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# UNIT-1

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## Contents

### The Multidisciplinary nature of environmental studies Natural Resource

- Renewable and non-renewable resources:• Natural resources and associated problems

- Forest resources

- b) Water resources

- c) Mineral resources

- d) Food resources

- e) Energy resources

- f) Land resources

Role of an individual in conservation of natural resources.

## MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition the word environment is derived from the French word “environ” meaning surroundings. Hence, everything surrounding us is called environment. Every organism is surrounded by materials and forces that constitute its environment. It is the environment from where every organism must derive its requirement. The environment creates favorable conditions for the existence and development of living organisms. The survival of any organism requires a steady supply of materials and removal of waste products. The natural environment encompasses all living and non-living things. This environment encompasses the interaction of all living species, climate, weather, and natural resources that affect human survival and economic activity.

Environmental studies are multi-disciplinary because it comprises various branches of studies like chemistry, physics, medical science, life science, agriculture and public health. It is the science of physical phenomena in the environment. Environmental studies deals with every issue that affects an organism. It is an applied science as it's seeks practical answers to making human civilization sustainable on the earth's finite resources. The environment is constituted by the interacting systems of physical, biological and cultural elements inter-related in various ways, individually as well as collectively. These elements are

(1) Physical Elements Space, landforms, water bodies, climate, soils, rocks and minerals. They determine the variable character of the human habitat, its opportunities as well as limitations

(2) Biological Elements Plants, animals, microorganisms and human beings constitute the biosphere.

(3) Cultural Elements Economic, social and political elements are essentially manmade features, which constitute the cultural milieu.

## **1.2. Scope and importance Environment Studies**

Enlighten us about the importance of protection and conservation of our environment. At present, a great number of environment issues have grown in size and complexity day by day, threatening the survival of mankind on earth.

1 We live in landscapes that have been heavily modified by human beings, in villages, towns or cities. But even those of us who live in cities get our food supply from surrounding villages and these in turn are dependent on natural landscapes such as forests, grasslands, rivers, seashores, for resources such as water for agriculture, fuel wood, fodder, and fish. Thus, our daily lives are linked with our surroundings and inevitably affects them. We use water to drink and for other day-to-day activities. We breathe air, we use resources from which food is made and we depend on the community of living plants and animals which form a web of life, of which we are also a part.

Everything around us forms our environment and our lives depend on sustaining its vital systems. The industrial development and intensive agriculture that provides the goods for our increasingly consumer oriented society uses up large amounts of natural resources such as water, minerals, petroleum products, wood, etc. Non renewable resources, such as minerals and oil are those which will be exhausted in the future if we continue to extract these without a thought for subsequent generations. Renewable resources, such as timber and water, are those which can be used but can be regenerated by natural processes such as re growth or rainfall. However, these too will be depleted if we continue to use them faster than nature can replace them. Deforestation leads to floods in the monsoon and Dry

Rivers once the rains are over What we should implement is Sustainable Development. It is the organizing principle for meeting human needs while at the same time sustaining the ability of natural systems to provide the resources and ecosystem services upon which the economy and society depends. The desirable end result is a society where living conditions and resource use continue to meet human needs without undermining the stability of the natural systems.

**The scope of environmental studies includes:**

1. Developing an awareness and sensitivity to the environment and its related problems.
2. Motivating people for active participation in environmental protection.
3. Developing skills to find solutions to environmental problems.
4. Imbibe and inculcate in others the necessity for conservation of natural resources.

1.3 Needs for awareness Increasing population, urbanization and poverty have exerted pressure on the natural resources and led to degradation of the environment. To prevent the environment from further degradation, the Supreme Court has ordered and initiated environmental protection awareness through government and non-government agencies. Environmental pollution cannot be prevented by laws alone. Public participation is equally important with regards to environmental protection. Environmental Education (EE) is a process of learning by giving a 2 overall perspective of knowledge and awareness of the environment. It sensitizes the society about environmental issues and challenges interested individuals to develop skills and expertise, thereby providing appropriate solutions. Climate change, loss of biodiversity, declining fisheries, ozone layer depletion,

illegal trade of endangered species, destruction of habitats, land degradation, depleting ground water supplies, introduction of alien species, environmental pollution, solid waste disposal, storm water and sewage disposal pose a serious threat to ecosystems in forest, rural, urban and marine ecosystems. Both formal and informal education on the environment will give the interested individual the knowledge, values, skills and tools needed to face the environmental challenges on a local and global level.

Natural Resources: Renewable and Nonrenewable Resources • Land resources and land use change; Land degradation, soil erosion and desertification. • Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.

- Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).

- Energy resources: Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

## **NATURAL RESOURCES**

- Resources does not refer to a thing or a substance but to a function which a thing or substance may perform or to an operation in which it may take part namely the function or operation of attaining a given end such as satisfying a want. • Resource, therefore, means to attain given ends. The aspect of satisfaction is so important that we consider a thing or substance resource so long it meets our needs.

- Life on this planet depends upon a large number of things and services provided by the nature, which are known as Natural Resources. Thus water, air, soil, minerals, coal, forests, crops and wild life are all examples of natural resources.

- Any material which is required or used to sustain life or livelihood is termed as are source.

- In other words, resources are all these requirements of organisms, population and communities which tend to help in accumulation of energy by their increased availability.

- Some examples of resources are air for breathing, water for drinking, land for living and growing food, forests for timber and paper, ores for aluminum, copper, iron and other metals and coal, oil and natural gas for producing energy. Natural Resources

- A natural resource is defined as a form of energy and/or matter which is essential for the functioning of organisms, populations and ecosystems.

- In the case of humans, a natural resource, in his words, refers to any form of energy or matter essential for the fulfillment of physiological, socio-economic and cultural needs, both at the individual level and that of the community. Life on our planet earth depends upon a large number of things and services provided by the

nature, which are known as natural resources. Water, air, soil, minerals, coal, forests, crops and wild life are all the examples of natural resources.

- According to Remade (1984), a natural resource is defined as a form of energy and/or matter, which is essential for the functioning of organisms, populations and ecosystems. Classification of natural resources

- According to Odum (1971), natural resources can be divided into two categories such as

- Renewable

- Non renewable resources

Renewable resources

- The resources that can be replenished through rapid natural cycles are known as renewable resource. • These resources are able to increase their abundance through reproduction and utilization of simple substances. Examples of renewable resources are plants, (crops and forests), and animals who are being replaced from time to time because they have the power of reproducing and maintain life cycles.

- Some examples of renewable resources though they do not have life cycle but can be recycled are wood and wood-products, pulp products, natural rubber, fibers (e.g. cotton, jute, animal wool, silk and synthetic fibers) and leather.

- In addition to these resources, water and soil are also classified as renewable resources.

- Solar energy although having a finite life, as a special case, is considered as a renewable resource in as much as solar stocks is inexhaustible on the human scale.

Non-Renewable Resources



- The resources that cannot be replenished through natural processes are known as non-renewable resources.
- These are available in limited amounts, which cannot be increased. These resources include fossil fuels (petrol, coal etc.), metals (iron, copper, gold, silver, lead, zinc etc.), minerals and salts (carbonates, phosphates, nitrates etc.).
- Once a non-renewable resource is consumed, it is gone forever. Then we have to find a substitute for it or do without it. Non-renewable resources can further be divided into two categories
- Re-cycle able – These are non-renewable resources, which can be collected after they are used and can be recycled. These are mainly the non-energy mineral resources, which occur in the earth's crust (e.g. ores of aluminum, copper, mercury etc.) and deposits of fertilizer nutrients (e.g. phosphate rock and potassium and minerals used in their natural state (asbestos, clay, mica etc.)
- Non-re cycle able – These are non-renewable resources, which cannot be recycled in any way. Examples of these are fossil fuels and uranium, which provide 90 per cent of our energy requirements some authors prefer to classify resources into biotic and abiotic resources
- Biotic resources – These are living resources (e.g. forest, agriculture, fish and wild life) that are able to reproduce or replace them and to increase
- Abiotic resources – These are non-living resources (e.g. petrol, land, minerals etc.) that are not able to replace themselves or do so at such a slow rate that they are not useful to consider them in terms of the human life times. Natural resources can be classified as

- Inexhaustible – The resources which are not changed or exhausted by man's activities and are abundantly available for ever are said to be inexhaustible. Examples are solar energy, atomic energy, wind power, power from tides etc. Most of the renewable resources are classified as inexhaustible. But if not maintained properly, they become extinct. For example, ground water is renewable only if water continues to percolate in the soil at a rate at which it is removed

- Exhaustible resources – These resources are limited in nature and they are non-maintainable e.g. coal, petrol and some minerals etc. Hence, they come under non-renewable category. – Even our renewable resources can become non-renewable if we exploit them to such extent that their rate of consumption exceeds their rate of regeneration. For example if a species is exploited so much that its population size declines below the threshold level then it is not able to sustain itself and gradually the species becomes endangered or extinct. – It is very important to protect and conserve our natural resources and use them in a judicious manner so that we don't exhaust them. It does not mean that we should stop using most of the natural resources. Rather, we should use the resources in such a way that we always save enough of them for our future generations Following are some examples of the major natural resources:

- Forest resources
- Water resources
- Mineral resources
- Food resources
- Energy resources
- Land resources.

## **FOREST RESOURCES**

- It is a dense growth of trees, together with other plants, covering a large area of land.
- Forests are one of the most natural resources on this earth. Covering the earth like a green blanket these forests not only produce innumerable material goods, but also provide several environmental services which are essential for life.
- About 1/3rd of the world's land area is forested which includes closed as well as open forests. • Former USSR accounts for about a 5th of the world's forests, Brazil for about a 7th and Canada and USA each for 6-7%.
- But it is a matter of concern that almost everywhere the cover of the natural forests has declined over the years.
- The greatest loss occurred in tropical Asia where one third of the forests resources have been destroyed

### **USES OF FORESTS: Commercial Uses**

- Forests provide us a large number of commercial goods which include timber, firewood, pulpwood, food items, gum, resins, non-edible oils, rubber, fibers, lac, bamboo canes, fodder, medicine, drugs and many more items, the total of which is estimated to be more than \$ 300 billion per year.
- Half of the timber cut each year is used as fuel for heating and cooking.
- One third of the wood harvest is used for building materials as lumber, plywood and hardwood, particle board and chipboard.
- One sixth of the wood harvest is converted into pulp and used for paper industry.

- Many forest lands are used for mining, agriculture, grazing, and recreation and for development of dams. Ecological uses

- While a typical tree produces commercial goods worth about \$590 it provides environmental services worth nearly \$ 196 to \$ 250. The ecological services provided by our forests may be summed up as follows: – Production of oxygen : The trees produce oxygen by photosynthesis which is so vital for life on this earth. They are rightly called as earth's lungs.

