Environmental Studies

Semester - I

I Year (CS,FSN,FD) - SvEs 11

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UNIT-1

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

DEFINITION,SCOPE AND IMPORTANCE:

IT is essentially **a multidisciplinary** approach that brings about an appreciation of our **natural** world and human impacts on its integrity. It is an applied science as its seeks practical answers to making human civilization sustainable on the earth's finite re- sources.

NATURAL RESOURCES AND ASSOCIATED PROBLEMS:

- Human population is growing day-by-day. Continuous increase in population caused anincreasing demand for natural resources. Due to urban expansion, electricity need andindustrialization, man started utilising natural resources at a much larger scale. Non-renewableresources are limited.They cannot be replaced easily. After some time, these resources may come to an end. It is amatter of much concern and ensures a balance between population growth and utilisation ofresources.This overutilisation creates many problems. In some regions there are problems of water loggingdue to over irrigation. In some areas, there is no sufficient water for industry and agriculture.Thus, there is need for conservation of natural resources.

FOREST RESOURCES: #USE AND OVER EXPLOITATION.

- Continued **overexploitation** can lead to the destruction of the **resource**. The term applies to natural **resources** such as: wild medicinal plants, grazing pastures, game animals, fish stocks, **forests**, and water aquifers. In ecology, **overexploitation** describes one of the five main activities threatening global biodiversity

#DEFORESTATION:

- **Deforestation** refers to the decrease in forest areas across the world that are lost for other uses such as agricultural croplands, urbanization, or mining activities. Greatly accelerated by human activities since 1960, **deforestation** has been negatively affecting natural ecosystems, biodiversity, and the climate

#TIMBER EXTRACTION:

- **Extraction** is the process of transporting cut **timber** from the place where it was growing to a point where it can can be removed from site. There are a wide range of different methods of **timber extraction** and they vary in their strengths and weaknesses, and in the sites where they are most appropriate.

#DAMS AND THEIR EFFECTS ON FOREST

- However, **dams** constitute a major direct and indirect cause of **forest** loss and most of them have resulted in widespread human rights abuses. ... They have also resulted in deforestation elsewhere, as farmers displaced by the **dams** have had to clear **forests** in other areas in order to grow **their** crops and build **their** homes.

#TRIBAL PEOPLE:

- Tribal peoples constitute 8.6 percent of India's total population, about 104 million people according to the 2011 census (68 million people according to the 1991 census). This is the largest population of the tribal people in the world. One concentration lives in a belt along the Himalayas stretching through Jammu and Kashmir, Himachal Pradesh, and Uttar Pradesh in the west, to Assam, Meghalaya, Tripura, Arunachal Pradesh, Mizoram, Manipur, and Nagaland in the northeast. Another concentration lives in the hilly areas of central India (Madhya Pradesh, Orissa, and, to a lesser extent, Andhra Pradesh); in this belt, which is bounded by the Narmada River to the north and the Godavari River to the southeast, tribal peoples occupy the slopes of the region's mountains.

WATER RESOURCES:# USE AND OVERUTILIZATION OF SURFACE:

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- Water resources are used for agricultural, industrial, domestic, recreational, and environmental activities. Majority of the uses require fresh water.
- However, about 97 percent of water found on the earth is salt water and only three percent is fresh water. A little over two-thirds of the available fresh water is frozen in glaciers and polar ice caps. The remaining freshwater is found mainly as groundwater and a negligible portion of it is present on the ground or in the air.

#FLOODS:

- A **flood** is an overflow of water that submerges land that is usually dry. In the sense of "flowing water", the word may also be applied to the inflow of the tide.

#DROUGHT:

- A **drought** is a period of time when an area or region experiences below-normal precipitation. The lack of adequate precipitation, either rain or snow, can cause reduced soil moisture or groundwater, diminished stream flow, crop damage, and a general water shortage.

#DAMS -BENEFITS & PROBLEMS:

- Benefits of Dams. Dams provide a range of economic, environmental, and social benefits, including recreation, flood control, water supply, hydroelectric **power**, waste management, river navigation, and wildlife habitat. Dams provide prime recreational facilities throughout the United States

#WATER CONSERVATION:

- **Water conservation** is the practice of using **water** efficiently to reduce unnecessary **water** usage. According to Fresh **Water** Watch, **water conservation** is important because fresh clean **water** is a limited resource, as well as a costly one.

