

Unit 1

Introduction to Environmental Studies

Important Questions

1. Why is Environment studies considered as a multidisciplinary subject?

Elaborate on the importance of environment studies, i.e.

- a. Awareness
- b. Acceptance
- c. Attitude
- d. Action

Specifically write about the role of various subjects in understanding various aspects of Environment Studies.

Economics:

2. How can public awareness regarding environment be increased? What is ideal outcome of increasing public awareness?

Elaborate on the role of various kinds of media in spreading awareness of EVS:

- Social media
- Print media
- Electronic media

And the role of other means in spreading awareness like

- Seminars and workshops,
- Street plays, campaigns and advertisements
- NGOs
- EVS course in schools and colleges

Write about what changes can be seen in the people if they are given environment education especially with respect to Awareness, Attitude and Action.

3. How can Environment studies subject help in increasing environmental conservation? What are the challenges faced in increasing awareness about environment among citizens?

Elaborate on how environment studies subject can help in affecting the Awareness, Attitude and Action of citizens of a country towards environmental issues. If there are any difficulties in spreading environment education, then mention that also. The following points can be explained.

1. Lack of interest towards environment
2. Large population in rural areas
3. Lack of knowledge of environment among people
4. Lack of any accountability towards environment
5. Rigidly following cultural and traditional practices without environment concern

6. Profit making attitude of people and corporate companies.
7. Many policies of government are not environment friendly.

Important days concerning our environment

World Environment Day	June 5
Earth Day	April 22
World ozone day or Preservation of Ozone layer day	September 16
World Water Day	March 22
World Wetlands Day	February 2
International Tiger day	July 29

https://instagram.com/envisage_sgndkc?igshid=1x0231x3c8kn0

Unit 2

Ecosystem

Important definitions and notes

- **Ecosystem:** An **ecosystem** is a community of living organisms in conjunction with the nonliving components of their environment (things like air, water and mineral soil), interacting as a system. These biotic and abiotic components are regarded as linked together through nutrient cycles and energy flows.
- **Structure of Ecosystem**
Ecosystem consist of biotic and Abiotic components:
Bioitc component: All the living beings are categorized as biotic components. The living beings can be divided into the following three categories:
 - a. Producers: Also called as autotrophs. These include all those species which can synthesize their own food using inorganic components. All plant species come in this category
 - b. Consumers: Also called as heterotrophs. These include all those organisms which depend on producers for their food. All animals come in this group.
 - c. Decomposers: These are natural recyclers of our ecosystem. They act on any dead matter and break them down into simple compounds which are released back air, water or soil.

Abiotic component: These includes all the factors of the environment that are non living.

- a. Climatic factors: Air, water, sunlight. Wind, humidity
 - b. Geographic factors: soil, rocks, mountains, rivers
 - c. Inorganic factos: Nitrogen, chlorine, Phosphorus, carbon
- **Functions taking place in an ecosystem:**
 - a. Energy Flow
 - b. Material flow in the form of food
 - c. Nutrient cycling or biogeochemical cycles
 - d. Ecological succession
 - e. Evolution
 - **Food Chain:** A series of organisms through which food energy flows in an **ecosystem from producers to the final consumers** is called a **food chain**. There are two types of food chain
 - a. **Grazing food chain:** A food chain that begins with living plants being eaten by herbivorous animals. The **first consumer** in this chain is a **herbivore**. This is more prevalent than detritus food chain and has more energy. For example:

Grass > Grasshopper > Frog > Snake
 - b. **Detritus food chain:** A food chain that begins with parts of dead plants and animals. The **first consumer** in this chain is a **detritivore**. This is less prevalent than grazing food chain and carries less energy. For example:

Dead leaves > beetle > Lizard > Snake

- **Food Web:** Interconnected networks of food chains in an ecosystem is called as food web.
- **Energy Flow:** The ultimate source of all energy for an ecosystem is the sun. Energy from the sun (light energy) is converted into food (chemical energy) by the producers. This food then moves along a series of consumers thus giving rise to a food chain or a food web. Energy flow along a food chain follows the 10 percent rule, i.e. at every level in a food chain, only 10 percent energy is available from the previous level. These levels are called as the trophic levels. The remaining 90 percent is utilized by the organism itself for performing all its survival and development functions. Energy flow in an ecosystem is Unidirectional.
- **Ecological Pyramid:** An **ecological pyramid** is a graphical model of **energy** flow in an ecosystem. The concept was first given by Charles Elton. Producers form the base of the pyramid followed by subsequent trophic levels of herbivores and carnivores. Pyramids can be made on the basis of
 1. Number of organisms at each trophic level (Pyramid of numbers)
 2. Biomass at each trophic level (Pyramid of Biomass)
 3. Energy available at each trophic level (Pyramid of Energy)Pyramids can be upright, inverted or diamond shaped. **Pyramid of ENERGY is always upright due to 10 percent rule of energy flow.** Pyramid of Biomass and numbers can have any of the three shapes.
- **Ecological succession:** This is the change in community structure (flora and fauna) of an ecosystem in response to change in environment. There are two kinds of succession; Primary succession and Secondary succession.

