MPBDQ-2019 Text - E

Celebrating 150th Birth Anniversary of Sh. M.K.Gandhi

"पृथ्वी सभी मनुष्यों की जरूरत पूरी करने के लिए पर्याप्त संसाधन प्रदान करती है, लेकिन लालच पूरी करने के लिए नहीं"

"Earth provides enough to satisfy every man's needs, but not every man's greed"

"Come let us Live in Harmony with Nature
आइए प्रकृति से सामंजस्य में जिएँ"

Madhya Pradesh Biodiversity Quiz Programme-2019
Biodiversity Quiz / Leadership Book

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"[Come let us Live in Harmony with Nature
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Madhya Pradesh Biodiversity Quiz Programme-2019
Biodiversity Quiz/Leadership Book
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R.Sreenivasa Murthy, IFS
Member Secretary.

Madhya Pradesh State Biodiversity Board

Foreword

Madhya Pradesh State Biodiversity Board has taken initiative to revise its State Biodiversity Strategy and Action Plan 2018-2030 in the year 2018. Presently the SAP is in its final draft form and awaiting approval from the Board and Government. While we were into State wide consultation process, it came to our knowledge that MP Tourism Board is doing Annual tourism Quiz programme and this programme is eliciting good response from the student community with respect to tourism aspects of the State.

A suggestion came to us that MPSBB also engages herself in a similar exercise annually to make the student community of the state aware of the burning day to day Biodiversity issues, especially during the times when we all see extreme events of biodiversity loss due to climate change effects. Hence it was decided at the Board level to follow the model already established in the State for the better cause of making aware of the youth with Biodiversity aspects of day to day life.

15th Board meeting dated 04 February 2019 approved the proposal for Annual MP State Biodiversity Quiz from 2019 onwards. Then came a golden opportunity of 150th Birth Anniversary of Father of Nation and we wanted to utilize the occasion to start the programme without losing time. Thus we sent a proposal to School Education Department of the State (*Lok Shikshan Sanchalanalay*) and it was the goodness of Smt Jayashree Kiyavat, Commissioner who immediately agreed to the proposal.

Then the immediate question of developing a practical syllabus and question bank for the process to run successfully and meaningfully was the next step to move on. For this we selected a group of eminent teachers and practitioners to put their thought process. Dr Suhas Kumar, Retd PCCF and eminent writer in forest and wildlife issues and our former Board member was requested to mentor the process and he agreed happily for the same. And finally, all the editorial board sat at Board for a week long and came out with the first draft. To great extent, it's ok text and ok question bank on Biodiversity. This requires further improvement from time to time.

Beautiful part of the book is that it is inclusive of audio-visuals, instagram, facebook and you tube and our own web site which are quite rich in content and visuals of biodiversity with special focus to Madhya Pradesh. You are advised to see and listen to my inspirational video on Biodiversity and Our Future before you start reading the book. This will help you to understand and assimilate various complex issues of Biodiversity, development and climate change in a simpler way with question answer mode.

I congratulate and thank all the editorial team by name who toiled day and night to come out with this first baby of modern times of Biodiversity learning tool. I hope and wish that this small effort will go long way if pursued consistently for the better citizenry that is Biodiversity sensitive to take care of the future of the Biodiversity rich state.

Jai Biodiversity, Jai Hind, Jai Mother Planet.

Bhopal,
19.09.2019.

R.Sreenivasa Murthy
MPSBB

Chapter -1
Understanding Biodiversity

1.1 Concept of Biodiversity

'Bio' means life and 'diversity' means variety. Simply explained, Biodiversity is the variety of all living things, including plants, animals, microorganisms and their interrelationships. It refers to the variability among living organisms from all sources including terrestrial, marine and other aquatic eco systems and the ecological complexes of which they are part. This diversity of life exists at three different levels: genes, species and ecosystems. Central to the concept of biodiversity is the understanding that all organisms interact, like a web of life, with every other element in their local environment.

- Biodiversity is contraction of the term "biological diversity "
- The term biodiversity was coined by Walter. G. Rosen in 1985.
- E.O. Wilson is known as father of Biodiversity.
- The Biodiversity found on Earth is the product of 4.5 billion years of evolution.

1.2 Levels of biodiversity

1. Genetic diversity: Variations of genes within a species results in different varieties or breeds within the species. India has more than 50,000 genetically different strains of rice, more than 1,000 varieties of mango and 2500 varities of Brinjal.

- Rice is one species which has numerous varieties like Chinnor, Kalimoonch, Basmati, Jeerashankar.
- Mango is a species having numerous varieties like Neelam, Langra, Totapari, Dashehri, Sundarja (Native variety of Rewa-M.P.) Noorjahan (Native variety of Katthiwara, Alirajpur Dist. M.P.) etc.
- Malvi, Nimari, Gir,Sahiwal, Jersey are breeds of Cattle.

2. Species diversity: This denotes the diversity of species. For example, Human beings (*Homo sapiens*) monkeys (*Macaca Fascicularis*), Goats *(Capra aegagrus hircus)* are faunal species, Sal (*Shorea robusta*), Karanj (*Millettia pinnata (L.) Panigrahi*), Neem *(Azadirachta indica)* trees are floral species. The Western Ghats have a greater amphibian species diversity than the Eastern Ghats.Our state symbols – Lotus(State flower),Barasingha (State animal),Banyan tree(State tree),Paradise fly catcher(State Bird),Mahseer (State fish) are all different species.

3. Ecological diversity: This refers to variations in Biological communities in which the species live, the ecosystem system in which communities exist and interaction among these levels. India, for instance, with its deserts, rain forests, mangroves, coral reefs, wetlands, estuaries, and alpine meadows has greater ecosystem diversity. In Madhya Pradesh we have Sal forests, Teak forests and Mix forests, grasslands, savannah forests and agricultural eco-systems. Ecological diversity also provides Eco-systems services

- Biodiversity is not equally distributed on earth, it is richest in the tropics (near equator between Tropic of Cancer and Tropic of Capricon)
- Tropical forest eco- system covers less than 10% of Earth's surface and contains 90% of world's species.
- Tropical rainforests are also known as the 'lungs of the Earth.

which are important for human welfare,water being the most important ecosystem service of forests. Other ecosystem services include rain,pure air,soil conservation,aquifer recharge,control of floods and holding of soil by forests. Pollination by insects is one of the most important ecosystem services without which we may not have our fruits, vegetables and agriculture crops. Just imagine that if there are no bees, you will not get your favourite fruit-Mango. Thanks to bees and other insects around us which by pollination make available the fruits and agricultural crops for us.

Why there is so much diversity ?

We all know that we need a balanced diet consisting of wheat, rice, pulses, varieties of vegetables, fruits, milk, egg, meat, curd etc. for the proper growth and maintenance of body. In the same way for maintaining health of nature variations at genetic species and ecological levels is required. Biodiversity is big defense mechanism essential for the survival of nature in all its pristine glory. All living beings are different from each other. This variation help them to survive any natural calamity and maintain their population.

In nature one species depends on another species for its food. This inter dependence give rise to food chains and food webs. For Example – Deers feed on grass, inturn deers are food for tigers, thus forming a food chain. Numerous food chains result in a food web and many food webs make a food pyramid.

Types of Biodiversity –

Floral Biodiversity	Trees, Herbs, Shrubs, Grasses
Faunal Biodiversity	Animals, Birds, Reptiles
Agro Biodiversity	Agriculture Crops-Cereals, Pulses, Oil seeds.
Horticulture Biodiversity	Fruits, Flowers, Spices.
Domesticated Biodiversity	Cow, Buffalo, Goat, Sheep, Poultry.
Aquatic Biodiversity	Fish, Phytoplanktons, Zooplantktons,
Microbial diversity	Bacteria, Virus, Fungi.

Importance of Biodiversity –

Most of us spend the bulk of our lives in human made houses, office buildings, factories, cars, and other artificial environments that insulate us from nature. This insulated life can give us the illusion that we live our lives apart from nature and that we can control or manipulate nature at our will to meet our needs and wants. The truth is that none of us can afford to live apart from nature. We depend on nature for food, air, water, and virtually everything we use. Ecosystems provide us with a number of eco-system services without which life would be impossible.

The biodiversity in nature is essential to human existence. It plays a significant role in natural processes such as the purification of water and air, pollination, the absorption of carbon by trees and other plant life, renewed oxygen supply, natural pest control, flood and the absorption and detoxification of human and industrial wastes.

The rich variety of gene, species, and biological communities gives us food, wood, fibres, energy, raw materials, industrial chemicals, and medicines, all of which pour hundreds of billions of dollars into the

world economy each year. Biodiversity also has great aesthetic values, for instance, eco tourism, bird watching, wild life observations, pet keeping, gardening etc. throughout human history, people have related biodiversity to the very existence of human race through cultural and religious beliefs.

Biodiversity services	
Direct	Indirect
Provisioning Services	**Regulatory and supporting services**
Food, Water, Timber, Forest resources, Drugs, Fiber, Genetic resources, recreational, spiritual & religious	Ecological balance, Atmospheric N,O,C cycling, Water cycle, Water Quality, Soil formation, Pollination, Decomposition, Nutrient Cycling, Control natural calamities,

Provisioning services/ Economic value: Humans derive countless direct economic benefits from nature food (cereals, pulses, fruits), firewood, fiber, construction material, industrial products (tannins, lubricants, dyes, resins, perfumes) and products of medicinal importance. More than 25 per cent of the drugs currently sold in the market worldwide are derived from plants and 25,000 species of plants contribute to the traditional medicines used by native peoples around the world. Nobody knows how many more medicinally useful plants there are in tropical rain forests waiting to be explored. With increasing resources put into 'bioprospecting' (exploring molecular, genetic and species-level diversity for products of economic importance), nations endowed with rich biodiversity can expect to reap enormous benefits.

Regulatory services/ Ecological value: Biodiversity also provides ecological value. It provides us with protection from storms and floods. It moderates climate, prevents soil erosion and maintain fertility of soil, acts as a carbon storehouse, creates food-webs, recycles waste, clean water, air ,maintains an overall balance to the biosphere, Pollination (without which plants cannot give us fruits or seeds) is another service, ecosystems provide through pollinators layer – bees, bumblebees, birds and bats.
The non-material benefits people obtain from ecosystems are called 'cultural services'. They include aesthetic inspiration, cultural identity, sense of home, and spiritual experience related to the natural environment. Typically, opportunities for tourism and for recreation are also considered within the group. Cultural services are deeply interconnected with each other and often connected to provisioning and regulating services: Small scale fishing is not only about food and income, but also about fishers' way of life. In many situations, cultural services are among the most important values people associate with Nature – it is therefore critical to understand them. We have a moral duty to care for their well-being and pass on our biological legacy in good order to future generations.

Supporting Services: Biodiversity provide living spaces for plants or animals and maintaining a diversity of plants and animals this is called as 'supporting services' and the basis of all ecosystems and their services. Different ecosystems provide living spaces for plants and animals; they also maintain a diversity of complex processes that underpin the other ecosystem services. Some habitats have an exceptionally high number of species which makes them more genetically diverse than others; these are known as 'biodiversity hotspots'. Genetic diversity (the variety of genes between, and within, species populations)

distinguishes different breeds or races from each other, providing the basis for locally well-adapted cultivars and a gene pool for developing commercial crops and livestock

1.3 Evolution of Life

The origin of life is considered a unique event in the history of universe. The universe is vast. Relatively speaking the earth itself is almost only a speck. The universe is very old – almost 20 billion years old. Huge clusters of galaxies comprise the universe. Galaxies contain stars and clouds of gas and dust. Considering the size of universe, earth is indeed a speck. The Big Bang theory attempts to explain to us the origin of universe. It talks of a singular huge explosion unimaginable in physical terms. The universe expanded and hence, the temperature came down. Hydrogen and Helium formed sometime later. The gases condensed under gravitation and formed the galaxies of the present day universe.