#WATERSHED MANAGEMENT:

- **Watershed management** is the study of the relevant characteristics of a **watershed** aimed at the sustainable distribution of its resources and the process of creating and implementing plans, programs and projects to sustain and enhance **watershed** functions that affect the plant, animal, and human communities

MINERAL RESOURCES -#USE AND EXPLOITATION:

- Exploitation of mineral refers to the use of mineral resources for economic growth. Exploitation of mineral resources at a mindless speed to meet the growing needs of modern civilization has resulted in many environmental problems.

#ENVIRONMENTAL EFFECTS:

- **Environmental impacts** of **mining** can occur at local, regional, and global scales through direct and indirect **mining** practices. **Impacts** can result in erosion, sinkholes, loss of biodiversity, or the contamination of soil, groundwater, and surface water by the chemicals emitted from **mining** processes.

FOOD RESOURCES: #WORLD FOOD PROBLEMS:

- The **global food problem** consists of the lack of **food** provision for the **Earth's** population. It manifests itself primarily in the poorest countries of the Third **World** and is currently aggravating as their populations grow. The total number of people suffering from a lack of **food** is over one billion people **worldwide**.

#CHANGES:

- **Changes** caused by agriculture and overgrazing
- Poor environmental agriculture practices such as slash and burn, shifting cultivation degrade the forests. ... Intensive agriculture operations, fossil fuel combustion and widespread cultivation of leguminous crops have led to huge additional quantities of nitrogen.

#EFFECTS OF MODERN AGRICULTURE:

- The top fertile soil of the farmland is removed due to the excessive water supply. This leads to the loss of nutrient-rich soil that hampered productivity. It also causes global warming because the silt of water bodies induces the release of soil carbon from the particulate organic materia

#FERTILIZER AND PESTICIDE PROBLEMS:

- Excessive use of **fertilizers and pesticides** by farmers in agriculture to enhance crop yield is detrimental to environment and human health. **Fertilizers and pesticides** use has led to the **problem** of air, water and soil pollution. ... Moreover, the seepage of **fertilizers and pesticides** also pollutes the ground water.

ENERGY RESOURCE:#GROWING ENERGY NEEDS:

- Global **energy needs** are expected to **grow**, with fossil fuels remaining the dominant source. Between 2005 and 2030, **energy needs** are projected to expand by 55 per cent, with **demand increasing** from 11.4 billion tons of oil equivalent to 17.7 billion

#RENEWABLE & NON-RENEWABLE RESOURCES:

- Resources are characterized as renewable or nonrenewable; a renewable resource can replenish itself at the rate it is used, while a nonrenewable resource has a limited supply. Renewable resources include timber, **wind**, and **solar** while nonrenewable resources include **coal** and **natural gas**

#ALTERNATIVE ENERGY SOURCES:

- Wave Energy.
- Biofuels. ...
- **Natural Gas**. ...
- **Geothermal** Power. ...
- **Wind Energy**. ...
- **Biomass Energy**. ...
- Tidal Energy. ...
- Hydrogen Gas. Unlike other forms of **natural gas**, hydrogen is a completely clean burning fuel.

LAND RESOURCES: #LAND AS A RESOURCE:

- **Land** is an essential natural **resource**, both for the survival and prosperity of humanity, and for the maintenance of all terrestrial ecosystems. ... Increased demand, or pressure on **land resources**, shows up as declining crop production, degradation of **land** quality and quantity, and competition for **land**.

#LAND DEGRADATION:

- **Land degradation**—the deterioration or loss of the productive capacity of the soils for present and future—is a global challenge that affects everyone through food insecurity, higher food prices, climate change, environmental hazards, and the loss of biodiversity and ecosystem services.

#MAN INDUCED LAND-SLIDES:

- Human-**induced landslides** (HIL) refer to **landslide** events that are directly triggered or partially aggravated by an-thropic activities. Most of them are the results of anthropogenic factors such as modification of the topography, change of the water circulations, land use changes, ageing of infrastructure, etc.

SOIL EROSION & DESERTIFICATION:

- **Desertification** is the gradual transformation of habitable land into desert. It involves both the physical loss (**erosion**) and the reduction in quality of topsoil associated with nutrient decline and contamination. ...