Primary succession is the succession that begins in new habitats, where there are no pre-existing communities. The first community that establishes in the area is called as *pioneer community*. The last community that establishes is called as *climax community*. The stages between these two communities are called as *Seral community*. Primary succession takes millions of years. Primary succession that begins on rocky areas is called as **Lithosere**. Primary succession that begins on rocky areas is called as **Hydrosere**.

Secondary succession is the succession that follows destruction of a pre-existing community due to natural means or human activities. Soil structure is already present in case of secondary succession. And this process takes 10 – 100 years.

Succession that begins on rocks is called as *Lithosere*
Succession that begins in water is called as *Hydrosere*
Succession that begins on sand is called as *Psammosere*

- **Forest Ecosystem:** A **forest ecosystem** is **defined** as an area dominated by trees and other woody plants. There are SIX major types of forest ecosystems:

- a. **Coniferous Forest:** characterized by coniferous trees in which leaves are modified into spines. Common trees include pine and deodar. Found in upper elevations of Himalayas where rainfall is less and snowfall is common
 - b. **Broadleaf Forests:** characterized by oaks, maple etc. Found in lower elevations of Himalayas where there is rainfall between 1000 – 2000 metres.
 - c. **Tropical evergreen forest:** Characterized by dense forests and thick canopy cover. Found in places where the rainfall is more than 2500 mm. Such places are hot and humid and are found near to the equator. Trees include rosewood, mahogany and ebony.
 - d. **Deciduous forests:** characterized by trees which shed their leaves annually. Common trees include Sal and Teak. Found in places where the rainfall is between 1000 to 2500 mm and where there is winter and summer seasons.
Trees
 - e. **Thorn and scrub forests:** characterized by short trees and bushes that have thorns and can tolerate waterless conditions. Common trees are babool and Khejri. Found in semi arid areas, that is those areas where temperature is very high for most of the season and rainfall is between 300- 800 mm annually. Soil is not very fertile and supports limited vegetation.
 - f. **Mangrove forests:** characterized by small and medium sized trees that grow in coastal areas in **brackish water**. Brackish water is a mixture of fresh water and salt water. These kind of forests are mainly found around delta regions in areas that are called as **Estuary**. Estuaries are formed where river water meets the seawater. Mangrove forests are continuously submerged in water and so they develop special kind of structures in their roots called as Pneumatophores. Common trees include white and red mangrove, mangrove palm, mangrove rose. These forests provide extremely vital **ECOSYSTEM SERVICES** in the form of cleaning water, preventing shoreline erosion, carbon storage, supporting enormous biodiversity and also supporting livelihood of local communities by providing areas for fishing.
- **Desert Ecosystem:** A large, dry, barren region, usually having sandy or rocky soil and little or no vegetation and receiving rainfall of less than 250 mm annually. Water lost to evaporation and transpiration in a **desert** exceeds the amount of precipitation; most **deserts** average less than 250 mm of rainfall annually. Deserts can be either cold deserts or Hot deserts. Although vegetation in deserts is very less, they still harbor a number of medicinal plants and also support a large human population in many areas.
 - **Grassland ecosystem: Grasslands** are areas where the vegetation is dominated by grasses. Shrubs and herbs can also be found here. Rainfall ranges from 500 – 1000 mm annually. Grasslands provide some of the most fertile regions of the world and are hence extremely important for agricultural activities. A number of cereal crops as well as fruits and vegetables are grown in these areas. They also harbor very economically and genetically important varieties of plants and animals. Common names of grasslands include Prairies (North America), Pampas (South America), Steppes (Central Asia), Velds and Savannas (Africa) and Downs (Australia).
 - **Aquatic Ecosystem:** An aquatic ecosystem is a community of organisms and their interactions in a water environment. An aquatic ecosystem contains a large variety of life, from fish and reptiles to microscopic organisms such as bacteria