- **Reducing global warming:** The main greenhouse gas carbon dioxide (CO<sub>2</sub>) is absorbed by the forests as a raw material for photosynthesis. Thus forest canopy acts as a sink for CO<sub>2</sub> thereby reducing the problem of global warming caused by greenhouse gas i.e. CO<sub>2</sub>

- . – **Wild life habitat:** Forests are the homes of millions of wild animals and plants. About 7 million species are found in the tropical forests alone

- . – **Regulation of hydrological cycle:** Forested watersheds act like giant sponges, absorbing the rainfall, slowing down the runoff and slowly releasing the water for recharge of springs. About 50-80% of the moisture in the air above tropical forests comes from their transpiration which helps in bringing rains.

- **Soil Conservation:** Forests bind the soil particles tightly in their roots and prevent soil erosion. They also act as windbreaks.

- **Pollution moderators:** Forests can absorb many toxic gases and can help in keeping the air pure and clean. They have also been reported to absorb noise and thus help in preventing air and noise pollution.

## **OVER EXPLOITATION OF FORESTS:**

- Since time immemorial, humans have depended heavily on forests for food, medicine, shelter, wood and fuel.
- With growing civilization the demands for raw material like timber, pulp, minerals, fuel wood etc. shot up resulting in large scale logging, mining, road-building and clearing of forests. • Our forests contribute substantially to the national economy. The international timber trade alone is worth over US \$ 40 billion per year.
- Excessive use of fuel wood and charcoal, expansion of urban, agricultural and industrial areas and overgrazing have together led to over exploitation of our forests leading to their rapid degradation.

## **DEFORESTATION**

- The total forest area of the world in 1990 was estimated to be 7000 million hectares which was reduced to 2890 million hectares in 1975 and fell down to just 2300 million hectares by 2000.
- Deforestation rate is relatively less in temperate countries, but it is very alarming in tropical countries where it is as high as 40-50 percent and at the present rate it is estimated that in the next 60 years we would lose more than 90 percent of our tropical forests.
- The forested area in India seems to have stabilized since 1982 with about 0.04% decline annually between 1982-90. FAO (1983) estimated that about 1.44 million hectares of land were brought under afforestation during this period leading to stabilization.

- As per FAO estimates, the deforestation rate per unit population in India is the lowest among the major tropical countries, despite the fact that we have a huge population size and very low per capita forest area (0.075 ha per capita). However, we are still far behind the target of achieving 33% forest areas, as per our National Forest Policy, as we are still having only 19.27% of our land area (63.38m ha) covered by forests based on satellite data (MoFF, 1998). Major causes of Deforestation:

- Shifting cultivation – There are an estimated 300 million people living as shifting cultivators who practice slash and burn agriculture and are supported so clear more than 5 lakh ha of forests for shifting cultivation annually. In India, we have this practice of North-East and to some extent in Andhra Pradesh, Bihar and M.P. which contribute to nearly half of the forest clearing annually

- Fuel requirements – Increasing demands for fuel wood by the growing population in India alone has shot up to 300-500 million tons in 2001 as compared to just 65 million tons during independence, thereby increasing the pressure on forests

- Raw materials for industrial use – Wood for making boxes, furniture, railway-sleepers, plywood, match boxes, pulp for paper industry etc. have exerted tremendous pressure on forests. Plywood is in great demand for packing tea for Tea industry of Assam while fir tree wood is exploited greatly for packing apples in J&K

- Development projects – Massive destruction of forests occur for various development projects like hydroelectric projects, big dams, road construction, mining etc

- Growing food needs – In developing countries this is the main reason for deforestation. To meet the demands of rapidly growing population, agricultural

lands and settlements are created permanently by clearing forests • Overgrazing – The poor in the tropics mainly rely on wood as a source of fuel leading to loss of tree cover and the cleared lands are turned into the grazing lands. Overgrazing by the cattle leads to further degradation of these lands

### **Major consequences of deforestation**

- It threatens the existence of many wild life species due to destruction of their natural habitat.
- Biodiversity is lost and along with that genetic diversity is eroded. • Hydrological cycle gets affected, thereby influencing rainfall.
- Problems of soil erosion and loss of soil fertility increase.
- In hilly areas it often leads to landslides Major activities in Forests:
  - Timber Extraction: – Logging for valuable timber, such as teak and Mahogany not only involves a few large trees per hectare but about a dozen more trees since they are strongly interlocked with each other a by vines etc. Also road construction for making approach to the trees causes further damage to the forests
  - **Mining:**
    - Mining operations for extracting minerals and fossil fuels like coal often involves vast forest areas.
    - Mining from shallow deposits is done by surface mining while that from deep deposits is done by sub- surface mining
    - More than 80000 ha of land of the country are presently under the stress of mining activities.

- Mining and its associated activities require removal of vegetation along with underlying soil mantle and overlying rock masses.
- This results in defacing the topography and destruction of the landscape in the area.
- Large scale deforestation has been reported in Mussorie and Dehradun valley due to indiscriminating mining of various minerals over a length of about 40 Km.
- The forested area has declined at an average rate of 33% and the increase in non-forest area due to mining activities has resulted in relatively unstable zones leading to landslides...

## **WATER RESOURCES**

- Water is an indispensable natural resource on this earth on which all life depends. About 97% of the earth's surface is covered by water and most of the animals and plants have 60- 65% water in their body. Water is characterized by certain unique features which make it a marvelous resource:
  - It exists as a liquid over a wide range of temperature i.e. from 0 to 100 C.
  - It has the highest specific heat, due to which it warms up and cools down very slowly without causing shocks of temperature jerks to the aquatic life.
  - It has high latent heat of vaporization. Hence, it takes huge amount energy for getting vaporized. That's why it produces a cooling effect as it evaporates.
  - It is in an excellent solvent for several nutrients. Thus, it can serve as a very good carrier of nutrients, including oxygen, which is essential for life. But it can also easily dissolve various pollutants and become a carrier of pathogenic microorganisms



. – Due to high surface tension and cohesion it can only easily rise through great heights through the trunk even in the tallest of the trees like Sequoia.

– It has anomalous expansion behaviour i.e. as it freezes; it expands instead of contracting and thus becomes lighter. It is because of this property that even in extreme cold, the lakes freeze only on the surface. Being lighter the ice keeps floating, whereas the bottom waters remain at a higher temperature and therefore, can sustain aquatic organisms even in extreme cold. The water we use keeps on cycling endlessly through the environment, which we call as Hydrological Cycle

. • We have enormous resources of water on earth amounting to 1404 million km<sup>3</sup>.  
• The water from various moist surfaces evaporates and falls again on the earth in the form of rain or snow and passes through living organisms and ultimately returns to oceans.

• Every year about 1.4inch thick layer of water evaporates from the oceans more than 90% of which returns to the oceans through the hydrological cycle.

• Solar energy drives the water cycle by evaporating it from various bodies, which subsequently return through rainfall or snow.

• Plants to play a very vital role by absorbing the groundwater from the soil and releasing it into the atmosphere by process of transpiration.

• Global distribution of water resources is quite uneven depending upon several geographic factors.

• Tropical rain forest areas receive maximum rainfall while the major world deserts occur in zones of dry, descending air (20-40 N and S) and receive very little rainfall.

## **WATER USE AND OVER-EXPLOITATION:**

• Due to its unique properties water is of multiple uses for all living organisms. – Water is absolutely essential for life. – Most of the life processes take place in water in water contained in the body. Uptake of nutrients, their distribution in the body, regulation of temperature, and removal of wastes are all mediated through water

. • Water use by humans is of two types – Water withdrawal: taking water from groundwater or surface water resource and – Water consumption: the water which is taken up but not returned for reuse. Water: A precious Natural Resource:

• Although water is very abundant on this earth, yet it is very precious.

• Out of the total water reserves of the world, about 97% is salty water (marine) and only 3% is fresh water

. • Even this small fraction of fresh water is not available to us most of it is locked up in polar ice caps and just 0.003% is readily available to us in the form of groundwater and surface water.

• Overuse of groundwater for drinking, irrigation and domestic purposes has resulted in rapid depletion of groundwater in various regions leading to lowering of water table and drying of wells.

• Pollution of many of the groundwater aquifers has made of these wells unfit for consumption.

• Rivers and streams have long been used for discharging the wastes. Most of the civilizations have grown and flourished on the banks of rivers, but unfortunately, growth in turn has been responsible for pollution of the rivers. Groundwater:

- About 9.86% of the total fresh water resources are in the form of groundwater and it is about 35-50 times that of surface water supplies.
- Effects of groundwater usage: – Subsidence – Lowering of water table – Water logging
- Surface water:
  - The water coming through precipitation (rainfall, snow) when does not percolate down into the ground or does not return to the atmosphere as evaporation or transpiration loss, assumes the form of streams, lakes, ponds, wetlands or artificial reservoirs known as surface water.
  - The surface water is largely used for irrigation, industrial use, public water supply, navigation etc.
  - A country's economy is largely dependent upon its rivers.
  - The problems arising out of water resources are floods, droughts.

### **BIG DAMS- BENEFITS AND PROBLEMS**

- Benefits – River valley projects with big dams have usually been considered a key role in the development process due to their multiple uses. – India has the distinction of having the largest number of river valley projects. – These dams are often regarded as a symbol of national development. – There are hopes all over from every corner of the region where such dam is planned to be constructed. – Such projects result providing much employment of opportunities, raise in the standard of living and improvement in quality of life. – Such projects have tremendous potential for economic upliftment and growth. – It can check floods and famines, generate electricity and reduce water and power shortage, provide irrigation water to lower areas, provide drinking water in remote areas and bring out overall development of the region
- Environmental problems

- The environmental impacts of big dams are also too many due to which very often big dams become an issue of controversy. The impacts can be at the upstream as well as downstream levels.

## **MINERAL RESOURCES**

- Minerals are naturally occurring, inorganic, crystalline solids having definite chemical composition and characteristic physical properties.

- There are thousands of minerals occurring in different parts of the world. However, most of the rocks, we see everyday are just composed of few common minerals like quartz, feldspar, biotite etc.

- These minerals in turn are composed of some elements like silicon, oxygen, iron etc.

- Minerals are generally used for development of industrial plants, generation of energy, construction, equipments and armament for defense, transportation means, medical system, communication, jewellery- gold, silver etc.

- Environmental impacts of mineral extraction and use are deforestation and defacing of landscape, subsidence of land, groundwater contamination, surface water pollution, air pollution, and occupational health hazards etc. Remedial measures include adoption of eco-friendly technology, microbial leaching technique, and restoration of mined areas by re-vegetating them with appropriate plant species, stabilization of the mined lands, gradual restoration of flora etc.

## **FOOD RESOURCES**

- There are thousands of edible plants and animals over the world out of which only about three dozen types constitute major food of humans.
- The main food resources include wheat, rice, maize, potato, barley, oats etc. about twenty or so common fruits and vegetables, milk, meat, fish and seafood.

