000	37	643
30	Madhya Pradesh	Bori-Satpura Tiger Reserve	1999-2000	28	1486
31	Assam	Kaziranga Tiger Reserve	2006	32	859
32	Tamil Nadu	Mudumalai National Park	2007	36	321
33	Odisha	Satkosia Tiger Reserve	2007	31	988
34	Karnataka	Anshi Dandeli Tiger Reserve	2007	34	875
35	Maharashtra	Sahyadri Tiger Reserve	2008	39	569
36	Chhattisgarh	Achanakmar Tiger Reserve	2008	33	963
37	Madhya Pradesh	Sanjay Dubri Tiger Reserve	2008	35	831
38	Tamil Nadu / Kerala	Annamalai Tiger Reserve	2008-09	29	1019
39	Chhattisgarh	Udanti & Sitanadi Tiger Reserve	2008-09	30	1580
40	Kerala	Parambikulam Tiger Reserve	2010	38	391
41	Karnataka	Biligiri Rangaswamy Temple Wildlife Sanctuary	2010	40	540
42	Karnataka	Kudremukh Tiger Reserve	2012	NA	NA

Kindly note that the last among above i.e. **Kudremukh tiger reserve** was given final approval last year. This area is close to Bhadra sanctuary of Karnataka and with this Karnataka has 5 tiger reserves. The state politicians had opposed inclusion of Kudremukh as Tiger Reserve.

Further, **'in-principle' approval** has been accorded by the National Tiger Conservation Authority for creation of five new tiger reserves as follows:

- 43. Pilibhit (Uttar Pradesh)
- 44. Ratapani (Madhya Pradesh)
- 45. Sunabeda (Odisha)
- 46. Mukundara Hills (including Darrah, Jawahar Sagar and Chambal Wildlife Sanctuaries) (Rajasthan)

47. Satyamangalam (Tamil Nadu).

Apart from the above, State Governments have been advised to send proposals for declaring the following areas as tiger reserves:

48. Bor (Maharashtra)

49. Suhelwa (Uttar Pradesh)

50. Nagzira-Navegaon (Maharashtra)

51. Guru Ghasidas National Park (Chhattisgarh)

52. Mhadei Sanctuary (Goa)

53. Srivilliputhur Grizzled Giant Squirrel / Megamalai Wildlife Sanctuaries / Varushanadu Valley (Tamil Nadu).

Summary: All India Tiger Estimation (2010)

- There is a countrywide increase of 20% in tiger numbers in 2010 with an estimated number of 1706 (1520-1909). The 2006 estimation was 1411 (1165 – 1657) tigers.
- This country level assessment is done once in every four years, and is a collaborative initiative between the NTCA, WII, tiger States and outside expertise.
- There is a decline of 12.6% in tiger occupancy from connecting habitats.
- The increase in tiger numbers is due to the fact that tiger populations in Uttarakhand, Tamil Nadu, Maharashtra and Karnataka have shown an increase in tiger density.
- The inclusion of Sunderbans, some portions of North East and parts of Maharashtra have also contributed to the increase.

How Tigers are counted

The National Estimation of the Status of the Tiger is based on established scientific procedure to provide information on tiger populations in India. The current procedure of tiger count involves rigorous statistical analyses and is far more accurate than earlier methods. It is conducted in three phases and involves **ground surveys**, **analyses of satellite data** and **camera traps**. Due to significant errors in the earlier pugmark counting method, its results are considered flawed, and cannot be compared with the results from this advanced procedure.

Chapter 14. Protection of Elephant

Project Elephant was launched in 1991-92 to assist the States with the following objectives .

- To protect elephants, their habitat & corridors
- to address issues of man-animal conflict
- welfare of domesticated elephants



As of now, the project is being implemented in **the 13 states of Andhra Pradesh, Arunachal Pradesh, Assam, Jharkhand, Karnataka, Kerala, Meghalaya, Nagaland, Odisha, Tamil Nadu, Uttaranchal, Uttar Pradesh and West Bengal.**

Note: There are 17 states in India in which elephants exist in the wild state.