and fungi. There are several types of aquatic ecosystems including marine ecosystems and freshwater ecosystems. A marine ecosystem is a salt water ecosystem and the largest aquatic ecosystem in the world. A marine ecosystem, in turn, is divided into smaller ecosystems or zones. For instance, a coral reef is its own ecosystem as are lagoons and intertidal zones. These ecosystems contain algae, corals, fish and sharks. Another major type of aquatic ecosystem is a freshwater ecosystem, which consists of lentic or slow-moving water ecosystems, lotic or fast-moving water ecosystems and wetland ecosystems. Lentic ecosystems include ponds and lakes, which break down into smaller zones or ecosystems including littoral zones, open-water zones and deep-water zones. Lotic ecosystems include rivers and streams. While lentic and lotic ecosystems are rich in fish, wetland ecosystems largely contain vascular plants and a variety of animal species.

Wetlands: A **wetland** is a land area that is **saturated** with **water**, either permanently or seasonally, such that it takes on the characteristics of a distinct **ecosystem**. The primary factor that distinguishes wetlands from other land forms or water bodies is the characteristic **vegetation** of **aquatic plants**, adapted to the unique water saturated soil. Wetlands provide a number **ECOSYSTEM SERVICES**, principally

- a. Water purification,
- b. Underground water (Aquifer) recharge
- c. Flood control,
- d. Carbon sink and
- e. Shoreline stability.

Wetlands are also considered the most **biologically diverse** of all ecosystems, serving as home to a wide range of plant and animal life.

- **Goods and services of Ecosystem:**

Goods	Services
Food products (examples)	Provides clean water
Medicinal plants (examples)	Provides clean air
Ornamental products (examples)	Prevention of soil erosion by trees
All kind of wood products (examples)	Flood control by trees
Raw material for cloth	Recharging of underground water
	Carbon storage
	Decomposition of dead material
	Cycling of nutrients
	Shelter to fauna
	Maintains local weather including rainfall

- **Invasive species:** An **invasive species** is a plant, fungus, or animal **species** that is not native to a specific location (an introduced **species**), and which has a tendency to spread to a degree believed to cause damage to the environment, human economy or human health. Examples include Vilayati keekar, Congress grass, and Lantana camara (all plant species) and also Cane toad and Bay barnacles (animal species). Invasive species are a threat to biodiversity. They

are harmful to the environment. Invasive species can grow and adapt in different kind of environment. They reproduce very fast and can tolerate different climatic conditions.

- **Endemic species:** **Endemic species** are plants and animals that exist only in one geographic region. **Species** can be **endemic** to large or small areas of the earth: some are **endemic** to a particular continent, some to part of a continent, and others to a single island. Endemic species are adapted to a very narrow range of environmental conditions. They are important for biodiversity. They are native to the place and are extremely important.
- **Ecological Restoration:** *Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.* Ecosystems are dynamic communities of plants, animals, and microorganisms interacting with their physical environment as a functional unit. These communities can be damaged, degraded, or destroyed by human activity. Damage refers to an acute and obvious harmful impact upon an ecosystem such as selective logging, road building, poaching, or invasions of non-native species. Degradation refers to chronic human impacts resulting in the loss of biodiversity and the disruption of an ecosystem's structure, composition, and functionality. Examples include: long-term grazing impacts, long-term over fishing or hunting pressure, and persistent invasions by non-native species. Destruction is the most severe level of impact, when degradation or damage removes all macroscopic life and commonly ruins the physical environment. Ecosystems are destroyed by such activities as land clearing, urbanization, coastal erosion, and mining.

Important questions

1. What is Ecosystem? What are the biotic and abiotic components of the Ecosystem? OR explain the structure of ecosystem.
2. What are the five functional aspects of an Ecosystem? Elaborate on them
3. Which are the two types of food chains? Discuss
4. Explain about ecological succession. Write short note on primary and secondary succession and differentiate between the two.
5. Write short note on
 - a. Desert ecosystem
 - b. Aquatic Ecosystem
 - c. Tropical evergreen Forest ecosystem of Northeast states and Western Ghats
 - d. Grassland ecosystem
 - e. Ecological restoration
6. Discuss the BENEFITS (goods and services) and THREATS (atleast three) on the following ecosystems
 - a. Desert ecosystem
 - b. Aquatic Ecosystem
 - c. Grassland ecosystem
 - d. Forest Ecosystem

7. Differentiate between
 - a. Ecosystem and Biosphere
 - b. Different types of Ecosystem
 - c. Grazing and Detritus food chain
 - d. Endemic and Invasive species
 - e. Endangered and Endemic species
 - f. Primary and secondary succession
 - g. Good and services of Ecosystem

Unit 3

Natural Resources

Important definitions, notes and questions

Land degradation: The loss in quality of land with respect to its fertility and productivity due to human activities or climatic conditions is called as Land degradation. Land degradation leads to loss of ecosystem services provided by the land and affects human populations surviving on that area.