Earth was supposed to have been formed about 4.5 billion years back. There was no atmosphere on early earth. Water vapor, methane, carbon dioxide and ammonia released from molten mass covered the surface. The UV rays from the sun broke up water into Hydrogen and Oxygen and the lighter H2 escaped. Oxygen combined with ammonia and methane to form water, CO2 and others. The ozone layer was formed. As it cooled, the water vapor fell as rain, to fill all the depressions and form oceans. Life appeared 500 million years after the formation of earth, i.e., almost four billion years back.

For a long time it was also believed that life came out of decaying and rotting matter like straw, mud, etc Louis Pasteur by careful experimentation demonstrated that life comes only from pre-existing life. However, this did not answer how the first life form came on earth many theories have been given in this context.

- In 1831 Charles Darwin, an English naturalist, embarked on the British ship H.M.S. Beagle to study the biodiversity of the Galapagos Islands of the South Pacific. He noticed that the tortoises were much larger than they were on the mainland. He also thoroughly examined the Galapagos finches for their unusual morphological diversity.
- Darwin observed that each distinct species of finch has its own unique adaptations, making it undeniably separate and different from other birds on the island. At the same time, however, morphologically they appeared very similar, and so one could not deny a common ancestor.
- In 1859 Darwin published his book The Origin of Species in which he describes the evolution of species through natural selection. According to Darwin, the theory of natural selection is based on several observations

Evolution is defined as the change in gene frequency of a given population over time.

1. There is observed variation in every species population,
2. Within the population, some members of the species will have beneficial variations that will ensure better likelihood of survival,
3. The members of a population with the beneficial variations will leave the most offspring, and
4. The beneficial traits are heritable and passed on to future generations.

The Origin of Species also established that all species descended from a common ancestor through a process called speciation. Speciation is the process through which a new species arises as a result of adaptation to an ever- changing environment.

Adaptations are the biological mechanism by which organisms adjust to new environments or to changes in their current environment.

Darwin defined natural selection as the "*principle by which each slight variation (of a trait), if useful, is preserved*". The concept was simple but powerful: individuals best adapted to their environments are more likely to survive and reproduce. As long as there is some variation between them and that variation is heritable, there will be an inevitable selection of individuals with the most advantageous variations. If the variations are heritable, then differential reproductive success leads to a progressive evolution of particular populations of a species, and populations that evolve to be sufficiently different eventually become different species.

1.4 Bio resources

Bioresources are non-fossil biogenic resources which can be used by humans for multiple purposes: to produce food, substantial products, and/or energy carriers. The Biodiversity Act defines, Biological resources as "plants, animals and micro-organisms or parts thereof, their genetic material and by-products (excluding value added products) with actual or potential use or value, but does not include human genetic material". For example – A neem tree is an example of species biodiversity, various bioresources obtained from it are – Neem leaves, Neem Bark, Neem oil, Neem fruit which are used in medicines and cosmetics.

1.5 India's Known biodiversity wealth:

Our country can be conveniently divided into ten major regions, based on the geography, climate and pattern of vegetation seen and the communities of mammals, birds, reptiles, amphibia, insects and other invertebrates that live in them. Each of these regions contains a variety of ecosystems such as forests, grasslands, lakes, rivers, wetlands, mountains and hills, which have specific plant and animal species.

1. With 2.4% of the land area, India accounts for 7-8% of the globally recorded species.
2. India is one of the 17 Mega-diverse countries of the world.
3. India ranks among the top ten species-rich nations and shows high endemism.
4. So far, 45,500 species of plants, 91,200 species of animals have been documented in the country.
5. India has 350 different mammals (rated eight highest in the world), 1,200 species of birds (eighth in the world), 453 species of reptiles (fifth in the world)
6. India has 50,000 known species of

India's Biogeographic Zones

1. The cold mountainous snow covered Trans Himalayan region of Ladakh.
2. The Himalayan ranges and valleys of Kashmir, Himachal Pradesh, Uttarakhand, Assam and other North Eastern States.
3. The Terai, the lowland where the Himalayan rivers flow into the plains.
4. The Gangetic and Bhramaputra plains.
5. The Thar Desert of Rajasthan.
6. The semi arid grassland region of the Deccan plateau Gujarat, Maharashtra, Andra Pradesh, Karnataka and Tamil Nadu.
7. The Northeast States of India,
8. The Western Ghats in Maharashtra, Karnataka and Kerala.
9. The Andaman and Nicobar Islands.
10. The long western and eastern coastal belt with sandy beaches, forests and mangroves.

insects, including 13,000 butterflies and moths.

7. 04 hot spots of Biodiversity – (Eastern Himalaya, Indo-Burma, Western Ghats and Sundaland).
8. It is estimated that 18% of Indian plants are endemic to the country and found nowhere else in the world. Among the plant species the flowering plants have a much higher degree of endemism, a third of these are not found elsewhere in the world.
9. India is one of the world's 8 Vavilovian centres of origin (with 167 species of agrihorticulture crops and 320 species of their relatives known to have originated here).
10. There is also a great diversity of cultivated crops and breeds of domestic livestock. The traditional cultivars included 30,000 to 50,000 varieties of rice and a number of cereals, vegetables and fruit.
11. Gene-banks have collected over 34,000 cereals and 22,000 pulses grown in India.
12. India has 27 indigenous breeds of cattle, 40 breeds of sheep, 22 breeds of goats and 8 breeds of buffaloes.

1.6 Biodiversity hotspots:

Biodiversity hotspots are regions with high species richness and a high degree of endemism. British biologist Norman Myers coined the term "biodiversity hotspot" in 1988.

Vavilovian Centers of Origin of Cultivated plants

- A Center of Origin (Center of Diversity) is a geographical area where wild relatives of agricultural crops originated or got domesticated.
- Centers of Origin were first identified by Russian scientist Nikolai Vavilov 1924.
- India is one of the 07 Vavilovian Centers of Origin.
- Wild relatives of Rice, Mango, Brinjal have originated in India that is why we have so much diversity of these species in our country.

Biodiversity hotspots in India are as follows:

1. **Himalaya:** Includes the entire Indian Himalayan region (and that falling in Pakistan, Tibet, Nepal, Bhutan, China and Myanmar).
2. **Indo-Burma:** Includes entire North-eastern India, except Assam and Andaman group of Islands (and Myanmar, Thailand, Vietnam, Laos, Cambodia and southern China)
3. **Western Ghats and Sri Lanka:** Includes entire Western Ghats (and Sri Lanka).
4. **Sundalands**: Includes Nicobar group of Islands (and Indonesia, Malaysia, Singapore, Brunei, Philippines).

Chapter -2

Classification of Biodiversity

2.1 Land/Terrestrial biodiversity:

Natural areas of different types with rich biodiversity are found on the land, for example forests, grassland, wetlands or deserts, agri-biodiversity rich areas which are natural habitats of plants, animals and microbes.

Forest Biodiversity: Forests are biologically diverse systems, representing some of the richest biological areas on Earth. They offer a variety of habitats for plants, animals and micro-organisms. They are the second largest land use in India next to agriculture. The forest cover of India is assessed as 67.83 million hectares which constitute 20.64 per cent of the country's geographical area, ranging from the Himalayan Temperate to Dry Zone forests. Being a mega-bio diversity country, India possesses high level of endemism.

Vultures:

The vultures are human friendly birds and natures most efficient scavengers. There are 23 species of vultures found in the world out of which 9 species are found in India and 7 are found in Madhya Pradesh. The populations of three species, White-rumped Vulture *(Gyps bengalensis)*, Indian Vulture *(G. indicus)*, and Slender-billed Vulture *(G. tenuirostris)*, had declined so precipitously that all three are considered Critically Endangered. Surveys in India show that the country's Indian and Slender-billed Vulture populations declined by almost 97% between 1992 and 2007. White-rumped Vultures fared even worse, dropping by 99.9 percent, to just one thousand of their 1992 population. Extensive research has identified the cause of the decline to be 'diclofenac', a non-steroidal anti-inflammatory drug (NSAID) used to treat livestock, Vultures feeding on the carcasses of animals recently treated with the drug suffer renal failure and die. Use of diclofenac is now banned in India. The IUCN Red Data book has listed Gyps bengalensis as "critically endangered".

The forests play vital role in harboring more than 45,000 floral and 81,000 faunal species of which 5150 floral and 1837 faunal species are endemic. The nation has established 597 Protected Areas comprising 95 National Parks, 500 Wildlife Sanctuaries, 2 conservation reserves covering 1.56 million ha area or 4.75 per cent geographical area of the country.

Agricultural Biodiversity: Agricultural biodiversity is a broad term that includes all components of biological diversity of relevance to food and agriculture, and all components of biological diversity that constitute the agricultural ecosystems, also named agro-ecosystems: the variety and variability of animals, plants and micro-organisms, at the genetic, species and ecosystem levels, which are necessary to sustain key functions of the agro-ecosystem, its structure and processes. Agricultural biodiversity provides humans with food and raw materials for goods - such as cotton for clothing, plants and roots for medicines, and materials for biofuels. Agricultural

Padmashri, Shri. Babulal Dhaiya:

Shri Babulal Dahiya is basically a Bagheli writer from Pithorabad, Satna. Shri Dahiya has been engaged in research and conservation of traditional rice varieties and several indigenous crops and vegetables since 2005. He was conferred with Padma Shri for collection and conservation of more than 200 native varieties in the year 2019

biodiversity also performs ecosystem services such as soil and water conservation, maintenance of soil fertility and biota, and pollination, all of which are essential to human survival. In addition, genetic diversity of agricultural biodiversity provides species with the ability to adapt to changing environment and evolve, by increasing their tolerance to frost, high temperature, drought and water-logging, as well as their resistance to particular diseases, pests and parasites. This is particularly important regarding climate change. The evolution of biodiversity, and therefore both its and our survival, mainly depends on this genetic diversity.

Horticultural Biodiversity: Horticulture is a science, as well as, an art of production, utilisation and improvement of horticultural crops, such as fruits and vegetables, spices and condiments, ornamental, plantation, medicinal and aromatic plants. India is the second largest producer of fruits and vegetables in the world after China. According to Government of India for 2016–17, horticulture crops in India are being cultivated in 24 million hectares, which is about 7 per cent of India's total cropped area.

- India is the largest producer of okra (lady's finger).
- India ranks second in the production of potato, onion, cauliflower, brinjal and cabbage.
- In fruits, it is the largest producer of banana, mango, guava, lemon and papaya.
- Mango, walnut, grapes, banana and pomegranate are the major fruits exported, while onion, okra, bitter gourd, green chilly, mushroom and potato have more exotic demand.

2.2 Aquatic biodiversity :

More than two-thirds of the Earth's surface is covered by water, which contains the aquatic biological diversity.

Inland- There are a large number of species of freshwater fish found in our Indian rivers and lakes that are now threatened by the introduction of fish from abroad as well as due to being introduced from one river into another. Fish are also now seriously affected by pollution. There are many endangered fish such as the "Mahseer" which once grew to over a meter in length.