World food problems:

- Every year food problem is killing as many people as were killed by the atomic bomb dropped on Hiroshima during World War II.
- This shows that there is drastic need to increase food production, equitably distribute it and also to control population growth.
- Although India is the third largest producer of staple crops, an estimated 300 million Indians are still undernourished. India has only half as much land as USA, but it has nearly three times population to feed.
- Our food problems are directly related to population. Because of overgrazing the agricultural land gets affected as follows, it results into: – Land degradation – Soil erosion – Loss of useful species
- Agriculture also makes impact on the usage of land generally as follows: – Deforestation – Soil Erosion – Depletion of nutrients
- Impact of modern agriculture is as follows: There is – Impact related to high yielding varieties (HYV) – Fertilizers related problems include micronutrient imbalance, nitrite pollution, and eutrophication
- Pesticide related problems include creating resistance in pests and producing new pests, death of non-target organisms, biological magnification.

- Some other problems include water logging, salinity problems and such others.

## **ENERGY RESOURCES**

- Energy consumption of a nation is usually considered as an index of its development. This is because almost all the development activities are directly or indirectly dependent upon energy.

- There are wide disparities in per capita energy use between developed and the developing nations.

- The very original form of energy technology probably was the fire, which produced heat and the early man used it for cooking and heating purposes.

- Wind and hydropower has also been used. Invention of steam engines replaced the burning of wood by coal and coal was further replaced by oil.

- The oil producing has started twisting arms of the developed as well as developing countries by dictating the prices of oil and other petroleum products.

- Energy resources are primarily divided into two categories viz. renewable and non-renewable sources. • Renewable energy resources must be preferred over the non-renewable resources. This will seek to end the energy crisis which the world is facing today. It is inevitable truth that now there is an urgent need of thinking in terms of alternative sources of energy, which are also termed as non-conventional energy sources which include:

1. – solar energy- made up equipments such has solar heat collectors, solar cells, solar cooker, solar water heater, solar furnace, solar power plants are must.
2. – Wind energy

3. – Hydropower, Tidal energy, ocean thermal energy, geothermal energy, biomass, biogas, befouls etc.
4. The non renewable energy sources include coal, petroleum, natural gas, nuclear energy.

## **LAND RESOURCES**

: Land as a resource:

- Land is a finite and valuable resource upon which we depend for our food, fiber and fuel wood, the basic amenities of life. Soil is also a valuable resource. Land Degradation:

- Because of increasing of population growth the demands for arable land for producing food and fuel wood is also increasing. Hence there is more and more pressure on the limited land resources which are getting degraded due to over-exploitation. Soil erosion, water logging, salinization and contamination of the soil with industrial wastes like fly-ash, press mud or heavy metals all cause degradation of land.

- Soil Erosion: – Soil erosion means wearing a way of soil. It defined as the movement of soil components, especially surface- litter and top soil from one place to another. It results in the loss of fertility. It basically of two types viz, normal erosion go geologic erosion and accelerated erosion. The agents that cause such erosion are- climatic agents and water induced erosion, biotic agents. Wind is also responsible for the land erosion through saltation, suspension and surface creep.

- In order to prevent soil erosion and conserve the soil the following conservation practices are employed: – Conservational till farming.

- Contour farming

- Terracing

- Strip cropping
- Strip cropping
- Alley cropping
- Wind breaks or shelterbelts
- Water logging
- Landslides: – Various anthropogenic activities like hydroelectric projects, large dams, reservoirs, construction of roads and railway lines, construction of buildings, mining etc. are responsible for clearing of large forested areas.
- Desertification: – Desertification is a process whereby the productive potential of arid or semiarid lands falls by ten percent or more. Desertification is characterized by de vegetation and loss of vegetal over, depletion of groundwater, salinization and severe soil erosion.

### **Role of an individual in conservation of natural resources**

Individuals play a crucial role in the conservation of natural resources through various actions and behaviors. Here are some key ways individuals can contribute:

1. **\*Reduce, Reuse, and Recycle\***: Minimizing waste by reducing consumption, reusing items, and recycling materials helps conserve resources and reduce pollution.
2. **\*Energy Conservation\***: Using energy-efficient appliances, turning off lights when not in use, and using renewable energy sources like solar panels can reduce the consumption of fossil fuels.



3. **\*Water Conservation\***: Fixing leaks, using water-efficient fixtures, and reducing water waste in daily activities help preserve this vital resource.
  
4. **\*Sustainable Living\***: Adopting a lifestyle that minimizes environmental impact, such as using public transportation, biking, or walking instead of driving, and supporting eco-friendly products and businesses.
  
5. **\*Support and Advocacy\***: Supporting policies and organizations that work towards environmental conservation and advocating for stronger environmental protections.
  
6. **\*Education and Awareness\***: Educating oneself and others about the importance of natural resource conservation and encouraging community involvement.
  
7. **\*Conservation Practices\***: Participating in local conservation efforts, such as tree planting, community clean-ups, and protecting local wildlife habitats.
  
8. **\*Responsible Consumption\***: Making informed choices about the products one buys, focusing on sustainably sourced, biodegradable, or recyclable items.



# Unit -2

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# **Ecosystems**

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; • Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

# ECOSYSTEM

## Ecosystem Definition

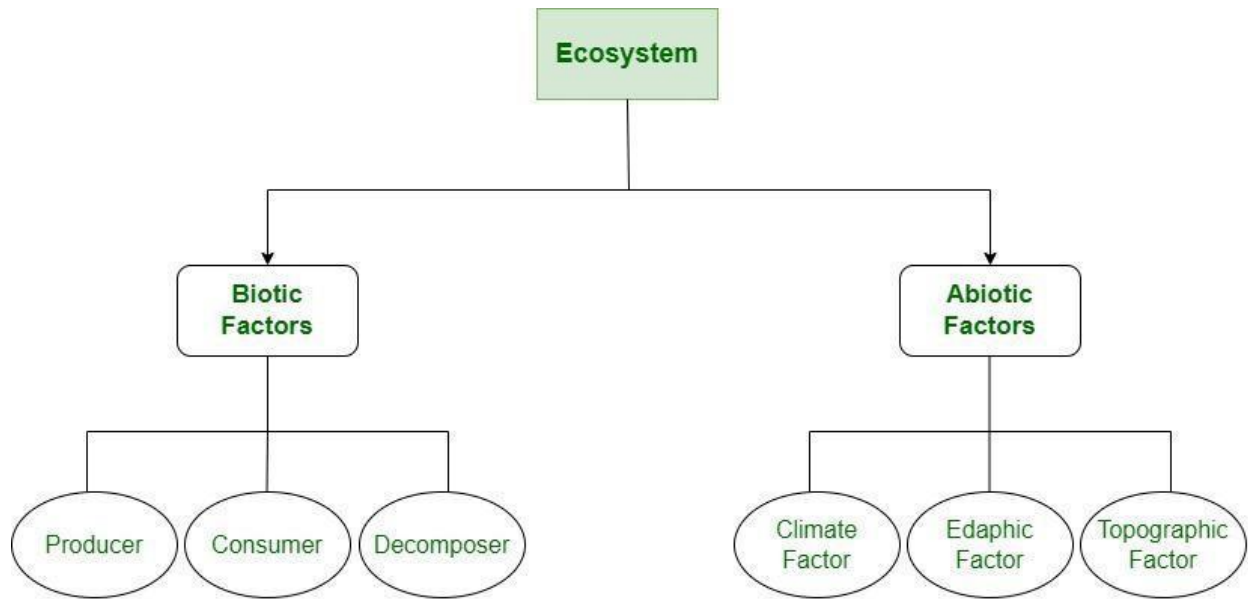
An ecosystem can be defined as a unit of ecological studies that includes all the interactions between living organisms with their surrounding non-living environment.

In the word “ecosystem”, “eco” means environment, and “system,” refers to connected and non-living components of the planet interact with each other. Ecosystem varies in the size and number of organisms they consist of. When the ecosystem is land-based it is called a terrestrial ecosystem and when it is water-based it is called an aquatic ecosystem. Processes or elements. **Ecosystems are made up of both biotic (and alive) and abiotic (or nonliving) components.** It is a biological community where living

## Structure of Ecosystem

The structure of an ecosystem is made of two main components: biotic and abiotic components. The biotic component interacts with the abiotic components to maintain the flow of energy. The energy is distributed in the environment. The ecosystem includes 2 main components for a working ecosystem:

- Biotic Component
- Abiotic Component



## Biotic Components

Plants, animals, microorganisms, aquatic plants, and all other living creatures are the biotic components of the ecosystem. These biotic components can be classified into:

- **Producers:** All autotrophs like plants, phytoplankton, etc. that can produce their food using sources like sun, water, carbon dioxide, or any other chemical elements belong to this category.
- **Consumers:** All heterotrophs, primarily animals that are dependent on the producers or other organisms are called consumers. These consumers are subdivided into the following groups:
  - **Primary consumers:** All [herbivores](#) that directly depend on plants, such as cows, goats, rabbits, and sheep, are considered primary consumers.

- **Secondary consumers:** All that depend on primary consumers for food are considered secondary consumers. The secondary consumer can be [omnivores](#) or [carnivores](#).
- **Tertiary consumers:** All animals that depend on secondary-level organisms for their food are known as tertiary consumers.
- **Quaternary consumer:** Those animals that depend on the tertiary level organism for their food and are known as the quaternary consumer. This level is present in some food chains only.
- **Decomposers:** All microorganisms, such as bacteria and [fungi](#), that depend on decaying and dead matter for food fall under this category. It contributes to environmental cleanup and ecosystem nutrient recycling. These nutrients support plant development and subsequently ecosystem maintenance.

## **Abiotic Components**

It involves all the non-living things present in the environment. Some of the [abiotic components](#) are sun, soil, water, minerals, climate, rocks, temperature, and humidity. These components' functioning together enables the ecosystem's energy and nutrition cycles. The sun's rays are the primary energy source. An ecosystem's temperature changes have an impact on the types of plants that may flourish there. The availability of nutrients and soil nature determines the type and abundance of vegetation in an area. All the abiotic factors are essential factors that determine the number and type of organisms present in a region.

## **Functions of Ecosystem**

Following are some of the [functions of the ecosystem](#);

1. It regulates different life processes.

2. The various components of an ecosystem are designed in a manner to support the life systems.
3. It regulates various types of nutrient cycles.
4. It maintains the balance of energy flow between various levels of the ecosystem.
5. It regulates the cycling of nutrients between abiotic and biotic factors.