Major Activities:

- Ecological restoration of existing natural habitats and migratory routes of elephants
- Development of scientific and planned management for conservation of elephant habitats and value population of wild Asiatic elephants in India
- 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
- Strengthening of measures for protection of wild elephants from poachers and unnatural causes of death
- Research on Project Elephant management related issues
- Public education and awareness programmes
- Eco-development
- Veterinary care

India's Elephant Reserves

Sighbhum Elephant Reserve in Jharkhand was the first reserve to be notified in the country in the year 2001 and since then **28 Elephant Reserves** (ERs) extending over about 60,000 Km² have been formally notified by various State Governments. All Elephant reserves *including the proposed* and in principally approved are listed in the below table:

No.	Elephant Reserve	State
1	Rayala Elephant Reserve	Andhra
2	Kameng Elephant Reserve	Arunachal
3	Deomali Elephant Reserve	Arunachal
4	Sonitpur Elephant Reserve	Assam
5	Dihing-Patkai Elephant Reserve	Assam
6	Kaziranga – Karbi Anglong Elephant Reserve	Assam
7	Dhansiri-Lungding Elephant Reserve	Assam
8	Chirang-Ripu Elephant Reserve	Assam
9	Singhbhum Elephant Reserve	Jharkhand
10	Mysore Elephant Reserve	Karnataka
11	Bhadra Elephant Reserve	Karnataka
12	Wayanad Elephant Reserve	Kerala
13	Nilambur Elephant Reserve	Kerala
14	Anamudi Elephant Reserve	Kerala
15	Periyar Elephant Reserve	Kerala
16	Garo Hills Elephant Reserve	Meghalaya
17	Khasi Hills Elephant Reserve	Meghalaya
18	Intanki Elephant Reserve	Nagaland
19	Mayurbhanj Elephant Reserve	Odisha
20	Mahanadi Elephant Reserve	Odisha

21	Sambalpur Elephant Reserve	Odisha
22	Baitarni Elephant Reserve	Odisha
23	South Odisha Elephant Reserve	Odisha
24	Nilgiri Elephant Reserve	Tamil Nadu
25	Coimbatore Elephant Reserve	Tamil Nadu
26	Anamalai Elephant Reserve	Tamil Nadu
27	Srivilliputtur Elephant Reserve	Tamil Nadu
28	Shivalik Elephant Reserve	Uttaranchal
29	Mayurjharna Elephant Reserve	W. Bengal
30	Eastern Dooars Elephant Reserve	W. Bengal

Elephant Corridors in India

Elephant corridors are narrow strips of land that allow elephants to move from one habitat patch to another. There are 183 identified elephant corridors in India. Out of this 138 are State Elephant Corridors, 28 Inter-State Elephant Corridors and 17 are International Elephant Corridors.

- Among state corridors, *maximum number of them are located in Meghalaya.*
- Among, inter-state corridors, maximum are shared by **Jharkhand and Odisha.**
- Maximum International corridors India shares with **Bangladesh.**

This is evident from the following table:

State Corridors	Inter-State Corridors	International Corridors				
		State	Number	States	Number	Countries
Meghalaya	26	Jharkhand– Odisha	8	Indo- Bangladesh	6	
Odisha	21	Arunachal– Assam	4	Indo- Bhutan	4	
Tamilnadu	19	Karnataka– Tamilnadu	4	Indo- Myanmar	4	
Assam	15	Assam– Nagaland	3	Indo – Nepal	3	
W. Bengal	14	Jharkhand – W. Bengal	3			
Kerala	12	Arunachal– Nagaland	2			
Karnataka	9	Jharkhand– M.P.	1			
Arunachal	8	Odisha–W. Bengal	1			
Jharkhand	6	Karnataka– Kerala	1			
Uttranchal	5	Kerala-Tamilnadu	1			
Uttar Pradesh	3					
Total	138	Total	28	Total	17	

Population of Wild Elephants in India

The following table shows the population of Wild Elephants in India as per the 2007 Census.