Mahasheer , The state fish of Madhya Pradesh :

Narmada Mahaseer (*Tor tor*) is highly endangered whose populations have been dwindled to around 3% in its natural environment. The loss of Narmada Mahaseer populations is due to the construction of various barriers on the river course in the form of series of dams and pollution of the river course at many points. Otherwise, Narmada Mahaseer is known as tiger of the river and identified as an established indicator of health of the river system. Realising the importance of dwindling population of Narmada Mahaseer, Madhya Pradesh government has declared Mahaseer (Tor tor) as the State Fish in the year 2011.

Successful breeding and hatching of Mahasheer was achieved in Forest Division Badwah in Khandwa District by the efforts of Forest Department and M.P. State Biodiversity Board.

Marine Biodiversity- Marine ecosystems are most frequently associated with fish and crustacea like crabs and shrimp, which we use as food. The other species that are endangered include the marine turtles, which are reptiles, and whales that are mammals. Marine fisheries are being over harvested in our coastal waters and the fish catch has decreased seriously over the last few years. Mechanized boats with giant, small-meshed nets are a major cause of depleting this resource. Many species of marine animals such as the whales, sharks and dolphins that live in the Indian Ocean are now threatened by extinction due to fishing in the deep sea.

2.3 Urban biodiversity (Green spaces, parks, Wetlands etc)

Urban biodiversity can be natural or artificial. Natural urban biodiversity may include grass lands, forest patches etc. Artificial urban spaces like green spaces, parks, green campuses, wetlands provide green cover in cities.

2.4 Microbial biodiversity

Microbes are tiny invisible organisms which constitute a part of biodiversity. Even a teaspoon of soil contains millions of micro organisms. Microbes include bacteria, virus, protozoa, yeast, fungi etc. Microbial biodiversity is an important component of earth and one of the oldest lifeforms.

Chapter -3

Biodiversity Profile Of Madhya Pradesh

Madhya Pradesh is situated on the genetic highway connecting two hotspots of biodiversity in country viz Eastern Himalayas and Western Ghats. Due to this strategic location Madhya Pradesh exhibits rich biodiversity.

1. The state harbours 04 types of forests, 10 National Parks, 25 Wildlife Sanctuaries; Madhya Pradesh has largest forest cover in the country.
2. The state has more than 5000 species of plants.
3. There are more than 500 species of birds.
4. The rivers of the state are rich in biodiversity with more than 172 species of fishes.
5. There is a rich diversity of minor millets like-Kodo, Kutki, Sanwa, Jowar, Bajra, Maize etc.

Dr. Richharia:
The late Dr. R H Richharia was one of the leading experts on rice in India. He documented and collected 23,000 native and indigenous rice varieties found in Madhya Pradesh during his career. Dr. Richharia's collection of rice germplasm is currently preserved at Indira Gandhi Krishi Vishw Vidayalaya, Raipur

3.1 Forests Biodiversity of Madhya Pradesh: Madhya Pradesh contributes to 12.2 7 % of total forest area of the country. Total forest area of Madhya Pradesh is 94, 3489 sq km. In the state forest are classified in three categories protected forest, reserved forest, unclassified forest. Protected forests constitute 31098 sq km of the total forest area. Reserved forests are spread over 61886 sq km and unclassified forests cover an area of 1705 sq km.

3.2 Agro Biodiversity of Madhya Pradesh:

1. Madhya Pradesh is endowed with varying climatic conditions, soils and diverse cropping pattern. The state is divided into 11 agro-climatic zones.
2. The main soil types found in Madhya Pradesh are alluvial, deep black, medium black, shallow black, mixed red and black, mixed red and yellow and gravelly soil.

11 agro-climatic zones

- Malwa Plateau, Vindhyan Plateau, Central Narmada Valley, Satpura Plateau, Jhabua Hills, Gird Region, Kymore Plateau, BundelKhand Region, Nimar Valley, Northern Hills of Chhattisgarh and Chhattisgarh plain .

3. The major crops of the state are Soyabean followed by Wheat, Gram, and Paddy, Jawar, Bajra, Maize, Kodo, Kutki, Lentil, Tur, Cotton, Mustard, Pea, Barley, Moong, Urad, Linseed, Sesame, Niger, Groundnut, Teora and Sugarcane .

3.3 Horticulture Biodiversity of Madhya Pradesh: Major horticultural species of Madhya Pradesh is Citrus fruits, papaya, pomegranate, chilli, potato, sweet potato, onion, bottle gourd, tomato, chrysanthemum, marigold.

Native Horticultural Species in MP

- "Noorjahan" is a rare mango grown in Katthiwara region of Alirajpur District. A single mango weighs from 1 kg. to 5 kg.
- "Sundarja" variety of mango is found in Govindgarh area of Rewa District. It is known for unique aroma and taste.
- Laal papita (Papaya) of Badwani,
- Jujube (Ber) of Bundelkhand region,
- Kumbhraj dhaniya of Guna-Gwalior

3.4 Domesticated Livestock Biodiversity of Madhya Pradesh:

India being an agriculture based country, animal husbandry is an important source of livelihood. In addition to supplying milk, meat, eggs, wool, their castings (dung) and hides, animals, mainly bullocks, are the major source of power for both farmers and drayers.

Native Livestock Breeds of Madhya Pradesh:

1. Cattle – Malwi (Ujjain, Shajapur, Rajgarh) Nimari (Nimar region) Gaolao (Chhindwara District) and Kenkatha (Panna District) are the native breeds of cattle
2. Buffalo - "Bhadhawari" (Bhind & Gwalior) is a native buffalo breed with highest fat content in milk.
3. Goat - "Jamunapari" (Bhind) is native breed of goat,
4. Camel-"Malvi" (Mandsour) is native breed of camel.
5. Poultry - "Kadaknath" (Jhabua, Alirajpur, Dhar) is a poultry breed famous for its black meat. The black colour of meat is due to high hemoglobin (iron) content. It is native to Jhabua and Alirajpur Districts.

Kadaknath chicken:

Kadaknath or Kala Masi is an Indian breed of chicken originating from the Jhabua, Alirajpur and Dhar districts of western Madhya Pradesh. It has a lower fat content of 0.73 — 1.03% compared to 13 to 25% in most other chicken breeds. The meat from this breed has a geographical indication (GI Tag) tag. It was approved by Indian government on 30 July 2018. The breed is maintained and improved by Krishi Vigyan Kendra Jhabua. The Kadaknath is popular for its adaptability and good-tasting greyish black meat. Due to the relatively high consumption of the breed, its numbers have sharply declined. To save the breed from extinction, the state government started a Kadaknath poultry breeding program.

3.5 Aquatic biodiversity of Madhya Pradesh:

Madhya Pradesh is blessed with vast aquatic resources like Rivers, lakes, ponds, wetlands etc. sustaining rich aquatic diversity such as varieties of fishes, turtle, ghariyal, Crocodile, smooth coated otter and the national aquatic animal of India the River Dolphins. The state is endowed with more than 136 species of fishes and around 29 of these fish species are found in river Narmada. You would also be amazed to know that for conservation of some flagship aquatic spices National Chambal Gharial wildlife sanctuary is playing a key role.

National Chambal Gharial wildlife sanctuary

The sanctuary is located on the Chambal River near the tripoint of Rajasthan, Madhya Pradesh and Uttar Pradesh, it was first declared in Madhya Pradesh in 1978 and has Critically Endangered gharial, the red-crowned roof turtle , Ganges river dolphin including threaten species like muggar crocodile and smooth-coated otter.

3.6 Brief of stakeholders of biodiversity

Biodiversity conservation is a multisectoral issue involving various government departments as stakeholders who manage biodiversity within their domain. Various departments managing sectoral biodiversity are: Forest Department, Agricutural Department, Horticultural Department, Animal Husbandary, Fisheries, Irrigation. Some of the departments may also have negative impact on Biodiversity like mining.

Chapter -4
Other Important Issues of Biodiversity

4.1 National and State symbols related to biodiversity

National and State symbols define the country and its ethnic cultural. India has 13 National symbols

National Symbols of India

The National Bird of India- The peacock, commanly known as Indian peafowl the declared National Bird of India in 1963. Peacock is a symbol of grace and beauty.

The National Animal of India - Bengal Tiger was declared as the National animal of India in April 1973, with the initiation of project tiger. The tiger is known as the lord of the Jungle and displays India's wildlife wealth.

The National Flower of India- The lotus has a very significant position in Indian mythology. It is known as the flower of goddess Laxmi and symbolises purity, achievement, logn life and good fet.

The National Fruit of India- Mangoes are native to India and thus truly indian. The Mugal emperor Akbar had planted about 100,000 mango trees in Lakhi Bagh in Darbhanga.

National Tree of India – The national tree of India is the Banyan tree, designated formally as *Ficus benghalensis*. The tree is revered as sacred in Hindu philosophy. The tree is often symbol of the fabled 'Kalpa Vriksha' or the 'Tree of Wish Fullfillment' as it is associated with longevity and has important medicinal properties.

National River- The Ganges or river Ganga is India's longest river (2,525 km) and is considered the holiest of rivers by Hindus. It was declared a national river in 2008 in order to achieve the objectives of the Ganga Action Plan,

National Aquatic Animal of India- The river Dolphin or Ganga Dolphin is the National Aquatic Animal of India. The Gange River Dolphin is a rare species of dolphins found only in Indian and neighbor countries. Dolphins are amongst one of the oldest creatures in the world along with some species of turtles, crocodiles and sharks.

State Symbols of Madhya Pradesh

The State Bird of Madhya Pradesh- The state bird of Madhy Pradesh is "Dhudraj" The Asian Paradise Flycatcher (*Terpsiphone paradisi*) It is a medium sized passerine bird native to Asia.

The State Tree of Madhya Pradesh- The state of Madhya Pradesh is the Indian banyan (*Ficus benghalensis*) is a large and extensive growing tree of the indian sub continent.

The State Animal of Madhya Pradesh- The state animal of Madhya Pradesh is the barasingha (*Rucervus duvaucelii syn. Cervus duvaucelii),* also called swamp deer, The swamp deer differs from all the Indian deer species in that the antlers carry more than three tines.

The State Fish of Madhya Pradesh- The state Fish of Madhya Pradesh is "Mahasheer", whose genus and species is Tor, is locally also known as Mahaseer Badas and is found in river originating from the Himalayas and also in Narmada, Ken, Betwa, Tapti and Chambal among others.