### **Types of Ecosystem**

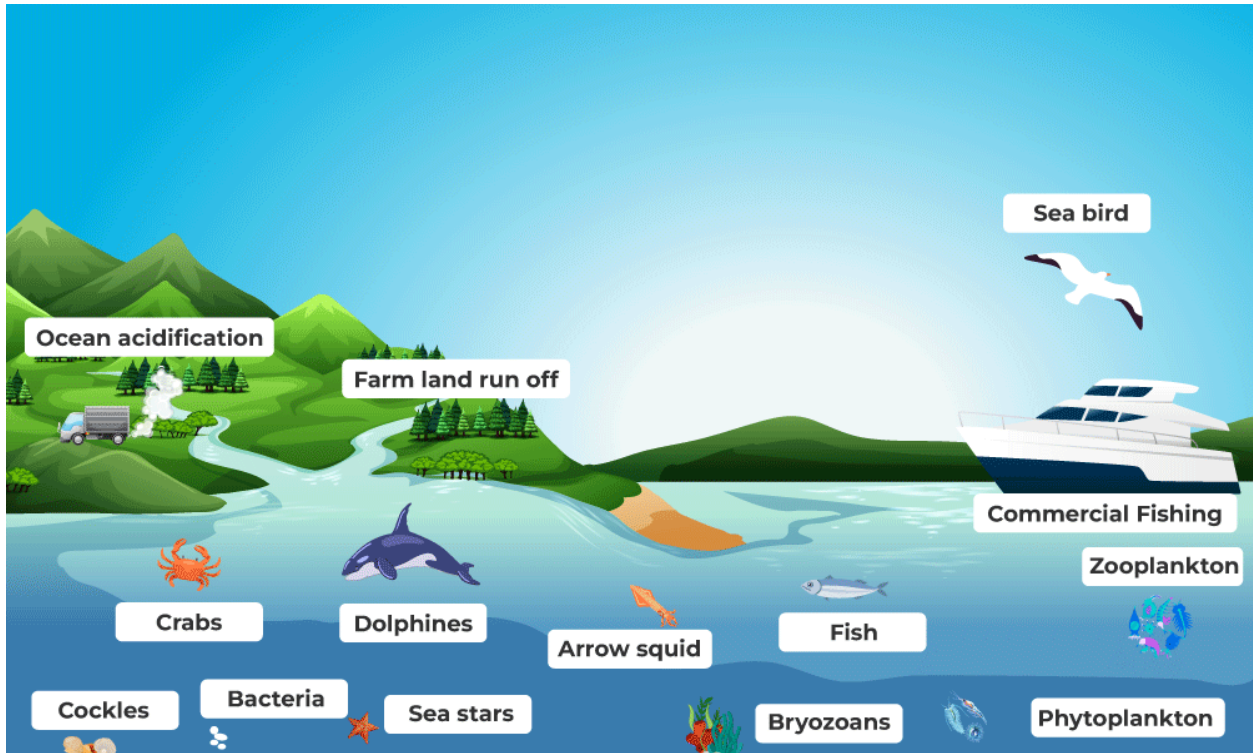
An ecosystem can be small or large. There are 2 [types of ecosystem](#):

- Aquatic Ecosystem
- Terrestrial Ecosystem

### **Aquatic Ecosystem**

Oceans, rivers, seas, lakes, springs, and other water bodies are aquatic biomes. The bulk of the earth's surface is covered by the water. Two-thirds of the earth's surface is made up of oceans, seas, the intertidal zone, reefs, the seabed, and rock pools. This ecosystem includes plants, fishes, amphibians, coral reefs, huge sea creatures, and insects.

○



There are 2 types of aquatic ecosystem:

- Freshwater Ecosystem
- Marine Ecosystem

### **Freshwater Ecosystems**

A freshwater ecosystem has low salinity levels, providing a good environment for a variety of plants and animals. The sizes of freshwater resources range from small ponds to very large rivers. Freshwater resources vary from one another in terms of how they travel. While some freshwater bodies are constantly moving, like rivers, others remain still, like ponds.

**Freshwater Ecosystem Types:** Based on the region, the three main categories of the freshwater environment are the lotic, lentic, and wetland freshwater ecosystems.



- **Lotic:** In a lotic freshwater ecosystem, the water bodies travel in one direction. Numerous rivers and streams start at their sources and meet rivers or oceans at their mouths as they travel toward their destinations.
- **Lentic:** All non-flowing (still) waterways, such as ponds, swamps, bogs, lagoons, and lakes are lentic ecosystems. Due to the saturation of the underlying land, water will temporarily remain on the earth's surface. They are closed structures that keep the water still. Because every lentic system has multiple areas with different biological environments, animals, and plants in that system behave and adapt in different ways.
- **Wetlands:** Wetlands contain water and are home to vascular plants. Wetland environments are more often known as marshes, swamps, and bogs. Because soil and water are so close together, wetlands are highly productive. The plant species found in wetlands are referred to as hydrophytes since they have adapted to the area's moist and humid climate. Wetland ecosystems contain hydrophytes plants such as cattails, pond lilies, and sedges. Various amphibians, reptiles, birds, shrimp, shellfish, and other animal species find refuge in wetlands.

**Living creatures that live in Freshwater Ecosystems:** Fishes, amphibians, reptiles, mosquitoes, dragonflies, bees, wasps, water spiders, ducks, geese, etc.

## **Marine Ecosystems**

Aquatic environments with high levels of dissolved salt are marine ecosystems. These comprise the deep ocean, the open ocean, and the coastal marine ecosystems. Each of these has unique biological and physical properties. The ecosystem's exposure to the sun, the amount of oxygen and nutrients that are dissolved in the water, the distance from land, the depth, and the temperature are

all significant abiotic factors. Marine ecosystems have unique biotic and abiotic characteristics.

## **Terrestrial Ecosystem**

A terrestrial ecosystem refers to an ecosystem of diverse land surfaces. Forests, deserts, grasslands, tundra, and coastal regions are all examples of terrestrial ecosystems. These terrestrial ecosystems are climate-dependent.

1. **Forests:** A type of terrestrial ecosystems that is covered in trees, creating several canopy layers. A variety of animal species live in dense tree covers and tropical rainforests. Forests are home to about 300 million different plant and animal species. A forest is a type of ecosystem that includes tropical rainforests, plantation forests, and temperate deciduous forests.
2. **Grasslands:** It has a dry environment that permits relatively little vegetation. Primarily, different species of grasses are what define the grassland ecosystem. In this environment, grass and herbs predominate. The ecosystem of grasslands is significant to the animal kingdom.
3. **Tundra:** Tundra has extreme environmental conditions like that of the polar region. The location is typically windy, blanketed in snow, and devoid of trees. Its environment is constantly covered in absolutely frozen dirt. Small ponds are formed when the snow melts. Some lichens can flourish in such ponds.
4. **Deserts:** Deserts are unproductive land surfaces with extreme temperature swings and inadequately maintained species. One of the driest land regions on the globe. A desert receives an extremely small amount of rainfall. Because of this, there is less vegetation. The desert ecosystem's plants and animals have learned the skill of surviving extreme environments.

## Functional Units of Ecosystem

The ecosystem's function is to maintain its various parts working together. It is a natural process of a transfer of energy in different biotic and abiotic elements of the world. Ecosystems maintain all the important ecological processes, including nutrient cycling. Ecosystems have different functional units those are:

- **Production:** Any ecosystem must have a consistent supply of solar energy to survive and function. Primary production is influenced by the types of plants that live there. Green leaves act as food preparators, while roots draw nutrients from the soil. Herbivores consume the plants, which then provide food for carnivores.
- **Decomposition:** Decomposition is the breakdown of complex organic matter by decomposers into inorganic components such as carbon dioxide, water, and nutrients. The decomposers break down garbage and dead organic material. The primary decomposers in many ecosystems are fungi and bacteria.
- **Energy flow:** Radiant energy from the sun is the primary source of energy in all ecosystems. The ecosystem's autotrophic, or self-sustaining, creatures utilize the energy of the sun. Plants use the sun's energy to change carbon dioxide and water into simple, energizing carbohydrates. The more complex chemical substances, like proteins, lipids, and starches are produced by autotrophs.

Energy goes unidirectionally from the sun to producers, herbivores, and carnivores. Decomposers convert the dead autotrophs and heterotrophs into nutrients, which are energy sources for plants.

- **Nutrient cycling:** Chemical substances known as nutrients are substances that organisms need for growth and the maintenance of life. A vast range of chemical compounds is created when bio-elements interact. The organisms

catch them, concentrate and combine them in different ways in their cells, and release them during metabolism and death.

## **Ecosystem Diversity**

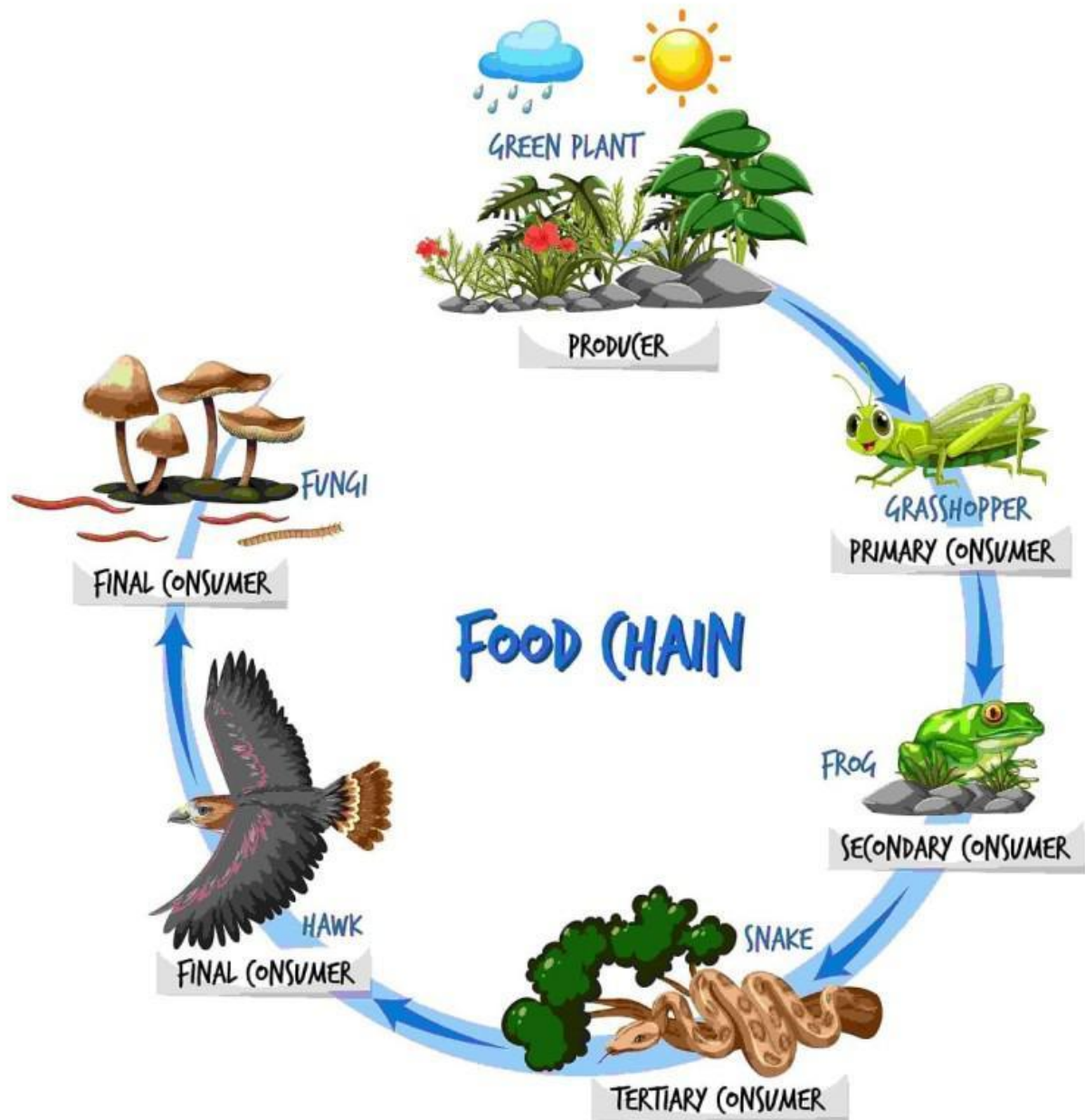
Ecosystem diversity refers to the variety of different habitats and communities found in a particular area, along with the various interactions between them. These ecosystems include forests, grasslands, deserts, rivers, and oceans, each supporting a unique array of plants, animals, and microorganisms. The diverse range of ecosystems contributes to the overall health and stability of the environment, providing essential services like air and water purification, soil fertility, and climate regulation. Ecosystem diversity is crucial for maintaining biodiversity, as it ensures the survival of a wide range of species and helps ecosystems adapt to environmental changes. Protecting and conserving ecosystem diversity is essential for preserving the delicate balance of nature and ensuring the well-being of both wildlife and humans.