- ✓ The below table makes it clear that *maximum number of wild elephants in India are in Kerala, followed by Assam and Karnataka.*

REGION	STATE	ELEPHANT POPULATION			
		1993	1997	2002	2007
North-East	Arunachal Pradesh	2102	1800	1607	1690
	Assam	5524	5312	5246	5281

	Meghalaya	2872	1840	1868	1811
	Nagaland	178	158	145	152
	Mizoram	15	22	33	12
	Manipur	50	30	12	-
	Tripura	100	70	40	59
	West Bengal (North)	186	250	292	300-350
Total for North-East		11027	9482	9243	9305-9355
East	West Bengal (South)	14	26	36	25
	Jharkhand	550	618	772	624
	Odisha	1750	1800	1841	1862
	Chhattisgarh	-	-	-	122
Total for East		2314	2444	2649	2633
North	Uttarakhand	828	1130	1582	1346
	Uttar Pradesh	47	70	85	380
Total for North		875	1200	1667	1726
South	Tamil Nadu	2307	2971	3052	3867
	Karnataka	5500	6088	5838	4035
	Kerala	3500	3600	3850	6068
	Andhra Pradesh	46	57	74	28
	Maharashtra	-	-	-	7
Total for South		11353	12716	12814	14005
GRAND TOTAL		25569	25842	26373	27669-27719

Elephant as National Heritage Animal of India

In 2010, Elephants have been declared as national heritage animal by the government with an aim to step up measures for their protection. The status was recommended by a task force on elephant project.

The government is still mulling over to **amend the Wildlife (Protection) Act** to pave way for setting up of **National Elephants Conservation Authority (NECA)** on the lines of the NTCA that has been constituted for the tiger conservation.

The panel which layed out a comprehensive action agenda for protection of the pachyderms attributed poaching for ivory and increased conflict between people and elephants for their dwindling habitat.

Chapter 15. Protection of Snow Leopard

Project Snow Leopard

In 2009 launched 'Project Snow Leopard' to safeguard and conserve India's unique natural heritage of high-altitude wildlife populations and their habitats by promoting conservation through participatory policies and actions.

The Project Snow Leopard is an initiative for strengthening wildlife conservation in the Himalayan high altitudes, covering the five states of



Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Arunachal Pradesh and Sikkim. It aims at promoting a knowledge-based and adaptive conservation framework that fully involves the local communities, who share the snow leopard's range, in conservation efforts.

Some notes:

- ✓ Being a predator like tiger, snow leopard is apex predator of ecological pyramid. Apex predator species occupy the highest trophic level(s) and have a crucial role in maintaining the health of their ecosystems. *Apex predators affect prey species' population dynamics. Where two competing species are in an ecologically unstable relationship, apex predators tend to create stability if they prey upon both. Inter-predator relationships are also affected by apex status.*
- ✓ Snow Leopard has suffered mainly on account of its relatively smaller population and also because of man-animal conflict.
- ✓ Snow leopard has been included in the list of species under Recovery Programme to be funded through the umbrella scheme of Integrated Development of Wildlife Habitats.

There are around 750 snow leopards in India. The snow leopard project will facilitate a landscape-level approach to wildlife conservation by developing scientific frameworks for comprehensive surveys, rationalising the existing protected area network and improving protected area management. It will develop a framework for wildlife conservation outside protected areas and promote ecologically responsible development.

Chapter 16. Protection of Hangul

In March 2009, the ministry of environment and forests had approved the Species Recovery Plan for Hangul and released Rs 99 lakhs for its implementation. Hangul or Kashmir stag (*Cervus elaphus hanglu*) is a subspecies of Red Deer and it is native to India, especially in Jammu and Kashmir where it is the state animal. Kashmir Stag is listed as critically endangered by IUCN as population is counted 160 mature individuals in 2008 census. It is found mainly in the Dachigam National Park and its adjoining areas. Conservation of this species assumes great significance as this is the only survivor of the Red Deer group in the Indian sub-continent.