India is a biodiverse country and contains various kinds of species. The list below shows the India's States Symbols viz. animals, birds, trees, flowers,fishes and butterflies etc.:

S.N.	States	Animal	Bird	Tree	Flower	Fishes	Butterfly
1.	**Andhra Pradesh**	Blackbuck	Indian Roller	Neem	Water Lily	Striped Murrel Channa straitus (Bloch, 1793)	*
2.	**Arunachal Pradesh**	Mithun	Great Hornbill	Hollong	Foxtail Orchid	Golden Mahseer Tor putitora (Hamilton, 1822)	*
3.	**Assam**	Indian One-horned Rhino	White-winged Wood Duck	Hollong	Foxtail Orchids		*
4.	**Bihar**	Gaur	Indian Roller	Peepal	Kachnar	Magur* Clarias batrachus (Linnaeus, 1758)	*
5.	**Chhattisgarh**	Wild Buffalo	Hill Myna	Sal	Indian Laurel		*
6.	**Delhi**	Nilgai	House sparrow	Gulmohar	Alfalafa		*
7.	**Goa**	Gaur	Black Crested Bulbul	Matti	Plumeria Rubra		*
8.	**Gujarat**	Asiatic Lion	Greater Flamingo	Banyan	Marigold (Galgota)		*
9.	**Haryana**	Blackbuck	Black Francolin	Peepal	Lotus	Kalbasu/ Calabasu Labeo calbasu (Hamilton, 1822	*
10.	**Himachal Pradesh**	Snow Leopard	Western Tragopan	Deodar	Rhododendron	Golden Mahseer Tor putitora (Hamilton	*
11.	**Jammu & Kashmir**	Hangul	Black necked Crane	Chinar	Rhododendron	Golden Mahseer Tor putitora (Hamilton	*
12.	**Jharkhand**	Elephant	koel	Sal	Palash/Parrot Tree		*
13.	**Karnataka**	Elephant	Indian Roller	Sandal wood	Lotus	Carnatic Carp** Puntius carnaticus (Jerdon, 1849)	Southern Birdwing
14.	**Kerala**	Elephant	Great Hornbill	Coconut	Kanikonna/Golden Shower Tree	Karimeen/Pearlspot Etroplus suratensis (Bloch, 1790)	*
15.	**Madhya Pradesh**	Swamp Deer	Paradise Fly catcher	Banyan	Madona lily	Mahasheer (Tor tor)	*
16.	**Maharashtra**	Giant Squirrel	Green Imperial Pigeon	Mango	Jarul		Blue Mormon
17.	**Manipur**	Sangai	Mrs. Hume's Pheasant	Toon	Siroi Lily	Pengba Osteobrama belangeri (Valenciennes, 1844)	*
18.	**Meghalaya**	Clouded Leopard	Hill Myna	Gamari	Lady Slipper Orchid		*
19.	**Mizoram**	Hillock Gibbon	Mrs. Hume's Pheasant	Iron Wood	Red Vanda	Ngahvang/ Burmese Kingfish Semiplotus modestus Day, 1870	*
20.	**Nagaland**	Mithun	Blyth's Tragopan	Alder	Rhododendron		*
21.	**Orissa**	Elephant	Peacock	Banyan	Ashoka	Mahanadi Mahseer# Tor mahanadicus (David, 1953)	*
22.	**Punjab**	Blackbuck	Northern Goshawk	Sheesham	Gladious		*
23.	**Rajasthan**	Chinkara	Indian Bustard	Khejri	Rohira		*
24.	**Sikkim**	Red Panda	Blood Pheasant	Rhododendron	Noble Orchid		*

S.N.	States	Animal	Bird	Tree	Flower	Fishes	Butterfly
25.	**Tamil Nadu**	NilgiriTahr	Emerald Dove	Palmyra Palm	Kandhal		*
26.	**Telangana**	Spotted Deer (Jinka)	Indian Roller (Paalapitta)	Shami (Jammi chettu)	Tanner's Cassia	Striped Murrel: Channa straitus (Bloch, 1793)	*
27.	**Tripura**	Phayre'sLangur	Green Imperial Pigeon	Agar	Nageshwar	Pabda Ompok bimaculatus (Bloch, 1794)	*
28.	**Uttarakhand**	Musk Deer	Himalayan Monal	Burans	Brahm Kamal		Common Peacock
29.	**Uttar Pradesh**	Swamp Deer	Sarus Crane	Ashok	Brahm Kamal	Chital Chitala chitala (Hamilton, 1822)	*
30.	**West Bengal**	Fishing cat	White-throated King Fisher	Devil's Tree	Shephali	Hilsa Tenualosa ilisha (Hamilton, 1822)	*
S. No.	**Union Territories**	**Animal**	**Bird**	**Tree**	**Flower**		**Butterfly**
31.	**Andaman & Nicobar Islands**	Dugong	Andaman Wood Pigeon	Andaman Padauk	Pyinma Tree (Lagerstroemia hypoleuca)		*
32.	**Chandigarh**	Indian grey Mongoose	Indian grey Hornbill	Mango	Dhak		*
33.	**Dadar& Nagar Haveli**	*	*	*	*		*
34.	**Daman & Diu**	*	*	*	*		*
35.	**Lakshwadeep**	Butterfly Fish	Sooty Tern	Bread Fruit	Neelakurinji	Butterflyfish Chaetodon decussatus Cuvier, 1829	*
36.	**Puducherry**	Squirrel	Asian Koel	Bael Fruit Tree	Cannon ball flower (Nagalinga flower)		*

4.2 Keystone, Endemic & Endangered species, Speciation, Adaptation & Mitigation:

Keystone species: Keystone species are species that maintain the structure and the organization of the community. These species allow large number of other species to persist in the community. If a keystone species is lost from a conservation area, numerous other species might be lost as well. The name *keystone species*, coined by American zoologist Robert T. Paine in 1969

- All top predators (Tiger, Lion, Crocodile, Elephant) are considered as keystone species because they regulate all other animal population indirectly. Hence top predators are given much consideration in conservation.
- Many tropical trees like *Ficus religiosa* (Peepal), *Ficus benghalensis* (Bargad), *Ficus glomerata* (Gular), *Ficus carica* (Anjeer), *Ficus recemosa* (Pakar) are key stone species.

Endemic species: Endemism is the **ecological state of a species being unique to a defined geographic location**, such as an island, nation, country or other defined zone, or habitat type; organisms that are indigenous to a place are not endemic to it if they are also found elsewhere. There are more than 200,000 species in India of which several are confined to India (endemic). The hard ground Barasingha as endemic to Kanha National Park.

An **endangered species** is a species of wild animal or plant that is in danger of extinction throughout all or a significant portion of its range. A species is considered threatened if it is likely to become endangered within the foreseeable future.

Adaptation, is the process by which a species becomes fitted to its environment; it is the result of natural selection's acting upon heritable variation over several generations. Organisms are adapted to their environments in a great variety of ways: in their structure, physiology, and genetics, in their locomotion or dispersal, in their means of defense and attack, in their reproduction and development

Mitigation: Mitigation means eliminating or reducing risk of loss from the occurrence of any undesirable event. This is an important element for any insurance business so as to avoid unnecessary losses.

Speciation is a process within *evolution* that leads to the formation of new, distinct species that are reproductively isolated from one another.

4.3 Biodiversity and Indian Traditions:

Living in harmony with Nature has been an integral part of Indian culture Many plants and animals have from historcial times been considered sacred in India by various communities. The most outstanding examples are the peepal tree *(Ficus religiosa).* The banyan tree *(Ficus 'bengelensiss,* and Khejdi tree *(Prosopis cineraria),* and these have been traditionally revered and therefore never cut. There are a number of other trees and plants considered sacred and grown in temple premises and are protected in other localities. More than a hundred such species of trees/plants in India are considered sacred by various communities and religious faiths. These include the sandalwood tree, beetlenut, palm, *neem,* coconut palm, juniper, *champa,* lotus, *tulsi,* pepper, etc. Such traditional cultural attitudes, though based on religious faith, have made significant contribution in the protection and propagation of various species of trees and plants in India.

Smt. Gaura devi :

Smt. Gaura Devi came to notice in 1974 when she was told that local loggers were felling trees on 25 March 1974 by a young girl. She was one of the activist who played a key role in Chipko movement. She stood vigilant for three days and nights to prevent the lumbermen from felling the trees. She was the women lead in the Chipko movement held in 1970s in Uttarakhand

Many animals are considered sacred and worshipped by several Hindu and other communities, and have thus received protection for centuries. The peafowl, sacred to lord Karttikeya is never hunted, the blue rock pigeon is considered sacred to Saint Hazrat Shah lalal and is protected in the Bengal region. Even rodents are considered sacred and are allowed to breed in the famous temple of goddess Karnimata in Rajasthan. The tiger and the cobra, though greatly feared, are afforded protection on religious grounds.

Chapter -5

Conservation of Biodiversity

5.1 In-situ Conservation

In-situ conservation is on site conservation or the conservation of genetic resources in natural habitat. It is the process of protecting an endangered plant or animal species in its natural habitat, either by protecting or cleaning up the habitat itself, or by defending the species from predators. It is applied to conservation of agricultural biodiversity in agro forestry by farmers, especially those using unconventional farming practices. In India, ecologically unique and biodiversity-rich regions are legally protected as biosphere reserves, national parks and sanctuaries. India now has 14 biosphere reserves, 90 national parks and 448 wildlife sanctuaries.

Project Tiger: Project Tiger was launched by the Government of India with the support of WWF-International in 1973 and was the first such initiative aimed at protecting this key species and all its habitats. Project Tiger was initiated in nine Tiger Reserves in different ecosystems of the country covering an area of 16339 sq km. By 2001 the number of Tiger Reserves increased to 27, covering an area of 37761 sq km. The tiger count climbed from 268 in 1972 in the nine Tiger Reserves, to around 1500 in 1997 in the 23 Tiger Reserves. The Project tiger recognized the fact that tigers cannot be protected in isolation, and that to protect the tiger, its habitat needed to be protected.

India has a history of religious and cultural traditions that emphasized protection of nature. In many cultures, tracts of forest were set aside, and all the trees and wildlife within were venerated and given total protection. Such sacred groves are found in Khasi and Jaintia Hills in Meghalaya, Aravalli Hills of Rajasthan, Western Ghat regions of Karnataka and Maharashtra and the Sarguja, Chanda and Bastar areas of Chhattisgarh. In Meghalaya, the sacred groves are the last refuges for a large number of rare and threatened plants.

Biodiversity Heritage sites

"Biodiversity Heritage Sites" (BHS) are well defined areas that are unique, ecologically fragile ecosystems - terrestrial, coastal and inland waters and, marine having rich biodiversity comprising of any one or more of the following components: richness of wild as well as domesticated species or intra-specific categories, high endemism (*Endemism is an ecological word meaning that a plant or animal lives only in a particular location, such as a specific island, habitat type, nation or other defined zone),* presence of rare and threatened species, species of evolutionary significance, wild ancestors of domestic/ cultivated species or their varieties, past pre-eminence of biological components represented by fossil beds and having significant cultural, ethical or aesthetic values and are important for the maintenance of cultural diversity, with or without a long history of human association with them

5.2 Ex-Situ Conservation:

Ex-situ conservation is the preservation of components of biological diversity outside their natural habitats. This involves conservation of genetic resources, as well as wild and cultivated or species, and draws on a diverse body of techniques and facilities. Such strategies include establishment of botanical gardens, zoos, conservation strands and gene, pollen seed, seedling, tissue culture and DNA banks. Sometimes there are situations in which an endangered species is so close to extinction that unless alternate methods are instituted, the species may be rapidly driven to extinction such strategy is known as ex-situ conservation, i.e. outside its natural habitat in a carefully controlled situation such as a botanical garden for plants or a zoological park for animals, where there is expertise to multiply the species under artificially managed conditions. There is also another form of preserving a plant by preserving its germ plasm in a gene bank so that it can be used if needed in future. In India, successful ex situ conservation programs have been done for all our three species of crocodiles.