The various human activities that lead to land degradation are

- a. Deforestation for agriculture, human settlements and industries
- b. Excessive use of pesticides and fertilizers
- c. Soil pollution from industries, domestic waste, sewage etc
- d. Mining
- e. Overgrazing
- f. Excessive use of underground water
- g. Destruction of wetlands

The climatic factors include

- a. Droughts and floods
- b. Soil erosion
- c. Excessive rainfall

(Read in detail from book)

Desertification: It is the process by which fertile land in semi arid areas are converted into barren lands due to human activities and climatic factors. The factors that cause desertification is similar to that of land degradation. Desertification is an extreme consequence of land degradation in semi arid areas. Desertification not only impacts the quality of land but it affects the wild animals, the human communities inhabiting the place and also their livestock.

Land Resources

1. What is land degradation? Explain the reasons that cause land degradation?
2. What is desertification? Explain the reasons that cause desertification. How does desertification affect the quality of life of people living in semi arid areas? What steps can be taken to overcome the problem of desertification?
3. Write a short note on United Nations Convention to Combat Desertification.

Forest Resources

4. What are the threats on Forest Resources of India? What steps have been taken by the government for increasing the forest cover in India?

Elaborate on threats to forests like

- *Deforestation for agriculture,*

- *industries and housing,*
- *Forest Fires,*
- *overutilization as raw material in industries,*
- *Forest fires,*
- *construction of dams and mines,*
- *Illegal smuggling of forest products*

Measures taken by Government include

- *Social Forestry*
- *Joint Forest Management*
- *National Forest Policy*

Prepare brief Explanation from book

5. What are the various impacts of dam construction?

Elaborate on the following points

➤ *Environmental Impact*

- *Large scale submergence of forest areas*
- *Loss of habitat for terrestrial as well as aquatic animals*
- *Air pollution by release of methane gas as well as during the entire construction process*
- *Greatly reduces the natural flow of water in rivers, which leads to excessive pollution in downstream areas.*

➤ *Social Impact*

- *Displacement of people who are affected not only mentally but also economically. People lose their land, the environment that they have been living in for generations, their livelihood, and don't even get proper compensation from the government.*
- *Risk of natural disaster like earthquakes increase which can always be a threat to downstream human settlements*
- *Downstream areas do not get clean water in rivers due to water being stopped by dams. Due to extremely polluted water of rivers, people over utilize their ground water resources that lead to water crisis in these areas.*

➤ *Economic Impacts*

- *Dam construction requires very high capital*
- *Siltation in dams reduces the efficiency of dams and reduces the life of dams.*

6. Why is mining considered as a necessary evil?

Elaborate on the importance of mining as well as the negative environmental and social impacts of mining.

7. Write short note on Joint Forest Management

8. How can local people or communities contribute to protection of forest

Elaborate on

- *Joint Forest management*
- *Knowledge of people about the flora and fauna of forest*

- *Sacred groves*
9. How, why and where did Chipko movement start? Who were the main people involved in the movement? What was the outcome of this social movement?
 10. How, why and where did Narmada Bachao Andolan start? Who were the main people involved in the movement? What was the outcome of this social movement?
 11. Write a short note on the Bishnoi movement in Rajasthan.

Water Resources

12. What are the various reasons (atleast five) for water shortage or water crisis faced by almost all states of India.

Elaborate on

- *Pollution of river water*
 - *Highly water intensive agriculture especially in semi arid areas*
 - *Wastage of water in agriculture, in industries and at domestic or individual level*
 - *Destruction of forests in watershed areas or drainage basins of rivers*
 - *Overutilization of ground water resources (aquifers)*
 - *Destruction of wetlands that re very helpful in recharging our aquifers*
 - *Mismanagement of water by municipal corporations*
 - *Lack of rainwater harvesting methods in human settlement areas*
13. What are the various measures (atleast five) that need to be taken for sustainable management of our water resources?
Elaborate on corrective measures with respect to above-mentioned points.
 14. Write short note on rainwater harvesting
 15. What are the reasons for river water conflicts among various Indian states. Discuss with an example.
Elaborate on
 - *Dam construction in upstream states leading to lack of enough water in downstream state*
 - *Excessive pollutants released into river by upstream state*
 - *Over utilization of ground water by downstream states*
 - *High requirement of water for agriculture in downstream states*
 - *Lack of proper water harvesting and management methods in downstream states*
 - *Destruction of wetlands in downstream states*
 - *Lack of rainfall*