UNIT-2

ECOSYSTEM

FOREST ECOSYSTEM:

- A forest ecosystem describes the community of plants, animals, microbes and all other organisms in interaction with the chemical and physical features of their environment: Specifically, a terrestrial environment dominated by trees growing in a closed canopy — a forest, in other words.
- The organisms involved in a forest ecosystem definition are interdependent on one another for survival and can be broadly classified according to their ecological role as producers, consumers and decomposers.

#GRASSLAND ECOSYSTEM:

- Grassland Ecosystem is an area where the **vegetation** is dominated by grasses and other herbaceous (non-woody) **plants**. It is also called transitional **landscape** because grassland ecosystems are dominated by the grass with few or no **trees** in the area where there is not enough for a **forest** and too much of a **forest**.

#DESSERT ECOSYSTEM:

- A **desert ecosystem** is defined by interactions between organisms, the climate in which they live, and any other non-living influences on the **habitat**. Deserts are arid regions that are generally associated with warm temperatures; however, cold deserts also exist.

AQUATIC ECOSYSTEM: #PONDS

- A **pond** is an area filled with water, either natural or artificial, that is smaller than a lake.[1] It may arise naturally in floodplains as part of a river system, or be a somewhat isolated depression (such as a kettle, vernal pool, or prairie pothole). It may contain shallow water with aquatic plants and animals.

#RIVER:

- **river** is a natural flowing watercourse, usually freshwater, flowing towards an ocean, sea, lake or another river. In some cases a river flows into the ground and becomes dry at the end of its course without reaching another body of water. Small rivers can be referred to using names such as stream, creek, brook, rivulet, and rill.

#OCEANS:

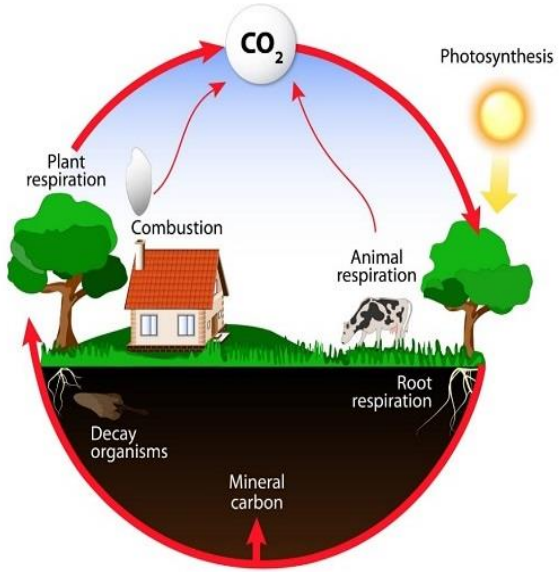
- An **ocean** is a body of water that composes much of a planet's hydrosphere. On Earth, an ocean is one of the major conventional divisions of the World Ocean. These are, in descending order by area, the Pacific, Atlantic, Indian, Southern (Antarctic), and Arctic Oceans. The phrases "the ocean" or "the sea" used without specification refer to the interconnected body of salt water covering the majority of the Earth's surface.As a general term, "the ocean" is mostly interchangeable with "the sea" in American English, but not in British English. Strictly speaking, a *sea* is a body of water (generally a division of the world ocean) partly or fully enclosed by land.[

#ESTUARIES:

- An estuary is a partially enclosed, coastal water body where freshwater from rivers and streams mixes with salt water from the ocean. Estuaries, and their surrounding lands, are places of transition from land to sea.

ENERGY FLOW IN ECOSYSTEM:

Energy moves life. The cycle of **energy** is based on the **flow** of **energy** through different trophic levels in an **ecosystem**. At the first trophic level, primary producers use solar **energy** to produce organic material through photosynthesis.