Crocodile Conservation: Crocodiles have been threatened as their skin is used for making leather articles. This led to the near extinction of crocodiles in the wild in the 1960s in India. A Crocodile Breeding and Conservation Program was initiated in 1975 to protect the remaining population of crocodilians in their natural habitat and by creating breeding centers. It is perhaps one of the most successful ex situ conservation breeding projects in the country. Crocodiles have been extensively bred in over 30 captive breeding centers, zoos and other sites where successful breeding takes place. Thousands of crocodiles of all three species have been bred and restocked in 20 natural water bodies.

Designated National Repositories for Ex-situ Conservation

The following institutes have been declared as national repositories where germplasm collections are maintained for future use:-

Botanical Survey of India, Kolkata.	Flora
National Bureau of Plant Genetic Resources, New Delhi.	Plant genetic resources of cultivated plants and their wild relatives
National Botanical Research Institute, Lucknow	Flora
Zoological Survey of India, Kolkata.	Fauna
National Bureau of Animal Genetic Resources, Karnal, Haryana.	Genetic resources of domestic animals
National Bureau of Fish Genetic Resources, Lucknow, U.P	Fish genetics resources
National Institute of Oceanography, Goa	Marine flora and fauna
Wildlife Institute of India, Dehradun.	Faunal resources in Protected Areas
National Bureau of Agriculturally Important Microorganisms, Mau Nath Bhanjan, U.P.	Agriculturally important microorganisms
Institute of Microbial Technology, Chandigarh.	Microorganisms for industrial use

All though ex-situ conservation is a means of conservation it can not replace in-situ conservation. In-situ conservation process of evoloution takes place resulting in new varieties of speci

Laboratry for the Conservation of Endangered Species (LaCONES)

At Center for Cellular Molecular Biology (CCMB), Hyderabad aims to conserve endangered animals of India by using modern techniques of DNA fingerprinting, genetic ploymorphism analysis and assisted reproductive techniques such as artificial, insemination, in vitro fertilization & cryo-banking of DNA.

Chapter -6
Threats to Biodiversity

Biodiversity is the result of billions of years of evolution. Due to human activity the rate of depletion of biodiversity is increasing. There are several factors responsible for loss of bio- diversity:-

6.1 Habitat Loss & Fragmentation

- Natural habitats of a species are either changed or destroyed due to the cutting of trees, filling a wetland, plowing grassland or burning a forest. It kills or forces out many plants, animals & micro-organisms. This disrupts the complex interactions between the species.
- Fragmented habitats are forest patches surrounded by cropland, orchards, plantations or urban areas.
- When large forests are fragmented, the species found in deeper parts of the forest disappears first. Mammals & birds requiring large territories and certain animals with migratory habits are affected, causing a decline in their population.
- Degradation of habitat occurs due to pollution. This can reduce or even eliminate populations of sensitive species. Use of chemicals, the release of radiations, oil spill over sea can change the quality of the habitat. E.g., pesticides caused the decline of fish-eating birds.

6.2 Invasive alien species is the second major reason for the extinction of species and loss of biodiversity.

- Due to some reasons when an alien species is introduced, some of them turn invasive & cause decline or extinction of indigenous species.
- Eicchornia, Parthenium, Lantana camara are examples of invasive weed species.
- African catfish introduced for aquaculture purposes is posing a threat to the indigenous fishes.

Pollution

Pollution is a major threat to biodiversity, and one of the most difficult problems to overcome; Water pollution is injurious to the biotic components of estuary and coastal ecosystems. Pollutants like, agricultural run-off, which contains a variety of fertilizers and pesticides, may contaminate the ground water and rivers and ultimately ocean, toxic wastes entering the water bodies disturb the food chain and so the aquatic ecosystems. The impact of coastal pollution is also seen on coral reefs which are being threatened from industrialization,

Crop Residue Burning(Narvai Burning):

Crop residue burning in Punjab and Haryana in northwest India has been cited as a major cause of air pollution in Delhi. In late September and October each year, farmers mainly in those two states burn an estimated 35 million tons of crop waste from their wheat fields after harvesting, as a low-cost straw-disposal practice to reduce the turn around time between harvesting and sowing for the second (winter) crop. Smoke from this burning produces a cloud of particulates mater and gases called smog which is visible from space, and has produced a "toxic cloud" in New Delhi, resulting in declarations of an air-pollution emergency. Crop residue burning has become a major environmental problem causing health issues as well as contributing to global warming.

oil transport and rising temperature of the sea.

6.3 Global Climate Change:

Many climatologists believe that the greenhouse effect is likely to raise world temperatures by about 2°C by 2030, meaning that sea levels will rise by around 30-50 cm by this time. Global warming, coupled with human population growth and accelerating rates of resource use will bring further losses in biological diversity.

6.4 Illegal Wildlife Trade:

The international trade in wild plants and animals is enormous. Live animals are taken for the pet trade, or their parts exported for medicines, food, cosmetic, fashion accessories. Plants are also taken from the wild for their horticultural or medicinal value.

6.5 Species extinction:

Extinction is a natural process. The geological record indicates that many hundreds of thousands of plant and animal species have disappeared over the eras as they have failed to adapt to changing conditions. Recent findings however indicate that the current rate of species extinction is at least a hundred to a thousand times higher than the natural rate due to climate change.

Chapter 7

Important Programs and Awards of MPSBB

1. **International Day for Biological Diversity-** Every year 22nd May is celebrated all over the world as International Day for Biological Diversity. This event is celebrated through out the state and at Bhopal head quarter by organizing programmes on theme declared by CBD Secretariat.

2. **Mowgli Utsav:** The "Mowgli Bal Utsav" was started by MPSBB as Annual Awareness Programme of biodiversity for school children. Originally the programme was organised by MPSBB but presently done by School Education Department in collaboration with MPSBB and Madhya Pradesh Eco-Tourism Development Board (MPETDB). This is a popular biodiversity education awareness annual programme of the State. First Mowgli festival was organised at Pench National Park, Seoni.

3. **Beej Yatra** : MPSBB initiated "**Beej Bachao-Krishi Bachao Yatra**" in May 2017. In the 56 days long yatra 55 Choupals were organized in 39 districts of the state. A total of 2052 traditional seed samples were collected. These seed have been propogated through community seed bank of Pithorabad, BMC in Satna and Bidiversity Learning and Demo Centre of MPSBB at Bhopal

4. **Seed Ball Programme:** In order to create awareness on collection and conservation of seasonal fruits and forest species MPSBB undertook an innovative programme on Seed (Mud) Ball preparation and seed sowing. Demonstration of Seed (Mud) Ball preparation is an ongoing programme from 2016 onwards.

5. **Maati Ganesh – Beej Ganesh – Sajeev Ganesh Programme –** As an innovative approach during Ganesh Ustav, 124 training and demonstration progammes were organized to make Ganesh Idols from Mud and implanting a seed so that instead of immersing Ganesh Idols in water bodies they are planted in a pot and new plant emerges out of it. This is also a ongoing programme from 2016 onwards.

6. **State Biodiversity Awards** – State Biodiversity Award have been instituted in 2018 in various categories (Individuals, Government and Non-Government Organizations, Biodiversity Management Committees) to recognize people and organizations engaged in conservation.

Chapter-8

Important Green days-National & International days: Yearly Calendar

Important Green Days - National and International days: yearly calendar

ENVIRONMENTALLY IMPORTANT DAYS	
February	
February 2	World Wetlands Day
February 27	International Polar Bear Day
February 28	National Science Day
March	
March 3	World Wildlife Day
March 14	International Day of Action for Rivers
March 20	World Sparrow Day
March 21	World Forestry Day, World Planting Day, World Wood Day
March 22	World Water & Sanitation Day
March 23	World Meteorological Day, World Resources Day
April	
April 7	World Health Day
April 10	World Atmosphere Day
April 18	World Heritage Day
April 22	World Earth Day
May	
May 3	International Energy Day
May 8	World Migratory Bird Day
May 11	National Technology Day
May 14	Endemic Bird Day
May 22	World Biodiversity Day
May 23	World Turtle Day
June	
June 5	World Environment Day
June 8	World Ocean Day
June 9	Coral Triangle Day
June 15	Global Wind Day
June 17	World Day to Combat Desertification and Drought
July	
July 1 – July 7	Van Mahotsav week
July 3	World Seabird Day
July 11	World Population Day
July 26	International Mangrove Day
July 29	International Tiger Day
August	
August 10	World Lion Day
August 12	World Elephant Day

ENVIRONMENTALLY IMPORTANT DAYS	
August 22	Honey Bee Day
September	
September 8	World Cleanup Day
September 16	World Ozone Day
September 18	World Water Monitoring Day
September 21	Zero Emissions Day
September 26	World Environmental Health Day
October	
October 1 – Oct 7	Wildlife Week
October 3	World Nature Day, World Habitat Day
October 4	World Animal Day
October 6	World Wildlife Day
October 24	International Day of Climate Action
November	
November 6	International Day for Preventing the Exploitation of the Environment in War and Armed Conflict
November 12	World Birds Day
November 14	World Energy Conservation Day
December	
December 5	World Soil Day
December 11	International Mountain Day
December 14	National Energy Conservation Day

Green Years

Name	**Date**
International Polar Year	1882–1883
International Polar Year	1932–1933
International Polar Year	2007-2008
World Population Year	1974
International Year of the Ocean (IYO)	1998
International Year of Mountains (IYM)	2002
International Year of Ecotourism (IYE)	2002
International Year of Freshwater (IYF)	2003
International Year of Deserts and Desertification	2006
International Year of the Dolphin	2007–2008
International Polar Year	2007–2009
International Year of Planet Earth	2008
International Year of Sanitation	2008
International Year of Natural Fibres 2009	2009
Year of the Gorilla	2009
International Year of Biodiversity	2010
International Year of Forests	2011
International Year of Soils	2015

Name	Date
International Year of Pulses	2016
International Year of Sustainable tourism for all	2017
International Year of Indigenous languages	2019

Green Decades

Name	Date
International Drinking Water Decade, 1981-1990	1980s
International Decade for Natural Disaster Reduction	1990s
United Nations Decade of Education for Sustainable Development	2005-2014
Water for Life Decade	2005-2015
United Nations Decade on Biodiversity	2011-2020
United Nations Decade for Deserts and the Fight against Desertification	2010-2020

Chapter- 09

Climate Change

The gradual change in our climate had been happening in last few centuries. In very simple terms, climate change means that the average weather of a country or region, which has been there for hundreds of years, is now changing.

For example we in India we have three main seasons and four "Ritus". Similarly in European countries, they have four seasons named spring, summer, autumn and winter. Each season has its own time span and characteristic. However, in last few decades we see that the rain pattern has changed, the summer is elongated and the winter and autumn is shrinking. Most importantly, this is happening all over the world. This is what we mean by climate change.

A warmer climate could affect our planet in a number of ways:

– More rainfall/ or less rainfall

– Changing seasons

– Shrinking sea ice

– Rising sea levels

9.1 Global Warming and Climate Change

Global warming and climate change refer to an increase in average global temperatures. Generally, the natural events and human activities are believed to be contributing to an increase in average global temperatures. This is caused primarily by increases in "greenhouse" gases such as Carbon Dioxide (CO_2).