Discuss recent example

16. What lessons can we learn about water conservation from our past generations?

Elaborate on

- *Traditional rainwater harvesting methods like Johads*
- *Concern for water resource and prevention of wastage of water*
- *Care for rivers and preventing its pollution*
- *Sustainable type of agriculture which requires less chemicals as well as less water*
- *No cutting of trees in watershed areas or drainage basins*

Energy resources

17. Differentiate between Non renewable (conventional) and renewable energy (Non conventional) sources of energy

18. What is Green energy? What are the sources of Green energy
Energy generated from renewable sources of energy is called as Green energy. Mention the various kinds of renewable energy sources.

19. Why is there a need for us to adopt renewable energy sources?

Elaborate on

- *Need to decrease carbon emissions (carbon footprint) so as to bring down the rate of global warming and its lethal impacts*
- *Need to decrease emission of harmful air pollutants so as to protect the health of humans*
- *Need to achieve energy security so that our country is energy independent (does not need to import energy sources) and also for providing electricity to every household of the country*
- *Need to achieve sustainable development so that our fossil fuels are saved for future generations as well*
- *Renewable energy sources are available abundantly and can be more cost efficient in future as compared to non-renewable sources.*

20. Which are the major renewable energy sources available for use in India? Explain them in detail. Discuss their applications (uses) and also the merits and demerits of each kind of renewable energy.

21. What is nuclear energy? What are the advantages of using nuclear energy? With the help of examples, discuss the problems associated with nuclear energy.

Unit 4

Biodiversity

Important definitions and notes

Biodiversity

The sum total of all varieties of living organisms existing at a given place.

Biodiversity Hotspot

A **biodiversity hotspot** is a biogeographic region with significant levels of biodiversity that is under threat from humans. Norman Myers wrote about the concept in two articles in “The Environmentalist” (1988) & the other in “Hotspots: Earth’s Biologically Richest and Most Endangered Terrestrial Ecoregions”, a paper published in the journal *Nature* (in 1990).

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

1. It must have at least **1,500 vascular plants as endemics** — which means, it must have a high percentage of plant life found nowhere else on the planet. A hotspot, in other words, is **irreplaceable**.
2. It must have **30% or less of its original natural vegetation due to human activities**. In other words, it must be **threatened**.

Around the world, **36 areas** qualify as hotspots. They represent just **2.3% of Earth’s land surface**, but they support more than half of the world’s plant species as endemics — i.e., species found no place else — and nearly **43% of bird, mammal, reptile and amphibian species as endemics**.

India is part of **FOUR** biodiversity hotspots

- a. **Himalayas:** Stretching in an arc over 3,000 kilometers of northern Pakistan, Nepal, Bhutan and the northwestern and northeastern states of India, the Himalaya hotspot includes all of the world’s mountain peaks higher than 8,000 meters. Of the estimated 10,000 species of plants in the Himalaya hotspot, about 3,160 are endemic.
- b. **Indo Burma:** Comprising the eastern Bangladesh extending across north-eastern India south of the Brahmaputra River, to encompass nearly all of Myanmar, part of southern and western Yunnan Province in China, all of the Lao People’s Democratic Republic, Cambodia and Vietnam, the vast majority of Thailand and a small part of Peninsular Malaysia. Consists of about 17000 species of flora and fauna of which 7000 plants and 1000 animals are endemic
- c. **Western Ghats and Srilanka.** The Western Ghats is a chain of mountains that stretch for 1,600 kilometers from the country’s southern tip to Gujarat in the north. The whole island country of Srilanka is also part of this biodiversity hotspot. There are a minimum of 6,000 vascular plant species in the Western Ghats and Sri Lanka hotspot, of which more than 3,000 (52 percent) are endemic. There are also more than 1000 vertebrate species of which about half are endemic to the hotspot.