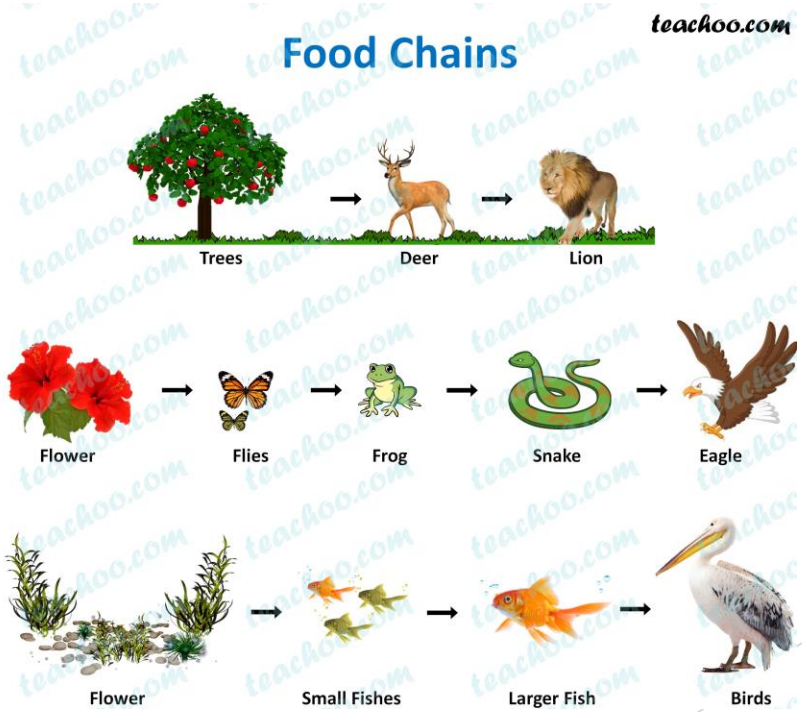


ECOLOGICAL SUCCESSION:

- **Ecological succession** is the process that describes how the structure of a biological community (that is, an interacting group of various species in a desert, forest, grassland, marine environment, and so on) changes over time.

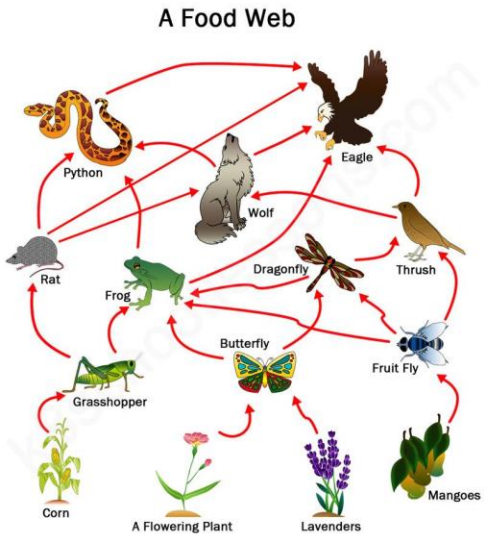
FOOD CHAIN:

A **food chain** is a linear network of links in a food web starting from producer organisms (such as grass or trees which use radiation from the Sun to make their food) and ending at apex predator species (like grizzly bears or killer whales), detritivores (like earthworms or woodlice), or decomposer species (such as fungi or bacteria). A food chain also shows how the organisms are related with each other by the food they eat.



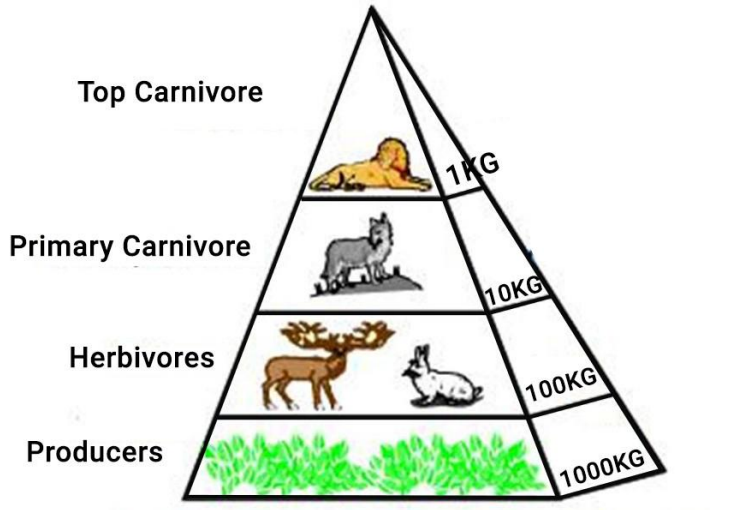
FOOD CHAIN:

A food web (or food cycle) is the natural interconnection of food chains and a graphical representation (usually an image) of what-eats-what in an ecological community. Another name for food web is consumer-resource system



ECOLOGICAL PYRAMIDS:

An **ecological pyramid** is a graphical representation of the relationship between different organisms in an **ecosystem**. Each of the bars that make up the **pyramid** represents a different trophic level, and their order, which is based on who eats whom, represents the flow of energy.