Species Recovery Plan is a Rs. 22 crore programme to be implemented in five years. This programme envisages survey and census of Hangul, Leopard and Black bear in the Hangul habitat.

Chapter 17. Protection of Vulture

Discovery of Decline in Vulture Population

In 1998, observations and counts of vultures at Keoladeo National Park, Bharatpur indicated a decline in numbers of vultures. In 1999, it was found that there is a sharp decline in number of vultures in India, Pakistan and Nepal. Research was initiated and research was focused around food shortages, poisoning, use of pesticides, disease or other factors.

In 2003, the researchers from Pakistan and The Peregrine Fund discovered that the veterinary drug diclofenac is widely used for treating livestock in Pakistan and is toxic to vultures. Similar research in India and Nepal confirmed the presence of diclofenac residues in vulture carcasses with *visceral gout* and the widespread availability and use of this drug by veterinarians.

The culprit was identified in Diclofenac.

The treatment of the painkiller Diclofenac was the culprit responsible for the drastic drop in the number of the Vultures, due to which, out of nine species of vultures, the population of three species- White-backed Vulture (*Gyps bengalensis*), Slender-billed Vulture (*Gyps tenuirostris*) and Long-billed Vulture (aka Indian Vulture) (*Gyps indicus*) declined by 99% in India.

Bioaccumulation of Diclofenac causes kidney failure and visceral gout in Vultures leading to death. Diclofenac is such dangerously fatal for Vultures that even 1% of it in carcass would kill the Vulture in a short time, after it feeds such carcass.

The Vulture Recovery meetings in Nepal and India produced a "Diclofenac Manifesto" and "Vulture Recovery Plan". Countries started banning the veterinary use of diclofenac, and the urgent requirements to find vulture safe alternative drugs and to capture and establish vulture conservation breeding centers.

Vulture Safe Zones

Environment Ministry of India intends to create vulture safe zones spanning across thousands of kilometers where these birds in the captivity would be released. From 2014 onwards, they would be released. The birds will be having color banding so that they can be located once air bound. Three proposed Vulture Safe Zones are as follows:

- I. The zone between Uttarakhand to Nepal, which spans from Corbett to Katriya Ghat, a Tarai belt, covering 30,000 sq kms, will be earmarked as 'Vulture Safe' zone. The species of slender-billed vulture and white-backed vulture are found in this area, which is marshy grassland.

Out of nine species of vultures, the population of three species- **White-backed Vulture** (*Gyps bengalensis*), **Slender-billed Vulture** (*Gyps tenuirostris*) and **Long-billed Vulture** (*Gyps indicus*) has declined by 99%. The Red-headed Vulture (*Sarcogyps calvus*) has also suffered a rapid decline in the recent past. Vultures keep the environment clean, by scavenging on animal carcasses. The decline in vulture populations has associated disease risks, including increased risk of spread of rabies and anthrax, besides adversely impacting the observance of last rites by the Parsis in the Towers of Silence.

- II. The belt between Dibrugarh (Assam) to North Lakhimpur (Arunachal Pradesh) will also be conserved as a vulture safe zone where slender-billed and white-backed species of vultures are found.
- III. The third zone would be in central India, covering Chhattisgarh, where white-backed and long-billed vultures are found.

Vulture breeding facilities

The vulture research facility at Pinjore, Haryana became Asia's first Vulture Conservation Breeding Centre in 2005. At present, India has three vulture breeding facilities at

- ✓ Rani, Guwahati (Assam),
- ✓ Pinjore (Haryana) and
- ✓ Buxa (West Bengal).

The breeding facilities had started some years back but it takes time for the reproduction amongst vultures. The projects are expensive but the real idea is that if vultures totally disappear there should be some at least in captivity which can be released.