9.2 The green house gas effect

The greenhouse effect is the rise in temperature on Earth as certain gases in the atmosphere trap energy. Energy from the sun drives the earth's weather and climate, and heats the earth's surface. In turn, the earth radiates energy back into space. Some atmospheric gases such as water vapour, carbon dioxide, and other gases trap some of the outgoing energy, retaining heat like the glass panels of a greenhouse. These gases are therefore

Young Climate Activist - Miss. Greta Thunberg**:**

Miss. Greta Thunberg is a Swedish environmental activist who is credited with raising global awareness of the risks posed by climate change, and with holding politicians to account for their lack of action on the climate crisis. In August 2018, when she was 15, Thunberg took time off school to demonstrate outside the Swedish parliament, holding up a sign calling for stronger climate action. Soon, other students engaged in similar protests in their own communities. Together they organized a school climate strike movement under the name "Fridays for Future". After Thunberg addressed the 2018 United Nations Climate Change Conference, student strikes took place every week somewhere in the world. In 2019, there were at least two coordinated multi-city protests involving over one million pupils each.

known as greenhouse gases.

Six main gases considered to be contributing to global climate change are carbon dioxide (CO_2), methane (CH_4) (which is 20 times as potent greenhouse gas as carbon dioxide) and nitrous oxide (N_2O), plus three industrial gases: hydro fluorocarbons (HFCs), per fluorocarbons (PFCs) and sulphur hexafluoride (SF_6).

9.3 What cause Climate Change

Burning of Fossils: Over the past 150 years, industrialized countries have been burning large amounts of fossil fuels such as oil and gas. The gases released into the atmosphere during this process act like an invisible 'blanket', trapping heat from the sun and warming the Earth. This is known as the "Greenhouse Effect".

Deforestation: Forests absorb huge amounts of carbon dioxide – a greenhouse gas – from the air, and release oxygen back into it. The Amazon rainforest is so large and efficient at doing this that it is often called 'the lungs of the Earth'. Sadly, many rainforests are being cut down to make wood, and to clear the way for farmland, roads, oil mines, and dams.

9.4 What can we do to overcome climate change?

Some of the steps you can take to stop global warming are:

1. Turn off the lights when you leave a room
2. Reduce the time to play video games or use computers, play outside
3. Turn off electrical devices when not in use
4. Plant a tree and make your own kitchen garden in flower pots.
5. Stop using plastic bags. Instead, stitch your own cloth bags from old bed sheets, saris etc
6. Use paper only when required. Do not forget to recycle it.
7. Stop the use of one time plastic like plastic bottles, boxes, bags, straw etc

9.5 Carbon foot print:

Every time you use a fossil fuel, which is a natural fuel or energy source, like coal or gas, you create a gas called carbon dioxide. Most scientists believe that carbon dioxide and other gases like it are contributing to global warming or the slow climate change of our planet. Global warming causes lots of problems for animals and people

What causes Carbon foot print?

Electricity

People use electricity in their homes to turn on lights, plug in kitchen appliances like a toaster or a microwave, and even watch TV or play video games. When you use electricity in your home, you are not

creating carbon dioxide, but the power plants that create your electricity do emit carbon dioxide. Power plants that use coal for energy create the most carbon dioxide.

Gas Heating

The gas heating is the second largest source of carbon dioxide emission. Most homes use oil, natural gas, or electricity to heat their home in the winter, and all of these sources create carbon dioxide. The amount of carbon dioxide that each family uses depends on how high they run the heat and what kind of fuel they use.

Garbage

Garbage can contribute to your carbon footprint. Every pound of Garbage you throw away, you create one pound of greenhouse gases. As it decays, garbage creates carbon dioxide and methane, which is another type of greenhouse gas.

Cars

Cars are another thing that contribute to your carbon footprint. This happens because the gas that your car uses to run produces carbon dioxide. Other forms of transportation, like buses, trains, and planes, also increase a carbon footprint.

Chapter -10
International and National Legal Framework of Biodiversity Conservation

10.1 The first United Nations Conference on Conservation and Development 1972:

The Stockholm Declaration was the product of the first major international conference on environment and its relationship with humans held under the auspices of the United Nations in 1972 at Stockholm. The Conference was attended by 114 States and a large number of international institutions and non-governmental observers. The Conference adopted a Declaration containing 26 Principles which are designed to 'inspire and guide the peoples of the world in the preservation and enhancement of the human environment.' In a way, the 26 Principles reflected a compromise between those states which believed it should stimulate public awareness of, and concern over, environmental issues, and those states who wanted the Declaration to provide specific guidelines for future governmental and intergovernmental action. The Stockholm Conference also proposed a new UN agency, the United Nations Environment Programme (UNEP). UNEP has been responsible for the establishment and implementation of regional as well as global treaties addressing ozone depletion; trade in endangered species, etc.

A revolutionary book *"Silent Spring"* by Rachel Carson:

Silent Spring is an environmental science book by Rachel Carson. The book was published on September 27, 1962, documenting the adverse environmental effects caused by the indiscriminate use of pesticides. Carson accused the chemical industry of spreading disinformation, and public officials of accepting the industry's marketing claims unquestioningly. The book brought powerful impact on the environmental movements in the world.

The following global conventions were signed under the auspices of UNEP:

1. Convention on the Control of International Trade in Endangered Species of Wild Fauna and Flora, Washington, 1973.
2. Convention on Migratory Species, Bonn, 1979.
3. Vienna Convention for the Protection of the Ozone Layer, Vienna, 1985, and Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal, 1987.
4. Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, Basel, 1989.

10.2 The Rio "Earth Summit" 1992 (Rio Declaration 1992)

In 1992, UNCED, popularly known as the Earth Summit, was held in Rio de Janeiro, Brazil. The primary aim of the Earth Summit (a result of the Brundtland commission) was to support the socio-economic development and prevent the continued deterioration of the environment through cooperation between the developing and the developed countries.

The summit was a landmark in a number of ways: not only were a large number of countries represented by their officials, but also a parallel conference of NGOs took place ensuring that environment was firmly placed on the international agenda.

The earth summit went beyond the previous UN conferences in emphasizing:

a. The need for international development initiatives to account for environmental impacts.
b. It recognized the need for governments and business to pay greater attention to eco- efficiency in terms of patterns of production.
c. The search for alternative sources of energy, the reduction of sources of pollution and the use of scarce water resources.

10.3 Convention on Biological Diversity (CBD),

Known informally as the **Biodiversity Convention**, is a multilateral treaty. The Convention was opened for signature at the Earth Summit in Rio de Janeiro on 5 June 1992 and entered into force on 29 December 1993. 196 parties took part in the convention and 168 countries are signatory of this convention. The Convention has three main goals including:

1. The conservation of biological diversity (or biodiversity)
2. The sustainable use of its components
3. The fair and equitable sharing of benefits arising from genetic resources

Its objective is to develop national strategies for the conservation and sustainable use of biological diversity. It is often seen as the key document regarding sustainable development.

CBD has two supplementary agreements - Cartagena Protocol and Nagoya Protocol.

10.4 Cartagena Protocol

The Cartagena Protocol on Bio-safety to the Convention on Biological Diversity is an international treaty governing the movements of living modified organisms (LMOs) resulting from modern biotechnology from one country to another. It was adopted on 29 January 2000 as a supplementary agreement to the Convention on Biological Diversity and entered into force on 11 September 2003.

10.5 Nagoya Protocol

The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) to the Convention on Biological Diversity is a supplementary agreement to the Convention on Biological Diversity. It provides a transparent legal framework for the effective implementation of one of the three objectives of the CBD: the fair and equitable sharing of benefits arising out of the utilization of genetic resources. The Nagoya Protocol on ABS was adopted on 29 October 2010 in Nagoya, Japan and entered into force on 12 October 2014. Its objective is the fair and equitable sharing of benefits arising from the utilization of genetic resources, thereby contributing to the conservation and sustainable use of biodiversity.

10.6 United Nations Environment Programme (UNEP)

The World Conservation Strategy (WCS) was prepared in 1980 by the International Union for Conservation of Nature and natural resources (IUCN), UNEP, and the World Wide Fund for Nature (WWF), UNESCO, and the Food and Agriculture Organization (FAO).

It emphasizes three objectives, stressing the inter dependence of conservation and development:

i. Essential ecological processes and life support systems must be maintained.

ii. Genetic diversity must be preserved.

iii. Any use of species or eco systems must be sustainable.

The WCS emphasizes the need for a cross-sectoral approach to environmental protection. After the publication of WCS, many countries produced national conservation strategies based on it. These strategies in turn simulated policies and plans as well as legislative enactment on environmental protection in a wide range of countries.

10.7 Conference of Parties (COP):

From the year 1994 to 2018 14 conference of parties meeting has been done details of which is as follows.

COP	YEAR	DETAIL
1	1994	The first ordinary meeting of the parties to the convention took place in November and December 1994, in Nassau, Bahamas
2	1995	The third ordinary meeting of the parties to the convention took place in November 1996, in Buenos Aires, Argentina.
3	1996	The fourth ordinary meeting of the parties to the convention took place in May 1998, in Bratislava, Slovakia.
4	1998	The First Extraordinary Meeting of the Conference of the Parties took place in February 1999, in Cartagena, Colombia.
5	2000	The fifth ordinary meeting of the parties to the convention took place in May 2000, in Nairobi, Kenya.
6	2002	The sixth ordinary meeting of the parties to the convention took place in April 2002, in The Hague, Netherlands.
7	2004	The seventh ordinary meeting of the parties to the convention took place in February 2004, in Kuala Lumpur, Malaysia.
8	2006	The eighth ordinary meeting of the parties to the convention took place in March 2006, in Curitiba, Brazil.
9	2008	The ninth ordinary meeting of the parties to the convention took place in May 2008, in Bonn, Germany
10	2010	The tenth ordinary meeting of the parties to the convention took place in October 2010, in Nagoya, Japan.
11	2012	Leading up to the Conference of the Parties (COP 11) meeting on biodiversity in Hyderabad, India 2012, preparations for a World Wide Views on Biodiversity has begun, involving old and new partners and building on the experiences from the World

		Wide Views on Global Warming.
12	2014	Under the theme, "Biodiversity for Sustainable Development," thousands of representatives of governments, NGOs, indigenous peoples, scientists and the private sector gathered in Pyeongchang, Republic of Korea in October 2014 for the 12th meeting of the Conference of the Parties to the Convention on Biological Diversity (COP 12).
13	2016	The thirteenth ordinary meeting of the parties to the convention took place between 2 and 17 December 2016 in Cancun, Mexico.
14	2018	The fourteenth ordinary meeting of the parties to the convention took place on 17 - 29 November 2018, in Sharm El-Sheikh, Egypt. The 2018 UN Biodiversity Conference closed on 29 November 2018 with broad international agreement on reversing the global destruction of nature and biodiversity loss threatening all forms of life on Earth. Governments agreed to accelerate action to achieve the Aichi Biodiversity Targets, agreed in 2010, from now until 2020. Work to achieve these targets will take place at the global, regional, national and sub national levels

10.8 Biological diversity Act, 2002

The Biological Diversity Act, 2002 is an Act of the Parliament of India for preservation of biological diversity in India.

Objectives of Biological diversity Act, 2002

1. Conservation of Biological Diversity.
2. Sustainable use of its components.
3. Fare and Equitable sharing of the benefits arising out of the use of biological resources and associated traditional knowledge.
4. The Act was enacted to meet the obligations under Convention on Biological Diversity (CBD), to which India is a party.

Biological Diversity Rules, 2004 were framed. In 2014 Guidelines on access to biological resources and associated knowledge and benefit sharing Regulations came into effect.