- d. **Sundaland:** Sundaland covers a small portion of southern Thailand (provinces of Pattani, Yala, and Narathiwat); nearly all of Malaysia (nearly all of Peninsular Malaysia and the East Malaysian states of Sarawak and Sabah in northern Borneo); Singapore at the tip of the Malay Peninsula; all of Brunei Darussalam; and all of the western half of the megadiversity country of Indonesia, including Kalimantan (the Indonesian portion of Borneo, Sumatra, Java, and Bali). **The Nicobar Islands, which are under Indian jurisdiction, are also included.**

India as a Mega-diversity nation (*Read in detail from book*)

To qualify as a Mega-diverse Country, a country must:

1. Have at least 5000 of the world's plants as endemics
2. Have marine ecosystems within its borders.

There are 17 Mega-diverse countries in the world and India is one among them.

Then, Write about the 10 biogeographic zones, about the different types of ecosystem with examples, different climatic factors etc. Then discuss about the total number of plant and animal species. And also discuss about the enormous number of endemic and endangered species present in India with examples.

Check this link

<http://earthuntouched.com/india-mega-diversity-nation/>

Invasive species

Definition

An **invasive species** is a plant, fungus, or animal **species** that is not native to a specific location (an introduced **species**), and which has a tendency to spread to a degree believed to cause damage to the environment, human economy or human health.

Examples

Vilayati keekar, Congress grass, and Lantana camara (all plant species)
Cane toad and Bay barnacles (animal species)

Characteristics of invasive species

Common invasive species traits include the following:

- Fast growth
- Rapid reproduction
- High dispersal ability
- Tolerance of a wide range of environmental conditions

Harm caused by invasive species

Harms Biodiversity: Invasive species grow very fast, increase greatly in numbers and enters into all kinds of environment. Thus it takes all nutrients and space available for other species, leading to death of native species. Slowly, invasive species spread into large regions like in the case of *Lantana camara*.

Causes economic loss: Invasive species occupy large areas of agricultural land thus making it useless for agricultural purposes. This leads to loss in terms of economic output of the land area. A huge amount of money has also been spent for removal of invasive species like *Cynodon dactylon* which also adds to the economic losses.

Harms Human health: Invasive species like *Cynodon dactylon* produce pollen grains which spread through wind and which can cause breathing problems to people suffering from Asthma and bronchitis. Some invasive species also produce toxic chemicals which can cause irritation in skin and eyes.

Biological invasion

The spread of an organism or species into an area where it was not found earlier, typically with harmful effects such as the displacement or extinction of native species, destabilization of the **invaded** ecosystem etc. Invasive species are the agents of biological invasion when they are introduced from one place to another.

Threats on Biodiversity (Read in detail from book)

1. Habitat Loss
2. Poaching and illegal smuggling
3. Invasive species
4. Human Wildlife Conflict
5. Overutilization

Importance of biodiversity (Read in detail from book)

Direct value

- a. Consumptive value
- b. Productive Value

Indirect Value

- a. Ecological services (as mentioned in goods and services of Ecosystem)
- b. Moral and ethical value
- c. Aesthetic value
- d. Recreational value
- e. Religious and social value

Endangered species

A species of animal or plant that is seriously at risk of extinction

Examples:

- Asiatic Lion,
- Snow Leopard,
- Black buck,
- Red Panda,
- Royal Bengal Tiger,
- Lion Tailed macaque,
- Hangul (Kashmiri stag),
- Once horned Rhinoceros

Endemic species

Species of plants and animals that exist only in one geographic region

Examples

- Asiatic Lion
- Hangul (Kashmiri stag),
- Lion Tailed macaque,
- Nilgiri Tahr
- Pygmy Hog
- Malabar Civet.

Conservation strategies (*Read in detail from book*)

In situ strategy

Protecting flora and fauna within their natural habitat.

Examples include

- National parks
- Wildlife sanctuaries
- Reserve Forest
- Tiger Reserves

These are also called as Protected Areas

- Advantages of In situ conservation
 - a. Protection in natural habitat
 - b. Cheap method
 - c. Protects large number of animals
- Disadvantages
 - a. Not good for critically endangered animals
 - b. Loss of economically useful land
 - c. Threat of poaching and smuggling

Ex-situ strategy

It is the process of protecting an endangered species, variety or breed, of plant or animal outside of its natural habitat.