## **Concepts of Ecosystem**

These are the important concepts under the ecosystem. Those are:

### **Food Chain and Food Webs**

The cycle of energy starts with solar energy. The chain of energy transfer from one level to the topmost level is known as the [food chain](#). Plants absorb solar energy and synthesize their food. Later on, herbivores feed on the plants for energy. Similarly, carnivores and omnivores feed on them for energy.



The interconnected food chain is known as the [food web](#). In nature mostly food webs are common instead of the food chain.

## Ecological Pyramids

These are the graphical representations of the number, energy, and biomass of the trophic level of an ecosystem. Charles Elton postulated the ecological pyramid in

1927. The base of the [ecological pyramid](#) denotes the producers of that particular ecosystem. Then it is followed by the consumers and the top decomposers.

### **Energy Flow in Ecosystem**

The flow of energy in the ecosystem is always in one direction or unidirectional. Even though producers tend to absorb 100% sun's light energy in their capacity, they only pass on 10% of that energy to the next trophic level and then only 10% of that energy is passed into the next level.

### **Biogeochemical Cycle**

It is also known as the [nutrient cycle](#) and includes all the phenomena that ensure that all the basic elements of nutrients like carbon, nitrogen, and phosphorus that are absorbed by living organisms from the environment are returned to the environment. This process involves the transfer of nutrients between abiotic and biotic factors and vice-versa. It includes the [carbon cycle](#), [nitrogen cycle](#), [water cycle](#), [phosphorus cycle](#), etc.

### **Conclusion – Ecosystem**

Ecosystems are the complex webs of life that includes all living organisms and their physical surroundings, working together in harmony. They provide essential services like clean air, water, and food, supporting life on Earth. Understanding and protecting ecosystems is crucial for maintaining biodiversity and ensuring the well-being of both wildlife and humans. By conserving ecosystems and practicing sustainable living, we can preserve the delicate balance of nature and secure a healthy environment for future generations to thrive in.

# Forest Ecosystem

**Forest Ecosystem definition:** A forest is an area with a high density of trees and undisturbed areas. Receives high annual rain fall. A forest ecosystem is a complex community of living organisms, including trees, plants, animals, fungi, and microorganisms, that interact with each other and their physical environment. Forests cover about 31% of the Earth's land area and play a crucial role in maintaining ecological balance. They provide habitat for a diverse range of species, support nutrient cycling, and regulate climate by absorbing carbon dioxide and releasing oxygen. Forest ecosystems also contribute to soil formation, water purification, and flood control. They are categorized into various types, such as tropical, temperate, and boreal forests, each with distinct characteristics and biodiversity.

## Types of forest ecosystem

Forest ecosystems can be broadly categorized into several types based on their geographical location, climate, and dominant vegetation. The main types are:

1. **\*Tropical Rainforests\*:** Found near the equator, these forests have high temperatures, significant rainfall, and dense vegetation. They are the most biodiverse ecosystems, home to numerous species of plants, animals, and microorganisms.

2. **\*Temperate Forests\***: Located in temperate zones, these forests experience four distinct seasons. They include deciduous forests, where trees shed leaves in autumn, and evergreen forests, where trees retain their foliage year-round.
3. **\*Boreal Forests (Taiga)\***: Found in high northern latitudes, these forests are characterized by cold climates and coniferous trees like pines, spruces, and firs. They have long winters and short, mild summers.
4. **\*Tropical Dry Forests\***: These forests occur in regions with distinct wet and dry seasons. Trees in these forests are often drought-resistant and may shed their leaves during the dry season to conserve water.
5. **\*Montana Forests\***: Located in mountainous regions, these forests vary with altitude. Lower elevations may have tropical or temperate forests, while higher elevations support coniferous forests and alpine vegetation.
6. **\*Mangrove Forests\***: Found in coastal areas, these forests consist of salt-tolerant trees and shrubs. They play a crucial role in protecting coastlines from erosion and providing habitat for marine life.
7. **\*Mediterranean Forests\***: These forests occur in regions with hot, dry summers and mild, wet winters. They are characterized by evergreen trees and shrubs adapted to drought conditions.



## **Grassland Ecosystem**

The Grassland Ecosystem occurs in the temperate and tropical regions of the world with less rainfall. It covers the landmass of the latitude and altitudes with the conditions of the soil and climate not suitable for the growth of trees.

The regions with less rainfall during the monsoon are able to support the growth of grass, but the amount of rainfall is not sufficient for the growth of shrubs or trees. The Grassland Ecosystem supports a large population of insects, reptiles, and rodents. The animals found in the grassland ecosystem are antelopes, zebras, asses, foxes, Badgers, etc.

### **Functions of Grassland Ecosystem**

The Grassland ecosystem is essential because of the following reasons-

- It maintains the flow of energy through the food chain.
- It is responsible for the biogeochemical cycles, i.e., the different Nutrient cycling.
- It contributes to the feedback control mechanisms or Homeostasis.
- It is an important part of ecological succession or ecosystem development.
- Due to low rainfall, the grassland ecosystem helps in reducing the leaching of minerals.
- It regulates the productivity of the ecosystem by increasing soil fertility.

Importance of Grassland Ecosystem Not only does the grassland ecosystem forms an important part of the ecosystem development, but it also has economic importance.

## **The economic importance of the Grassland ecosystem is as follows-**

- Many rural communities depend on the grasslands for grazing, especially the farmers that keep goats or other cattle.
- Common village lands are used for grazing domestic animals
- In summer, there is no leftover grass for grazing. At that time, the collected fodder was used to feed cattle.
- It is home to various insects, and these insects help them to pollinate crops.
- The grass collected from the grasslands makes farm sheds and houses.
- Various grasslands have been degraded because of overgrazing by huge domestic livestock herds.
- It has insect predators, including amphibians such as frogs, birds of prey, reptiles like lizards, and small mammals like shrews.
- The carnivores help in controlling the insect pests in the agricultural lands.

## **Components of Grassland Ecosystem**

The structure or the composition of the Grassland Ecosystem includes biotic and abiotic components.

These components are explained as follows

### **Abiotic Components**

The Abiotic components of the Grassland Ecosystem include aerial and soil nutrients. It also includes the elements required by plants, like Sulphur, phosphorus, nitrogen, oxygen, and hydrogen. These elements are present in soil

and air and are supplied to the plants in the form of sulfates, phosphates, nitrates, water, CO<sub>2</sub>, and as trace elements in the soil.

**Biotic Components** The biotic components of the Grassland Ecosystem include producers, consumers, and decomposers.

- **Producers:** The producers contribute to the primary biomass production. It includes herbs, shrubs, and grasses.
- **Consumers:** The consumers comprise primary, secondary, and tertiary consumers. Herbivores are the primary consumers, e.g., millipedes, termites, insects (Leptocorisa, Coccinella, etc.), and grazing mammals (buffaloes, rabbits, deer, sheep, etc.). The organisms that feed on the primary consumers. This includes birds, lizards, frogs, snakes, jackals, foxes, etc. The tertiary consumers include animals and birds that feed on the secondary consumers, e.g., hawks.
- **Decomposers:** The decomposers consist of fungi, moulds, and bacteria of death and decay. The decomposers are responsible for bringing the minerals back into the soil.

### **Classification and Structure of Grassland Ecosystem**

Formation of the Grassland Ecosystem is dependent on the climate. Based on the climate of the region, the grassland ecosystem of the world is divided into two categories, i.e., one in the tropical region and the other in the temperate region

**Tropical Grasslands** Tropical grasslands are found on both sides of the equator and spread to the tropics.

These grasslands receive low rainfall annually, and the vegetation grows up to 4m in height.

The common fauna of the tropical Grassland includes leopards, deer, giraffes, zebra, and elephants. E.g., Savannah grasslands of Africa. Temperate Grassland the temperate grasslands exist in the middle of the latitudinal zones and much inside the continents. The vegetation of such grasslands is short and nutritious. The fauna of the temperate grasslands includes antelopes, bison, and wild buffaloes.

### **Desert Ecosystem**

Despite several pieces of research about life on other planets, it has come to a conclusion that Earth is the one and only planet where living organisms are found. Survival requires specific forms of atmospheres, land formations, and ecosystems that only Earth comprises. Each continent on this planet includes a desert and comprises its own ecology, better referred to as the desert ecosystem.

The word desert is a largely barren, dry and abandoned land without flora or fauna in the sand. It might be cold and hot. The Desert is the most dried area on the planet that gets negligible precipitation on an annual basis. It receives less rainfall throughout the year.

So, the desert ecosystem is the planet's driest ecosystem, and thus, it has less diversity of life and little vegetation. Being a part of the terrestrial ecosystem, it houses animals and plants that can live in harsh weather conditions. The desert ecosystem is devoid of any precipitation and rainfall.

So, the desert ecosystem is a community of non-living and living organisms living and interacting with each other in an abandoned environment. It's the interaction between Abiotic and Biotic Components of this environment. If you are searching for the desert ecosystem PDF, read on to learn further about its features.

## **Characteristics of Desert Ecosystem**

Here are the characteristics of desert ecosystem:

- **Less Rainfall or Precipitation**

Less precipitation is a significant desert feature and the reason behind its dryness. Deserts receive seasonal rainfall that occurs for a small duration (just around 25 to 30 centimeters).

- **Aridity**

Aridity implies a deficiency of dry moisture. As it experiences less rainfall, it results in aridity

- **Wind Velocity**

Wind velocity is high in this ecosystem. That's why deserts experience dust storms or sandstorms of higher intensity, forming sand dunes.