Chapter -11
Institutional Structures under the Biodiversity National Frame Work

To implement the provisions under the act a three tier structure has been established i.e.

a. At national level **National Biodiversity Authority (NBA)** was established in 2003 headquarters at Chennai.
b. At state level **State biodiversity boards** were created
c. **Biodiversity Management Committee** at local body whether Panchayats or Municipalities throughout the country were created.

11.1 National Biodiversity Authority (NBA)

NBA is head quartered at Chennai. NBA has advisory and regulatory role to perform. NBA advises Central Government on Biodiversity Conservation Issues. It performs regulatory role by granting approvals to Foreign Nationals and Companies for access to Bio-resources for commercial use. It also Grant approvals for IPRs of Bio-resources and associated Traditional Knowledge to Indians and Non-Indians

11.2 State Biodiversity Boards-

State Biodiversity Boards are responsible for implementation of BD Act 2002 within their state boundaries and regulate access to bioresources for commercial use within their state. SBB advises State Government on Biodiversity Conservation issues. It performs regulatory role by issuing Grant approvals to Indians and Indian Companies to access of Bio-resources for commercial use from the State.

Madhya Pradesh state Biodiversity Board (MPSBB)

Madhya Pradesh State Biodiversity Board is head quartered at Bhopal. MPSBB also has advisory and regulatory role to perform. Madhya Pradesh State Biodiversity Board has been constituted by the State Government as per the provisions of Biological Diversity Act, 2002 notified by the Government of India. Madhya Pradesh Biological Diversity Rules, 2004 were notified by the State Government on 17.12.2004 under the provision of Section 63 (1) of Biological Diversity Act, 2002. The notification regarding the constitution of Board was issued on 11th April. 2005.

Functions of NBA & SBB

- Regulation of acts prohibited under the Act
- Advise the Government on conservation of biodiversity
- Advise the Government on selection of Biological Heritage Sites
- Take appropriate steps to oppose grant of intellectual property rights in foreign countries, arising from the use of biological resources or associated traditional knowledge.

11.3 Biodiversity Management Committees (BMCs)

As per the Biological Diversity Act, 2002, BMCs are to be constituted at Gram Panchayat, Janpad Panchayat, Zilla Panchayat, Municipal Corporations, and Municipalities & Nagar Panchayats.

Functions of Biodiversity Management Committee (BMC)

- BMC within its area should promote 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 micro-organisms and documentation of knowledge related to biological diversity
- Most Significantly the BMC is to prepare **People's Biodiversity Register** in consultation with local people. The Register shall contain comprehensive information on availability and knowledge of local biological resources, their medicinal or any other use or any other traditional knowledge associated with them.

Biodiversity Management Committee, Gram Panchayat Pithorabad dist. Satna, Madhya Pradesh::

The Pithorabad Biodiversity Management Committee (BMC) was set up in 2013, and since then has made focused and sustained efforts towards the conservation and sustainable utilization of bio-resources. The BMC conserves around 115 traditional types of paddies, 32 varieties of vegetables, and medicinal plants. The committee has helped identify local flora and fauna and associated traditional knowledge, which have been documented in the People's Biodiversity Register. It has established a community seed bank and facilitated value addition in the form of marketing for select products like organic wheat. Varieties of traditional paddy collected by the BMC along the Narmada belt of Madhya Pradesh were distributed among the farmers for in-situ conservation. The committee was awarded best BMC in the year 2018.

11.4 People's Biodiversity Registers (PBR)

The key mandate of BMCs is to facilitate preparation of People's Biodiversity Registers (PBR) which shall contain information on availability and knowledge of local Biological resources and Traditional Knowledge (TK) associated with them.

Chapter -12
Cross Cutting Issues

12.1 Aichi Targets:

The 'Aichi Target' adopted by the Convention on Biological Diversity (CBD) at its Nagoya conference. In the Conference of Parties-10 meeting, the parties agreed that previous biodiversity protection targets are not achieved, So we need to do come up with new plans and targets The short term plan provides a set of **20** ambitious yet achievable **targets**, collectively known as the **Aichi Targets**.

12.2 Sustainable Development Goals (SDGs): The Sustainable Development Goals (SDGs) are a collection of 17 global goals set by the United Nations General Assembly in 2015 for the year 2030. The goals are broad based and interdependent. The 17 sustainable development goals each have a list of targets that are measured with indicators.

12.3 Paris Agreement:

The Paris Agreement is an agreement within the United Nations Framework Convention on Climate Change (UNFCCC), dealing with greenhouse-gas-emissions mitigation, adaptation, and finance, signed in 2016. The agreement's was adopted by consensus on 12 December 2015. As of March 2019. 195 UNFCCC members have signed the agreement, and 186 have become party to it. The Paris Agreement's long-term goal is to keep the increase in global average temperature to well below 2 °C above pre-industrial levels; and to limit the increase to 1.5 °C, since this would substantially reduce the risks and effects of climate change.

Sustainable Development Goals (SDGs):

1. No Poverty
2. Zero Hunger
3. Good Health and Well-being
4. Quality Education
5. Gender Equality
6. Clean Water and Sanitation
7. Affordable and Clean Energy
8. Decent Work and Economic Growth
9. Industry, Innovation, and Infrastructure
10. Reducing Inequality
11. Sustainable Cities and Communities
12. Responsible Consumption and Production
13. Climate Action
14. Life Below Water
15. Life On Land
16. Peace, Justice, and Strong Institutions
17. Partnerships for the Goals.

12.4 National Biodiversity Target:

In order to achieve the goals of CBD Indian has developed 12 National Biodiversity targets in line with aichi targets that has to be achieved by 2020.

List of National Parks in Madhya Pradesh. Name of National Parks, Year of Notification and Total Area is as follow:

S. No.	Name of National Park	Year of Notification	Total Area(km²)	District
1	Bandhavgarh National Park	1968	448.85	Umariya
2	Fossil National Park	1983	0.27	Dindori
3	Kanha National Park	1955	940	Mandla
4	Madhav National Park	1959	375.22	Shivpuri
5	Panna National Park	1981	542.67	Panna, Chhatrpur
6	Pench (Priyadarshini) National Park	1975	292.85	Seoni,Chhindwara
7	Sanjay National Park	1981	466.88	Sidhi
8	Satpura National Park	1981	585.17	Pachmari
9	Van Vihar National Park	1979	4.45	Bhopal
10	Dinosaur National Park	2010	0.8974	Dhar

Wildlife Sanctuaries in Madhya Pradesh

Name	Area Sq.km	District
Bori Wildlife Sanctuary	518.00	Hoshangabad
Bagdara Sanctuary	478.90	Sidhi
Phen Sanctuary	110.74	Mandla
Ghatigaon Sanctuary	512.00	Gwalior
Gandhi Sagar Sanctuary	368.62	Mandsaur
Karera Sanctuary	202.21	Shivpuri
Ken Ghariyal Sanctuary	45.00	Chhatarpur, Panna
Kheoni Sanctuary	122.70	Dewas, Sehore
Narsingharh Sanctuary	57.19	Rajgarh
National Chambal Sanctuary	320.00	Morena
Nauradehi Wildlife Sanctuary	1,194.67	Sagar
Pachmarhi Sanctuary	461.85	Hoshangabad
Panpatha Sanctuary	245.84	Shahdol
Kuno Wildlife Sanctuary	345.00	Morena
Ratapani Sanctuary	823.84	Raisen
Snajay-Dubri Wildlife Sanctuary	364.69	Sidhi
Singhori Sanctuary	287.91	Raisen
Son Ghariyal Sanctuary	41.80	Sidhi
Sardarpur Sanctuary	348.12	Dhar
Sailana Sanctuary	12.96	Ratlam
Ralamandal Sanctuary	2.00	Indore
Orchha Sanctuary	44.90	Tikamgarh
Gangau Sanctuary	69	Chhatapur
Veerangna Durgawati Sanctuary	23.97	Damoh

Tiger Reserves

Name	Area(sq.km)	District
Kanha Tiger Reserve	2051.791	Mandla, Balaghat
Pench Tiger Reserve	1179.63225	Seoni, Chhindwara
Bandhavgarh Tiger Reserve	1598.10	Umaria
Panna Tiger Reserve	1598.10	Panna
Satpura Tiger Reserve	2133.30797	Hoshangabad
Sanjay-Dubri Tiger Reserve	1674.502	Sidhi District, Singrauli

List of Some Rare and Endemic Flora of Madhya Pradesh

S.no	Botanical name	Local Name	Family
Regionally threaten Tree species (30)			
Critically Endangered (3)			
1.	*Cordia macleodii*	Dahiman	Boraginaceae
2.	*Dillenia pentagyna*	Karkat, Shalyakrni	Dilleniaceae
3.	*Litsea glutinosa*	Meda	Lauraceae
Endangered (4)			
4.	*Oroxylum Indicum*	Sonapatha	Bignoniaceae
5.	*Radermachera Xylocarpa*	Garud Tree	Bignoniaceae
6.	*Pterocarpus marsupium*	Beeja	Fabaceae
7.	*Symplocos racemosa*	Lodhra	Symplocaceae
Vulnerbale (8)			
8.	*Careya arborea*	Kumbhi	Lecythidaceae
9.	*Cochlospermum religiosum*	Gabdi	Cochlospermaceae
10.	*Garuga pinnata*	Kekad	Burseraceae
11.	*Stereospermum chelonoides*	Pader, Ardhkapari	Bignoniaceae
12.	*Strychnos potatorum*	Nirmali, jharmohra	Loganiaceae
13.	*Sterculia urens*	Kullu	Sertculiaceae
14.	*Soymida febrifuga*	Rohina	Meliaceae
15.	*Dalbergia latifolia*	Sheesham	Fabaceae
Near Threatened (15)			
16.	*Anogeissus latifolia*	Dhva	Combretaceae
17.	*Boswellia serrata*	Salai	Burseraceae
18.	*Buchanania lanza*	Achar	Anacardiaceae
19.	*Dolichandrone falcate*	Tamoli	Bignoniaceae
20.	*Erthrina suberosa*	Gadha Palash	Fabaceae
21.	*Grewia tilifolia*	Dhankat	Tiliaceae
22.	*Haldina Cordifolia*	Haldu	Rubiaceae
23.	*Hardwickia binata*	Anjan	Caesalpiniaceae
24	*Schrebera swietenioides*	Mokha	Oleaceae
25	*Ougeinia oojeinensis*	Tinsa	Fabaceae
26	*Wendlandia heynei*	Tilvan	Rubiaceae
27	*Semecarpus anacardium*	Bhilma	Anacardiaceae