Examples include

- Zoological parks
- Botanical Gardens
- Seed banks
- Captive Breeding centers
- Tissue banks

- Advantages of Ex situ conservation
 - a. Better care for animals and plants
 - b. Good method for critically endangered species
 - c. Long time storage possible
- Disadvantages of Ex situ conservation
 - a. Very costly method

- b. Alters natural behavior of animals

Case studies to be prepare

- Project Tiger – An in-situ conservation strategy
- Project Gharial – A dual conservation strategy
- Vulture breeding Program - An ex-situ conservation strategy
- Beej Bachao Andolan: A dual conservation strategy
- Role of tribal communities in protecting biodiversity
- Sacred groves
- Spread of Congress Grass (invasive species) in India

Important Questions

1. What is biodiversity? What are the three different levels of biodiversity?
2. Which are the 10 biogeographic zones found in India
3. List five values of biodiversity to humankind.
4. Why is India called as a Megadiversity nation?
5. What is a Biodiversity Hotspot? How many biodiversity hotspots are there in the world. How many biodiversity hotspots is India part of?
6. What are the major threats to Biodiversity?
7. Give three examples of
 - a. Endangered plants
 - b. Endangered animals
 - c. Endangered birds
 - d. Endemic animals
8. What are endemic animals? Give five examples
9. Differentiate between Ex-situ and In-situ conservation strategies. Provide examples for each.

Unit 5

Pollution

Important definitions, notes and questions

Pollution: Presence of undesirable substance or form of energy (in case of noise) into the environment, in concentrations that cause harm to flora and fauna including human beings and overall environment is called as Pollution

Pollutant: The undesirable substance that when present in high concentration harms the environment is called as Pollutant

Primary Pollutant: The pollutants that are released directly from the source. For example Sulphur oxides, nitrogen oxides released directly from exhaust of vehicles or chimneys of factories.

Secondary pollutant: The pollutants that are formed when primary pollutants mix among themselves or with water. For example sulphur oxides and nitrogen oxides mix with water to form acids that are part of acid rain.

Point sources of pollution: These are stationary sources of pollution which release huge amount of pollutants into the atmosphere. Example industries, Thermal power plants

Non point sources: These are stationary or mobile sources of pollution which individually release less amount of pollution but have a much greater effect cumulatively. Example, vehicles, Kitchen chimneys etc

Carbon Footprint: The total amount of green house gas emissions (mainly carbon dioxide and methane) caused by individual or organization or event or a country.

Smog: This is a type of air pollution that is caused when smoke consisting of nitrogen and sulphur oxides and volatile organic compounds (VOC's), combines with moisture in atmosphere in the presence of sunlight. It is extremely bad for human health.

Eutrophication: Explosive growth of algae due to high concentrations of nutrients (especially nitrates and phosphates) in water bodies. The nutrient concentration increased due to runoff of fertilizers from agricultural fields into nearby water bodies. Eutrophication harms aquatic flora and fauna by reducing penetration of sunlight and increasing the Biological Oxygen Demand.

Biological Oxygen Demand (BOD): It is the amount of dissolved oxygen needed aerobic decomposers (microorganisms that require oxygen) to completely break down or decompose the biodegradable organic matter (substances of living origin) present in a given sample of water at a certain temperature over a specific time period. In other words, it is the amount of dissolved oxygen required for healthy survival of aquatic fauna.

Chemical oxygen Demand (COD): It is the amount of oxygen needed to chemically oxidize all organic matter (biodegradable as well as non biodegradable) present in a

given sample of water at a certain temperature over a specific timer period. COD is always higher than BOD

Bioaccumulation: It is the accumulation of inorganic substance, mainly pesticides or other chemicals in living tissues of organisms.

Biomagnification or bioamplification or biological magnification: It is the increasing concentration of a substance such as a toxic chemical in the tissues of organisms at successively higher levels in a food chain.

Solid Waste: Solid waste means any kind of discarded solid or semi solid garbage from households, agricultural fields, industrial facilities, municipalities, hospitals etc. In India most of this waste is disposed off in landfills.

Composting: Decomposition of dead and biodegradable organic material with the help of microorganisms so as to form rich soil known as compost. Composting is mainly done for fallen leaves, food scraps and grass clippings. This is a slow process and requires constant mixing of the waste material

Vermicomposting: Decomposition of dead and biodegradable organic material with the help of worms and insects so as to form rich soil known as compost. Vermicomposting is mainly done for large amount of kitchen waste that is produced in households or institutions. This is a slower process and does not require mixing of waster material.