- **Extreme temperature**

This type of ecosystem experiences extreme hot or cold temperatures during night and day! The days happen to be hot, while nights are extremely cold.

- **Humidity**

Its humidity level is low in the daytime, while it turns out to be high during the nights.

- **Population Density**

Population density happens to be low in the deserts. And there's a dearth of food and water, plus the climatic conditions are harsh which is certainly not preferable for living

- **Scarcity of water**

As it receives negligible rainfall, there's a scarcity of water. This shortage of water makes deserts experience drought for more than six months!

- **Biodiversity**

Surviving in a desert ecosystem is challenging. But in spite of this face, deserts house different animals and plants. They have adapted the survival skills to live in such extreme and harsh conditions of a desert.

- **Soil Quality**

Deserts are rocky, dry, sandy, and thin. Thus, it experiences low growth in vegetation. The soil is grey in color that does not have any organic contents such as phosphorus and nitrogen.

## **Outlining the Desert Ecosystem Types**

Besides dry and hot areas, desert ecosystems also exist in the arid, tropical, and extremely cold areas. Here are the types:

### **1. Hot & Dry**

This ecosystem comprises dry and hot climatic conditions and receives low rainfall annually. Extreme variations in the temperature are there where the soil is harsh

and rough. The best dry & hot desert ecosystem examples are South Asia, Central America, Africa, Australia, North America, etc.

## **2. Semi-Arid**

It's similar to the prior one. This ecosystem has stable ground, hard rocks, and lesser sand dunes. Temperature isn't extreme. The best example of this kind of desert ecosystem is the Great Basin, which gets a good amount of rainfall.

## **3. Coastal**

It's found in the large water bodies' coastal lines such as seas and oceans and affected by ocean currents. Besides receiving winter fog, the climate is hospitable. Namib in Africa and Atacama Desert in Chile have a coastal desert ecosystem.

## **4. Cold desert ecosystem**

It comprises abundant rainfall during winters and less during summers. It has chilling winters and snowfall, shorter summers, and a moderately moist & hot climate. The ecosystem is covered with snow dunes. The best cold desert ecosystem examples are Antarctica, the Nearctic realm, and Greenland.

## **Functions of Desert Ecosystem**

Desert ecosystem happens to be a significant part of our planet. And regardless of how dry or harsh this ecosystem is, it has a function to play. Each function of the

desert ecosystem in the bullet point has a significant part to contribute to the planet.

- It serves as a habitat to multiple species of animals and plants and. These animals and plants have adapted, and they survive in extreme environments.
- It acts as the carbon sink. That means the bacteria in sands help in storing CO<sub>2</sub> or carbon dioxide in order to prevent it from getting into the atmosphere.
- The ecosystem is a huge source of natural gas, oil, and minerals and.
- Desert ecosystem contributes to the production of salt.
- It's a perfect ecosystem for preserving the historical belongings of Mother Nature. So, deserts have huge significance in archaeological discoveries.
- They have unusual landscapes & oases. People get attracted to its scenic beauty due to its natural formation. Thus, deserts have become a tourist's favorite location.
- Desert sands act as the carbon sink. Scientists found that bacteria that are living in Africa's Kalahari Desert helps store the carbon dioxide and CO<sub>2</sub> from the air.



# **Aquatic Ecosystem**

## **Introduction of Aquatic Ecosystem**

An ecosystem is defined as a functional unit wherein all living organisms interact with their surroundings and one another to sustain themselves in the environment. In a broad sense, an ecosystem can be categorized as a land/terrestrial ecosystem or a water/aquatic ecosystem.

Many lives are undoubtedly supported by water. Furthermore, aquatic creatures are those that can thrive in water. They also rely on water for food, shelter, reproduction, and a variety of other life functions. This particular article will offer you a fair idea of the types of aquatic ecosystems and their importance in brief!

## **What is the Aquatic Ecosystem?**

The aquatic ecosystem definition states it is a water-based environment, wherein, living organisms interact with both physical and chemical features of the environment. These living creatures whose food, shelter, reproduction, and other essential activities depend on a water-based environment are known as aquatic organisms.

Water plays a significant role in the management of world-scale ecosystem processes in aquatic systems, connecting the atmosphere, lithosphere, and biosphere by transferring material between them and allowing chemical reactions to occur. Water has unique physicochemical features that reflect the water body's quality. The physicochemical characteristics of an aquatic ecosystem determine how well it functions and how long it can support life forms. In the same way as

sediments in terrestrial ecosystems provide substrate, nutrients, and a home for live aquatic resources, sediments in aquatic ecosystems are equivalent to the soil in terrestrial ecosystems. Sediments are significant catalysts in environmental food cycles and the two water quality dynamics.

The quality of sediment has a direct or indirect impact on the functioning of an aquatic ecosystem. The many physicochemical properties of sediment determine its quality. Similarly, the biotic mix of an aquatic environment determines how well it functions. In the aquatic environment, they serve as a trophic level and a source of energy. Fish have a significant ecological role in the whole food web at the trophic level.

Some of the most common aquatic organisms are – nekton, plankton, and benthos. Additionally, lakes, oceans, ponds, rivers, swamps, coral reefs, wetlands, etc. are a few popular aquatic ecosystem examples.

### **Features of Aquatic Ecosystem**

Salient features of the aquatic ecosystem are highlighted in this figure below –

- Freshwater or saltwater can be used to make them.
- They serve as a home for a variety of aquatic animals.
- The majority of the vegetation is made up of algae and corals.
- They have a lot of biological diversity, which makes them the most productive and wealthiest ecosystems on the planet.

- They help regulate the hydrological cycle and act as a pollution filter, among other things.

## **Types of Aquatic Ecosystem**

In general, there are two types of aquatic ecosystems, namely marine ecosystems and freshwater ecosystems. Both marine and freshwater ecosystems are further divided under different aquatic ecosystems.

Let's Take a Look at the Aquatic Ecosystem and its Types Below.

### **A. Marine Water Ecosystem**

This particular ecosystem is the largest aquatic ecosystem and covers over 70% of the earth's total surface. This ecosystem is relatively more concentrated in terms of salinity. Nonetheless, the body of aquatic organisms is well-adjusted to saline water, and they may find it challenging to survive in freshwater. The following categories comprise the marine ecosystem

- **Ocean Ecosystem**

Pacific Ocean, Atlantic Ocean, Indian Ocean, Arctic Ocean, and the Southern Ocean are the five major oceans on earth. Notably, the Pacific Ocean is the largest and deepest of these five, while the Atlantic is the second largest in terms of size. Also, the Southern Ocean harbors the largest population of Krill among them. Other than that, the oceans serve as home to aquatic organisms like – turtles, crustaceans, plankton, corals, shellfish, blue whale, sharks, tube worms, reptiles, etc.

- **Estuaries**

Typically, it is the meeting point of a sea and rivers, which makes the water slightly more saline when compared to freshwater and more diluted when compared to the marine ecosystem. Biologically, estuaries are considered to be productive as they stimulate primary production and trap plant nutrients. Some examples of estuaries include – tidal marshes, river mouth, and coastal bays.

- **Coral Reefs**

These are fondly referred to as the Rain Forest of Oceans as they harbor a wide diversity of aquatic flora and fauna. A coral reef is an aquatic ecosystem made up of corals that form reefs. Coral polyps are held together by calcium carbonate in the formation of reefs. Stony corals, whose polyps cluster in groups, make up the majority of coral reefs.

The animal phylum Cnidarians includes sea anemones and jellyfish, and coral is part of the class Anthozoa. Corals secrete hard carbonate exoskeletons that support and protect them, unlike sea anemones. Warm, shallow, clear, sunny, agitated water is ideal for most reefs. At the beginning of the Early Ordovician, 485 million years ago, coral reefs displaced the Cambrian's microbial and sponge reefs.

- **Coastal Ecosystem**

Coastal ecosystems are formed when land and water meet. The structure, variety, and energy flow of these ecosystems are all unique. The bottom of the coastal environment is dominated by plants and algae. Insects, snails, fish, crabs, shrimp, lobsters, and other animals make up the fauna. It is one of the major aquatic ecosystems and is quite distinct in terms of structure and diversity. The coastal ecosystem is formed in the union of land and water. Coastal ecosystems harbor a variety of plants and algae and serve as a home to snails, shrimps, crabs, lobsters, and fish.

## **B. Freshwater Ecosystem**

This aquatic ecosystem covers less than 1% of the earth's surface and is broadly divided into – wetlands, lentic and lotic ecosystems.

- **Swamps and Wetlands**

These are marshy areas that are often covered in water and harbor a variety of flora and fauna. Wetlands are known to be a home of water lilies, marshes, swamps, Northern Pikes, dragonflies, Green Heron, etc.

- **Lentic Ecosystems**

It includes standing water bodies like ponds and lakes and is a home to both floating and rooted plants, algae, and [invertebrates](#). All standing water

habitats, such as lakes and ponds, are included in lentic ecosystems. Algae, rooted and floating-leaved plants, and crustaceans like crabs and shrimp live in these habitats. Frogs and salamanders, as well as reptiles like alligators and water snakes, can be found here. Salamanders, frogs, water snakes, and alligators are commonly found in lentic ecosystems.

- **Lotic Ecosystems**

These aquatic ecosystems are characterized by rapid flowing water moving in one direction. They are a hub of a wide variety of insects like beetles, mayflies, and stoneflies, among others. Also, it harbors species like river dolphins, beavers, otters, eel, minnow, and trout.

### **Functions of Aquatic Ecosystem**

These pointers highlight the importance of aquatic ecosystem -

- Facilitates recycling of nutrients
- Helps to purify water
- Recharges groundwater
- Is a habitat for aquatic flora and fauna
- Mitigates flood



# UNIT 3

D.Mohana Rupa

## Contents

ENVIRONMENTAL POLLUTION- AIR POLLUTION,  
WATER POLLUTION, SOIL POLLUTION



# ENVIRONMENTAL POLLUTION

The environment is the surrounding of an organism. The environment in which an organism lives is made up of various components like air, water, land, etc. These components are found in fixed proportions to create a harmonious balance in the environment for the organism to live in. Any kind of undesirable and unwanted change in the proportions of these components can be termed as pollution. This issue is increasing with every passing year. It is an issue that creates economic, physical, and social troubles. The environmental problem that is worsening with each day needs to be addressed so that its harmful effects on humans as well as the planet can be discarded.

## Causes of Environmental Pollution

With the rise of the industries and the migration of people from villages to cities in search of employment, there has been a regular increase in the problem of proper housing and unhygienic living conditions. These reasons have given rise to factors that cause pollution.

Environmental pollution is of five basic types namely,

- \* Air pollution,
- \* Water pollution,
- \* Soil pollution, and
- \* Noise pollution.