S.no	Botanical name	Local Name	Family
28	*Terminalia chebula*	Hara	Combretacea
29	*Hymenodictyon orixense*	Bhudkut	Rubiaceae
30	*Schleichera oleosa*	Kusum	Sapindaceae
31	*Stereospermum colais*	Paadr	Bignoniaceae
32	*Farmina Colorata*	Ferminiya	Malvaceae
25	*Spondia Pinnata*	Khtamba	anacardiaceae
Sufficient (28)			
26	*Acacia catechu* (L. *f*.) Willd.	Khair	Mimosaceae
27	*Aegle marmelos* (L.) Correa	Bel	Rutaceae
28	*Alangium salvifolium* (L. *f*.) Wang	Ankol	Alangiaceae
29	*Albizia lebbeck* (L.) Benth.	Kala Sirus	Mimosaceae
30	*Albizia odoratissima* (L. *f*.) Benth.	Chichwa	Mimosaceae
31	*Albizia procera (*Roxb.) Benth.	Safed Sirus	Mimosaceae
32	*Bauhinia malabarica* Roxb.	Amta	Caesalpiniaceae
33	*Bauhinia purpurea* L.	Kevlar	Caesalpiniaceae
34	*Bauhinia racemosa* Lam.	Kathmahula	Caesalpiniaceae
35	*Bauhinia semla* Wunderline	Sehra	Caesalpiniaceae
36	*Bauhinia variegata* L.	Kachnar	Caesalpiniaceae
37	*Bombax ceiba* L.	Semal	Bombacaceae
38	*Bridelia retusa* (L.) Spreng.	Kasai	Euphorbiaceae
39	*Butea monosperma* (Lam.) Taub.	Palash	Fabaceae
40	*Cassia fistula* L.	Amaltash	Caesalpiniaceae
41	*Chloroxylon swietenia* DC.	Bhirra	Rutaceae
42	*Dalbergia paniculata* Roxb.	Dhobin	Fabaceae
43	*Holarrhena pubescens* (Buch.-Ham.) Wall. *ex* G. Don	Kutki	Apocynaceae
44	*Lagerstroemia parviflora* Roxb.	Sendha	Lythraceae
45	*Lannea coromandelica* (Houtt.) Merr.	Gunja	Anacardiaceae
46	*Madhuca longifolia* (J. Koenig) Macbr. var. *latifolia* (Roxb.) Chevalier	Mahua	Sapotaceae
47	*Miliusa tomentosa* (Roxb.) Sinclair	Kari	Annonaceae
48	*Phyllanthus emblica* L.	Anola	Euphorbiaceae
49	*Terminalia alata* Heyne *ex* Roth	Saja	Combretaceae
50	*Shorea robusta* Gaertn. *f.*	Saal	Dipterocarpaceae
51	*Tectona grandis* L. *f.*	Sagon	Verbenaceae
52	*Wrightia arborea* (Dennst.) Mabberley	Indranav	Apocynaceae
53	*Wrightia tinctoria* R. Br.	Indranav	Rhamnaceae
Not evaluated (11)			
54	*Cleistanthus collinus* (Roxb.) Benth. *ex* Hook. *f.*	Grari	Euphorbiaceae
55	*Diospyros montana* Roxb.	Ptvan	Ebenaceae
56	*Gardenia gummifera* L. *f*.	Kaaper	Rubiaceae
57	*Gardenia latifolia* Ait.	Paapda	Rubiaceae
58	*Gardenia resinifera* Roth	Dikamali	Rubiaceae

S.no	Botanical name	Local Name	Family
59	*Haldina cordifolia* (Roxb.) Ridsd.	Haldu	Rubiaceae
60	*Kydia calycina* Roxb.	Barga	Malvaceae
61	*Morinda pubescens* Sm.	Aakshi	Rubiaceae
62	*Ehretia laevis* Roxb.	Chamrol	Boraginaceae
63	*Schleichera oleosa* (Lour.) Merr.	Kusum	Sapindaceae
64	*Naringi crenulata* (Roxb.) Nicolson	Vilsena	Rutaceae
Rare (9)			
65	*Ficus amplissima*	Pakar	Moraceae
66	*Ficuss beddomei king*	Ficcus species	Moraceae
67	*Ficus caulocarpa*	Ficcus species	Moraceae
68	*Ficus drupacea*	Ficcus species	Moraceae
69	*Ficus exasperate*	Ficcus species	Moraceae
70	*Ficus talboti*	Ficcus species	Moraceae
71	*Sterculia villosa*	Udal	Sterculiaceae
72	*Stereospermum colasis*	Chota Padar	Bignoniaceae
73	*Strychnos nux-vomica*	Kuchla	Loganiaceae
74	*Firmiana colorata*	kuvarin	Sertculiaceae
Endemic tree (1)			
75	*Ficus cupulata haines*	Ficcus species	Moraceae

Source : *Research and extension wing of M.P. forest department*

Trees Having Different Value

S.no	Botanical name
Timber Value	
1	*Pterocarpus marsupium*
2	*Dalbergia latifolia*
3	*Grewia tillifoloia*
4	*Haldina cordifloia*
5	*Ougeinia oojeinensis*
Medicinal value	
6	*Litsea gultinosa*
7	*Oroxylum indicum*
8	*Symplocos racemose*
9	*Stereospermum chelonoides*
10	*Strychnos potatorum*
11	*Semecarpus anacardium*
12	*Terminalia chebula*
Gum Value	
13	*Cochlospermum religiosum*
14	*Sterculia urens*
15	*Anogeissus latifolia*
16	*Boswellia serrata*
Fodder	
17	*Garuga Pinnata*

18	*Dolichandrone falcate*
19	*Hardwickia binata*
Fruits	
20	*Buchanania lanza*
Plant of local believes (10)	
21	*Cordia macleodii*
22	*Dillenia pentagyna*
23	*Radermachera xylocarpa*
24	*Careya arborea*
25	*Soymida febrifuga*
26	*Schrebera Swietenioides*
27	*Wendlandia heynei*
28	*Hymenodictyon orixense*
Multiple value (7)	
29	*Cordia macleodii*
30	*Pterocarpus marsupium*
31	*Dalbergia latifolia*
32	*Anogeissus latifolia*
33	*Grewia tiliifolia*
34	*Hardwickia binata*
35	*Ougeinia oojeinensis*

Some important fauna of Madhya Pradesh

S. No.	Species
Wild Animals	
1.	Tiger
2.	Leopard
3.	Wolf
4.	Indian wild dog
5.	Indian pangolin
6.	Swamp deer
7.	Black buck
8.	Chinkara
9.	Caracal
10.	Indian fox
11.	Sloth bear
12.	Gaur
13.	Four horned antelope
14.	Mouse deer
Aquatic animals	
15.	Magar
16.	Gharial
17.	Smooth Coated Otter
18.	Turtle

19.	River Dolphin
Lizard	
20.	Indian monitor lizard
Snake	
21.	Indian rock python
Birds	
22.	Lesser Florican
23.	White Rumped Vulture
24.	Indian Vulture
25.	Red Headed Vulture
26.	Egyptian vulture
27.	Great Indian Bustard
28.	Pallas Fish Eagle
29.	Sarus Crane
30.	Indian Skkimer
31.	Sociable Lapwing
Butterflies	
32.	Commander
33.	Common Gull
34.	Common Indian Crow
35.	Common Pierrot
36.	Crimson Rose
37.	Common Rose
38.	Common Jezebel
39.	Common tiger
40.	Orange oakleaf
41.	Peacock pansy
42.	Plain tiger
43.	WSF Danaid Eggfly (M)

Fish Taxa of Madhya Pradesh

S.no	Name of Fish Species
1	Tor Putitora
2	Tor Tor
3	Tor Khudree
4	Notopterus Chitala
5	Labeo Dyocheilus
6	Rita Rita
7	Puntius Sophore
8	Mystus Tengara
9	Glypltothorax
10	Noemacheilus helius beavani
11	Silonia silondia

List of plants and animal with cultural belief that help in conservation of Biodiversity

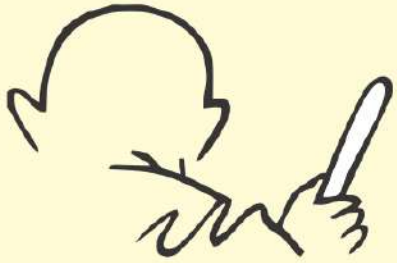
S.no	Name of Animal	Belief
1.	Cow	The cow is holiest animal in India and their slaughter is banned throughout India. Cow is one of the most worshiped animal in India, she treated as the gods in the shape of animal. The cow in India is believed as a gift of the gods to the peoples
2.	Monkey	Monkey is believed as the form of God Hanuman or Bajrang Bali, the god of power and strength. Many Indian temple's like Durga Temple Varanasi and famous Monkey Temple Galta, Jaipur is the home for thousand's of monkey's.
3.	Snake	The worship of serpent deities is present in several old cultures, In the Hindu religion's the Lord Shiva wear the Nag snake "Indian Cobra" as an ornament around his neck. Indian Cobra is the most sacred snake in India. Nag Panchami, the festival of snakes, is a Hindu festival dedicated to the worship of snakes and serpent deities.
4.	Elephant	The elephant is ride of Indra and "The elephant-headed God" Shri Ganesh, deity of success and education is worship by the Indian peoples. The elephant in India is part of Hindu ethos and culture.
5.	Tiger	The Royal Bengal Tiger "National Symbols of India" is one of the sacred animal in India. The National animal of India Tiger and Great Lion are the vehicle of Hindu deity "Maa Durga". The Bengal tiger is Worshiped by the tribes and by the sundervan people as well.
6.	Rat	Rat is the ride of "Shri Ganesha" and there is a temple in the state of Rajasthan were it is sacred.
7.	Peacock	It is the ride of "Lord Kartikey" and is linked with "Lord Krishna"
8.	Eagle	It is the ride of "Lord Vishnu"
9.	Owl	It is lnbked with "Godess Lakshmi" and there is a belief that it's a good omen to see Owl on the day of Diwali
10.	Crow	Crow is the ride of Lord Shani and is of religious importance in the days of Pitra
S.no	**Name of Plants and flower**	**Belief**
11.	Ashoka	In Hinduism the ashoka is considered a sacred tree. Not counting a multitude of local traditions connected to it, the ashoka tree is worshipped in Chaitra, the first month of the Hindu Calendar. It is of great religious importance in Budhism and Jainism also
12.	Banyan tree	Banyan tree is linked with lord Brahma and is worshiped on Vat Savitri
13.	Bel patra	It is offered to lord Shiva
14.	Tulsi	It is a sacred plant in India and is offered to lord Vishnu
15.	Lotus flower	Lotus flower is offerd to goddess Lakmi and Saraswati
16.	Peepal tree	It is considered that all three dities Brahma, Vishnu Mahesh resides in this tree
17.	Awala	It is offered to lord Shiva and Vishnu and is worshiped on Awla navmi
18.	Banana tree	It is worshiped on Thursdays and is very dear to Lord Vishnu
19.	Neem tree	The neem tree is one of the most respected trees in India due to its innumerous benefits. Neem has medicinal properties and is used to treat many diseases. It is also associated with goddess Durga and many people believe that neem trees help

		in keeping evil spirits at bay
20.	Mango	The leaves and fruits of the sacred mango tree are used in many religious ceremonies. The mango tree has been cited in the epics like Ramayana, Mahabharata and even in the Puranas. The fruit of the mango tree is an emblem of purity, love and fertility. The leaves of the mango tree are always hung by a string express the auspiciousness of any occasion.

Disclaimer

This book is only a supportive text for "Madhya Pradesh Biodiversity Quiz Programme". Children may refer other available literature for the quiz. Text, photographs, videos and questions banks our reading material are also available on:-

1. www.mpsbb.nic.in
2. MPBDQ-2019 instagram, facebook and youtube also.
3. You may also search the related sites for your own benefit like http://nbaindia.org/, https://www.cbd.int/.



Celebrating 150th Birth Anniversary of Sh. M.K.Gandhi

"पृथ्वी सभी मनुष्यों की जरुरत पूरी करने के लिए पर्याप्त संसाधन प्रदान करती है, लेकिन लालच पूरी करने के लिए नहीं"

"Earth provides enough to satisfy every man's needs, but not every man's greed"

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