Write short notes on (**Prepare from book or internet**)

1. London Smog
 2. Bhopal Gas disaster
 3. Air Quality Index
 4. Odd Even Formula
 5. Eutrophication
 6. Ganga River Pollution
 7. Ganga Action Plan
 8. Noise Pollution: its causes, effects and preventive measures
 9. DDT pollution
 10. Minamata disease
 11. Arsenic pollution
 12. Organic Farming
 13. Thermal Pollution
 14. Swachh Bharat Abhiyaan
 15. Nuclear pollution: its causes, effects and preventive measures
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1. Elaborate on the causes of Air pollution and its impacts on the environment. What steps need to be taken by the individual and the government to deal with the problem of air pollution in our metropolitan cities?
 2. What are the causes of pollution of various rivers in India? What measures need to be taken to clean our river system?
 3. Do traditional and cultural rituals of India lead to water pollution? Discuss
 4. What is Solid Waste? What steps need to be taken for proper disposal of solid waste at various levels?
 5. What is soil pollution? What are the causes of soil pollution and what measures need to be taken to reduce soil pollution?

Unit 6

Global Environmental Issues and Policies

Important definitions, notes and questions

Sustainable development: This is a mode of development that meets the needs of present generation without compromising the ability of future generations to meet their own needs. The term was first used in the report produced from the Brundtland commission which was titled 'Our Common Future'. *(Read in detail from book or internet)*

Global Warming: Gradual increase in the overall temperature of the earth's atmosphere due to increase in concentration of green house gases. According to studies, the average global temperature on earth has increased by about 0.8 °Celsius. Global warming harms the environment in a number of ways. *(Read in detail from book or internet)*

Acid Rain: It is a broad term that includes any form of precipitation (rain, snow, fog etc) with acidic components (such as nitric acid, sulphuric acid) that fall to the ground from atmosphere in wet or dry forms. *(Read in detail from book or internet)*

Ozone Depletion: It is the reduction in the amount of ozone in the stratosphere, especially over the south-pole region, caused by ozone depleting substances like chlorofluorocarbons. *(Read in detail from book or internet)*

Earth Summit: A popular name for the United Nations Conference on Environment and Development held at Rio de Janeiro, Brazil from 3-14 June, 1992. *(Read in detail from book or internet)*

Montreal Protocol: An international treaty designed to **protect the ozone layer** by banning and phasing out production of those substances that are responsible for the ozone layer depletion. It was adopted at a meeting held in Montreal, Canada, in 1987 and it came into effect in 1989. It is the most successful international treaty on a global environmental issue. *(Read in detail from book or internet)*

Kyoto Protocol: An international treaty designed to **reduce green house gas emissions or carbon emissions** so as to reduce the rate of global warming. This protocol was adopted in Kyoto, Japan in 1997 and entered into force in 2005. *(Read in detail from book or internet)*

Convention of Biological Diversity (CBD): Also known as the Biodiversity convention. It is an international treaty designed to develop national strategies for the conservation and sustainable use of biological diversity. There are three major goals of CBD:

- a. Conservation of biological diversity
- b. Sustainable use of its components
- c. Fair and equitable sharing of benefits arising from genetic resources.

(Read in detail from book or internet)

Human- Wildlife Conflict: It refers to the interaction between wild animals and people and the resultant negative impact on people and their resources or wild animals and their habitat. *(Read in detail from book or internet)*

Questions

10. What is sustainable development? What are the three pillars on which Sustainable development is based? What are the indicators of sustainable development? How can resources be utilized in a sustainable way at an individual level as well as by a country or the world as a whole?

11. Write short note on the following
 - a. Climate Change
 - b. Global warming
 - c. Acid rain
 - d. Ozone depletion
 - e. Montreal Protocol
 - f. Kyoto Protocol
 - g. Convention on Biological Diversity (CBD)
 - h. UNFCCC
 - i. Earth Summit 1992

12. Discuss in brief about the following Acts
 - a. Environment Protection Act
 - b. Wildlife Protection Act
 - c. Forest Conservation Act

13. How are tribal populations important for protection of biodiversity?

14. What is human wildlife conflict? What are the reasons that increase the conflict between wild animals and humans? How can this issue be overcome?

Unit 7

Human communities and the Environment

Important topics to do (Read from Book)

1. Effect of growing human population on environment with respect to pollution, land degradation, resource depletion, climate change etc
2. Importance of mass movements with case study: Bishnoi movement, Chipko Andolan, Narmada Bachao Andolan, Silent Valley movement
3. Importance and strategies to increase public awareness about environment among masses
4. Case studies: Swacchh Bharat Abhiyan, CNG vehicle implementation
5. Environmental Justice and National green Tribunal