## Air Pollution

### Air Pollution Definition

Air pollution means contamination of air, water, or soil by any substance that is harmful to live organisms. It's like an introduction or release of a toxic substance into the environment, that can harm the elements in the environment. The pollution can take place because of natural (such as volcanic eruption), and man-made reasons. But nowadays, it's man-made reasons that are causing more pollution than natural ones. From the increasing number of vehicles to ever-growing industrial wastages in the form of air or water, each contributes to air pollution in some way.

### What is Air Pollution?

The air pollution definition says that when any physical, chemical, or biological change takes place in the air and contaminates it, then it is called air pollution. The

contamination of air can be caused due to many factors such as poisonous or harmful gases, smoke, fog, smog, dust, etc. air pollution affects both plants as well as animals.

## **Types of Air Pollutants**

The air pollutants are divided into primary and secondary pollutants. Pollutants are those substances that cause air pollution.

- **Primary Pollutants:**

The primary pollutants responsible for air pollution are the ones that directly cause air pollution. These include harmful gases such as sulfur dioxide coming from the factories. Primary pollutants are those that are produced as a direct result of the process. Sulfur dioxide, generated by factories, is a classic example of a primary pollutant.

- **Secondary Pollutants:**

The secondary pollutants are formed by the process of intermixing or intermingling of primary pollutants. Smog, which is a combination of fog and smoke, is a secondary pollutant.

## **Causes of Air Pollution:**

To prevent the pollution of air around, you have to understand the causes of air pollution at first. The main causes are –

- **Burning of Fossil Fuels:**

Fossil fuel emits harmful gases such as sulfur dioxide and carbon monoxide into the air. One of the biggest causes of air pollution is sulfur dioxide, which is emitted through the combustion of fossil fuels such as coal, petroleum for energy in power plants, and other industry combustibles.

- **Automobiles:**

The emission of harmful gases is caused by the excessive use of automobiles.

- **Agricultural Activities:**

Various processes take place during agricultural activities such as the emission of ammonia, overuse of insecticides, pesticides, and [fertilizers](#). Ammonia is a typical byproduct of agriculture and one of the most dangerous gases in the atmosphere. Insecticides, pesticides, and fertilizers have all become increasingly common in

agricultural practices. They release hazardous chemicals into the atmosphere and can pollute water.

Farmers also set fire to the fields and old crops to clear them up for the new cycle of sowing. According to reports, burning to clean up fields pollutes the air by emitting toxic pollutants.

- **Factories and Industries:**

Emission of harmful gases and chemicals into the air by the increasing industrial activities. Manufacturing companies emit a significant amount of carbon monoxide, hydrocarbons, organic compounds, and chemicals into the air, lowering air quality.

Manufacturing industries may be found in every corner of the globe, and no region has escaped their influence. Petroleum refineries also emit hydrocarbons and a variety of other pollutants, which damage the air and soil.

- **Mining Activities:**

Increasing emission of harmful substances through mining activities. Mining is the extraction of minerals from under the earth's surface utilizing heavy machinery. Dust and chemicals are released into the air throughout the process, resulting in significant air pollution.

This is one of the factors contributing to the deteriorating health of workers and inhabitants in the area.

- **Domestic Resources:**

Effects of domestic sources such as the use of chemical paints and overuse of air conditioners. Household cleaning products and painting supplies release hazardous chemicals into the air, polluting the environment. Have you ever observed that when you paint your house's walls, it emits a noxious odor that makes it nearly impossible to breathe?

Another source of pollution is suspended particle matter, sometimes known as SPM. SPM refers to the particles that float in the air and is typically caused by dust, combustion, and other factors.

### **Diseases caused by air pollution:**

Air Pollution can lead to increasing diseases like throat infections and lung cancer in humans. Every year, diseases related to air pollution kill and hospitalize millions of people. According to World Health Organization estimates, one out of every eight

fatalities worldwide is caused by conditions related to air pollution. New research has found significant correlations between the development of respiratory and cardiovascular disorders and both outdoor and indoor air pollution. Ischemic heart disease, stroke, chronic obstructive pulmonary disease (COPD), lung cancer, and acute lower respiratory infections in children are among the most prevalent diseases induced by air pollution.

"Ischemic heart disease, or coronary heart disease," adds Kevin Wood, Vice President Sales & Marketing at Camfil USA, "is connected to the deposition of calcium or other materials like fat within the coronary artery." "This causes blockages, preventing blood from reaching the heart and other vital organs." According to new research, air pollution hastens the occlusion of arteries, increasing the risk of ischemic heart disease."

### **Effects of Air Pollution:**

The air pollution information shows that increasing air pollution can have an adverse effect on plants, animals, and humans.

- **Global warming**

Air Pollution can increase the amount of global warming as the temperature of the earth will keep rising with the emission of harmful gases. With rising global temperatures, rising sea levels, melting ice from colder places and icebergs, relocation, and habitat loss, an imminent crisis has already been signaled if preservation and normalization measures are not done soon.

- **Acid rain**

When water droplets combine with harmful chemicals and pollutants, it will lead to acid rain. When fossil fuels are burned, harmful chemicals such as nitrogen oxides and sulfur oxides are emitted into the environment. When it rains, the water droplets interact with the contaminants in the air, becoming acidic and falling to the earth as acid rain. Acid rain has the potential to harm humans, animals, and agriculture.

- **Ozone layer Depletion**

All this will eventually lead to depletion of the ozone layer that protects us from harmful UV sun rays. The presence of chlorofluorocarbons and hydro chlorofluorocarbons in the atmosphere is degrading the ozone layer on Earth.

As the ozone layer thins, damaging rays are emitted back to Earth, potentially causing skin and eye problems. UV rays have the power to harm crops as well. Thus, we have to work on the prevention of air pollution.

## **Effects on Animals**

Increasing air pollution affects animals and aquatic life, leading them to stray and wander for food. Many of the animals are on the verge of extinction because of this. Animals, sometimes known as wildlife, are particularly vulnerable to the effects of air pollution. Acid rain, heavy metals, persistent organic pollutants (POPs), and other harmful compounds are all pollution concerns.

Insects, worms, clams, fish, birds, and mammals all have diverse ways of interacting with their surroundings. As a result, each animal's exposure to and vulnerability to the effects of air pollution is unique.

Air pollution has two major effects on wildlife.

It has an impact on the area or habitat in which they reside, as well as the food supply's availability and quality.

## **Air Pollution Control**

**It is not easy to control air pollution, but it will require some simple steps like:**

- **Avoid Using Vehicles**

Prefer using public transport as it will reduce the emission of CO into the air. The availability of carpools can help in the reduction of vehicles which in turn reduces pollution. Prefer walking or cycling to nearby places and many such.

- **Energy Conservation**

Use energy-efficient electrical devices at the workplace and home place. You can keep your lights switched off when not in use. The electrical appliances should be checked on a regular notice period so that it won't affect the conservation.

- **Use of Clean Energy Resources**

It will help to reduce the pollution level. Instead of using fossil fuels, we can use natural resources to produce energy like Solar Energy, Wind Energy, etc.

By decreasing and eliminating the usage of fire and fire-related items.

Because industrial emissions are one of the leading causes of air pollution, the pollutants can be reduced by controlling or treating them at the source. If a given raw materials reactions produce a pollutant, for example, the raw materials can be replaced with less harmful materials.

Another method of reducing pollution is to use different fuels. CNG – Compressed Natural Gas–powered vehicles are replacing petrol and diesel vehicles in many parts of India. Vehicles that aren't fully equipped with optimal emission engines are the most likely to use these.

Although India has a number of practices aimed at improving air quality, most of them have been forgotten or are not well implemented. There are still many automobiles on the road that haven't had their emissions tested.

## **Water pollution**

### **What is water pollution?**

Two-thirds of our planet is made up of water which is as big as 1 octillion liters. 70 percent of the human body is made up of water. It is a universal solvent. It is the only substance that exists in all 3 forms of matter on this planet. Today, the United Nations has recognized water as a basic human right, besides considering it as an economic commodity.

Pollution is the introduction of contamination into the environment. Water pollution is the presence of extreme levels of pollutants (hazards) in a water body, such that it is no longer suitable for regular human usages such as bathing, cooking, or drinking.

Polluting water is commonly seen with the involvement of human activities such as throwing waste, industrial and agricultural effluents, chemical discharge, etc. This leads to the degradation of water quality and affects aquatic life. When humans or animals consume this water for thirst, the health effects caused are adverse to life. Only less than 0.3% of the freshwater of the earth is suitable for normal drinking. 'Pure' water form is thought to be water with the minimum amount of gases, minerals, and life. But for all practical purposes, it is generally thought to have the least amount of solutes. High-quality water is essential for drinking purposes, but for any other needs, water quality can be flexible.

The article encompasses the discussion of the effects and preventive steps to control water pollution.

## **Sources of Water Pollution**

Since we have developed an understanding of what is water pollution, let us look into the sources of water pollution. There are many sources of water pollution. Most of the freshwater is surface water. It can get contaminated by seepage of harmful chemicals from the surface. There are two major sources when seen from the origin of the contamination. One is the 'point' source pollution, which means that the source of the pollution originates from a specific place. The other is 'nonpoint' source pollution as contamination from diffuse options. Transboundary contamination means it will not be limited to a country but can affect other places as well. Other common causatives for water pollution include Urbanization, high use of Detergents, insecticides and [fertilizers](#), Deforestation. Even many social and religious ceremonies are key sources of water pollution.

Let us look at a few other modern sources of water contamination with examples.

## **Water Pollution: A Modern Epidemic**

Most causes of water pollution originate from human activities and their waste products. The sources of water pollution are numerous, but some of the major pollutants in today's modern scenario are as follows:

### **Industrial Waste**

Many regular industrial activities release enormous amounts of toxic chemicals such as lead and mercury. They spread to other living species when humans use this contaminated product for regular purposes. It also affects the biodiversity of the water body.

### **Sewage and Waste**

Tones of sewage waste are dumped into water bodies. This not only causes pollution but also releases dangerous disease-causing pathogens.

## **Mining**

Mining in today's generation is key to the major lake and river pollution. This process brings out harmful chemicals that are buried deep under the earth's surface. When this comes in contact with water, the effects are dangerous to any living creature.

## **Marine Dumping**

The garbage generated every day is dumped into the seas and oceans going as far as to give rise to garbage islands. An easy step of throwing waste products only in the bin can reduce more than half of the water pollution levels.

## **Agricultural Activities**

The use of chemical fertilizers, pesticides, and other runoffs during irrigation flows into the water bodies. These chemicals cause pollution to water bodies in a short span of time.

## **Radioactive Wastes**

After usage of radioactive materials for nuclear wagons or as an energy source, they are mostly dumped into water bodies or in glaciers that will immediately mix with water when the temperature rises.

## **Urbanization and Population Growth**

Cities are unable to meet the water demand of their growing population. This has caused contamination and loss of water due to overuse.

## **Effects of Water Pollution**

The most diverse effects of water pollution on humans are when it affects the health of people. Disruption of aquatic life is the primary effect of water pollution. Polluted water contains many disease-causing elements such as bacteria and viruses which trigger other harmful diseases, namely cholera, giardia, and typhoid. It can even lead to chronic conditions, including hormonal imbalances, hepatitis, altered brain function to cancer. A pregnant woman is especially prone to these water-borne diseases. Also, swimming in polluted water is a high risk as it can cause skin and eye allergies.



The environment is also disturbed as it slowly kills animals and plants' life that is dependent on them for nourishment. It also supports the growth of harmful organisms that destroy the biodiversity of the water body. Certain algae growth reduces the level of oxygen in the water, killing everything in it. In some areas, pollution is so severe that it causes "dead zones" where there is no life.

### **Minamata Incident**

The 1932's Minamata Incident is the worst record case in the history of water pollution. Methyl mercury and its effluents started to flow from a factory in Japan. Methyl mercury is one of the key sources of causing neurological disorders in human beings. The effects were initially not observable until seashells started to grasp these toxic chemicals into them. People and other local men started to consume these fishes, and the ill effects were soon prominent.

Animals such as cats and dogs were the first ones to suffer the ill effects of this chemical. The term 'dancing cat disease' was coined from this incident, referring to the sounds of cats before they convulse and die. The symptoms were worse, including loss of motor coordination, acute mercury poisoning, ataxia, and even damage to speech and hearing. Severely affected persons are recorded to have coma and paralysis, leading to demise.

The Japanese government and officials took 36 years to understand the seriousness of the incident and provided support funds to the victims. Soon the Japanese government also opened avenues to start protecting their water bodies and took proper measures for the prevention of water pollution.

### **Pollution of the Ganges**

The 6th most polluted river in the world is India's Ganges (Ganga). Cremating dead bodies of humans along with other religious practices, quickly developed water contaminated into the river. This river is also the major cause of cholera and typhoid.

Even the fauna of this river has been adversely affected, and notable ones include the Ganges River Dolphin and Ganges River Shark. Nearly 1000 children die each year due to [water pollution in India](#). Currently, there are a few steps taken to drive away from this level and address these issues properly.

## **Control Measures of Water Pollution**

Since we have understood the concept of water pollution, let us look into some of the actions taken to control water pollution. Prevention and control of water pollution could be done in so many ways. To start off, it is to plant more trees around water bodies as they naturally help to assimilate and recycle the pollutants. Some important points are summarized below.

- There is a plant known as 'Water Hyacinth' that absorbs dissolved toxic substances like cadmium and mercury from water bodies, thus actively removing pollutants from water.
- It is important to dispose-off waste carefully and not to dump it directly into water bodies, without proper waste treatment.
- Industries should treat their wastes carefully before disposing of chemicals and other materials into water bodies directly. Sewage treatment plants and wastewater treatment plants in industries are established to treat the water used so it can be safely mixed into the river streams. It also enables water recycling.
- Using natural fertilizers and pesticides as substitutes for chemical ones is good for plants and water.
- Chemical processes such as coagulation, ion exchange method, reverse osmosis, etc. will greatly reduce the level of water pollution.
- Lastly, it is better to reduce the consumption of water in our daily activities and reuse water whenever possible to reduce the overall level of pollution.

In conclusion of the article, it can be said that we have learned about what is water pollution and the control measures taken to reduce it. Case studies of water pollution are also mentioned in the article.

## **Soil Pollution**

### **Define Soil Pollution?**

Soil pollution is defined as the presence of toxic chemicals (pollutants or contaminants) in the soil, in very high concentrations to pose a risk to human health and the ecosystem. Or in simple words Alteration in the natural soil due to human activities is termed Soil Pollution. For example, exposure to soil containing high concentrations of benzene can increase the risk of soil pollution diseases like contracting leukemia

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## **Soil Contamination**

All the soils contain compounds that are harmful to human beings and other living organisms. However, the concentration of such substances in unpolluted soil is so low that they do not pose any threat to the surroundings but when the concentration of such toxic substances becomes high enough to cause damage to living organisms, the soil is said to be contaminated.

Soil contamination can occur because of human activities or because of natural processes. However, mostly it is due to human activities. It occurs due to many different activities such as overuse of pesticides the soil will lose its fertility and the presence of excess chemicals will increase the acidity or alkalinity of soil and hence degrading the quality of the soil.

## **Types of Soil Pollution**

- Agriculture soil pollution is caused due to the excessive use of pesticides and insecticides.
- Soil Pollution by industrial discharges of chemicals from mining and manufacturing of goods.
- Solid waste soil pollution/ Poor management or inefficient disposal of waste.
- Soil Pollution due to urban activities. etc

## **Soil Pollution Causes**

### **Industrial Pollution**

The discharge of industrial waste into soils can result in soil pollution. In India, as mining and manufacturing activities are increasing rapidly, soil degradation is also increasing. The extraction of minerals from the earth is responsible for affecting soil fertility. Whether it is iron ore or coal, the by-products are contaminated, and they are disposed of in a manner that is not considered safe. As a result, the industrial waste stays on the soil surface for a long duration and makes it unsuitable for further use.

### **Agricultural Activities**

The use of insecticides and pesticides for a long period can cause soil pollution. Repetitive use can cause insects and pests to become resistant to it. Instead of killing pests and insects, it degrades the soil quality. They are full of chemicals that are not

produced in nature and cannot be broken down by them. As a result, they seep into the ground after they mix with water and slowly reduce the fertility of the soil. Plants absorb many of these pesticides, and after decomposition cause soil pollution.

## **Pesticides**

Pesticides are substances used to kill or control pests, such as weeds, insects, and parasitic fungi. In agriculture, they come in different types:

- Herbicides: Used to kill or control weeds and unwanted plants.
- Insecticides: Used to kill insects.
- Fungicides: Used to kill parasitic fungi or inhibit their growth.

However, when pesticides unintentionally spread into the environment, known as 'pesticide drift,' it raises environmental concerns like water and soil pollution. Some soil contaminants from pesticides include:

- Herbicides: Triazines, Carbamates, Amides, Phenoxyalkyl acids, aliphatic acids.
- Insecticides: Organophosphates, Chlorinated hydrocarbons, Arsenic-containing compounds, Pyrethrum.
- Fungicides: Mercury-containing compounds, Thiocarbamates, Copper sulfate.

These chemicals pose health risks to humans, leading to diseases like central nervous system disorders, immune system diseases, cancer, and birth defects.

## **Waste Disposal**

Disposal of plastics and other solid waste is a serious issue that causes soil pollution, disposal of electrical items such as batteries causes an adverse effect on the soil due to the presence of harmful chemicals. Eg: lithium present in batteries can cause the leaching of soil. Human waste such as urine, faeces, diapers, etc is dumped directly in the land. It causes both soil and water pollution.

## **Acid Rain**

It is caused when pollutants present in the air mix with the rain and fall back on the ground. The polluted water could dissolve away some of the essential nutrients found in soil and change the structure of the soil thus making it unsuitable for agriculture.

## Heavy Metals

The presence of heavy metals (such as lead and mercury) in very high concentrations present in soils can cause them to become highly toxic for human beings.

Toxic metals that cause soil pollution

Arsenic	mercury	lead
Antimony	zinc	nickel
cadmium	selenium	beryllium
Thallium	chromium	copper

## Nuclear Waste

It can also lead to soil degradation.

## Oil Spills

Oil leaks can happen during the storage or transport of chemicals, the chemicals present in the fuel deteriorates the quality of soil and makes them unsuitable for further cultivation, chemicals can also enter into the groundwater through the soil, and hence it will make water undrinkable.

## Effects of Soil Pollution

Soil pollution affects the health of humans, plants, and animals. Crops or plants grown on such contaminated soil absorb toxic material from the soil and will decrease the agricultural output of the land. When animals or human beings consume these crops or plants the toxic material can pass into their body.

Long-term consumption of these crops may cause chronic diseases that are untreatable. Children are usually more susceptible to exposure to contaminants because they come in close contact with the soil by playing in the ground, so, it is always important to test the quality of the soil before allowing kids to play there, especially in an industrialized area.

## Effects of Soil Pollution on Human Health

The contamination of soil has a major consequence on human health. Crops and plants that are grown on polluted soil absorb most of the pollution and then pass them to

humans. Living, working, or playing in contaminated soil can lead to respiratory diseases, skin diseases, and other health problems. Diseases caused by soil pollution include Irritation of the skin and the eyes, Headaches, nausea, vomiting, coughing, pain in the chest, and wheezing.

### **Effects on Plants**

In such a short period of time, plants are unable to adapt to the soil change chemistry. Fungi and bacteria found in the soil that bind them together start to decline, which creates an additional problem in soil erosion. Regular use of chemical fertilizers, inorganic fertilizers, pesticides will decrease the fertility of the soil and alter the structure of soil. This will lead to a decrease in soil quality and poor quality of crops. The fertility of the soil diminishes slowly, making land unsuitable for agriculture and any local vegetation to survive.

### **Effects on the Ecosystem**

The soil is an important habitat for different [types of microorganisms](#), birds, and insects. Thus, change in the chemistry of soil can negatively impact the lives of living organisms and can result in the gradual death of many organisms.

### **Possible Solutions to Soil Pollution**

Soil pollution is a complex issue that must be addressed. It is important that we all understand the importance of soil to our survival. The earlier we recognize the problem, the simpler it will be to solve the problem of soil pollution. It's a complicated problem that requires everyone's participation, from individuals to the government. A few methods for reducing soil pollution are listed below.

#### **Reduced Use of Chemical Fertilizers**

Chemical fertilizers are more damaging than helpful. While the right quantity can help the soil become more fertile, too much might potentially poison it. Chemical fertilizers in excess could harm the soil in a variety of ways. It has the ability to affect the soil's pH values.

#### **Reforestation and Afforestation Should be Promoted**

Soil erosion, which is produced by deforestation, is one of the major sources of soil pollution. With an ever-increasing population, it is only logical that mankind requires more and more room to expand their civilization. It is frequently accomplished at the

expense of soil health. Reforestation of a deforested area should be encouraged to prevent this from happening.

### **Recycle and Reuse Products**

These measures not only reduce waste output, but they also reduce soil pollution. Plastic now makes up a significant portion of the waste flow. The great majority of these wastes are buried in landfills.

### **Promote Use of Natural Manure**

One of the best sources of nutrients for the soil is natural manure. It's 100% natural and safe. It restores the soil's critical nutrients and improves its overall health. It doesn't produce any toxic by-products that could harm the soil or the environment.

### **Conclusion:**

Soil is a finite and irreplaceable resource that sustains life on Earth. Addressing soil pollution is not just an environmental imperative, but a critical step towards ensuring a healthy future for ourselves and future generations. By embracing sustainable practices, promoting responsible waste management, and raising awareness, we can protect this vital resource and ensure that the soil beneath our feet continues to nurture life for years to come.

-----THANK YOU-----

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