Upright Pyamid of Biomass in aTerrestrial Ecosystem

UNIT-3

BIO DIVERSITY & ITS CONSERVATION

BIO DIVERSITY- DEFINITION:

- **Biodiversity** is the variety and variability of life on Earth. Biodiversity is typically a measure of variation at the genetic, species, and ecosystem level.Terrestrial biodiversity is usually greater near the equator, which is the result of the warm climate and high primary productivity.Biodiversity is not distributed evenly on Earth, and is richest in the tropics.These tropical forest ecosystems cover less than 10 percent of earth's surface, and contain about 90 percent of the world's species.

GENETICS SPECIES & ECO SYSTEM:

- **Biodiversity** is increased by **genetic** change and evolutionary processes and reduced by **habitat** destruction, population decline and extinction. ... **Genetic Diversity** is the **diversity** of **genetic** characteristics (expressed or recessive) within a **species** (i.e. between individuals and populations of the same **species**).

BIOGEOGRAPHICAL CLASSIFICATIONS OF INDIA:

- **Biogeographic classification of India** is the division of India according to biogeographic characteristics. Biogeography is the study of the distribution of species (biology), organisms, and ecosystems in geographic space and through geological time. India has a rich heritage of natural diversity. India ranks fourth in Asia and tenth in the world amongst the top 17 mega-diverse countries in the world. India harbours nearly 11% of the world's floral diversity comprising over 17500 documented flowering plants, 6200 endemic species, 7500 medicinal plants and 246 globally threatened species in only 2.4% of world's land area.

VALUE OF BIODIVERSITY:

- Biodiversity boosts ecosystem productivity where each species, no matter how small, all have an important role to play. For **example**, A larger number of plant species means a greater variety of crops. Greater species diversity ensures natural sustainability for all life forms.

BIODIVERSITY AT GLOBAL:

- **Global biodiversity** is the measure of **biodiversity** on planet Earth and is defined as the total variability of life forms. ... Estimates on the number of Earth's current species range from 2 million to 10^{12}, of which about 1.74 million have been databased thus far and over 80 percent have not yet been described.

BIODIVERSITY AT NATIONAL AND LOCAL LEVELS:

- India has over 108,276 species of bacteria, fungi, plants and animals already identified and described (Table 4.2). Out of these, 84 percent species constitute fungi (21.2 percent), flowering plants (13.9 percent), and insect (49.3 percent). In terms of the number of species, the insecta alone constitute nearly half of the biodiversity in India.

INDIA AS A MEGA DIVERSITY VERSION:

- **India** is one of the 12 **mega biodiversity** countries in the world. ... These are concentrated in the floristically rich areas of North-East **India**, the Western Ghats, North-West Himalayas and the Andaman and Nicobar Islands. These areas constitute two of the 18 hot spots identified in the world.

HOT SPOTS OF BIODIVERSITY:

- A **biodiversity hotspot** is a biogeographic region that is both a significant reservoir of **biodiversity** and is threatened with destruction. The term **biodiversity hotspot** specifically refers to 25 biologically rich areas around the world that have lost at least 70 percent of their original habitat.

THREATS OF BIODIVERSITY:

- Habitat Fragmentation. Ecosystem conversion and ecosystem degradation contribute to habitat fragmentation. …
- Exotic Species Introductions. Infestation by alien species, such as the Codling Moth, is also a major **threat** to BC ecosystems. .
- Pollution.
- Global Climate Change.
- Corridors and Connectivity.

ENDANGERED SPECIES OF INDIA:

- **Critically endangered animals**
- White-bellied heron (Ardea insignis)
- Great **Indian** bustard (Ardeotis nigriceps)
- Baer's pochard (Aythya baeri)
- Spoon-billed sandpiper (Calidris pygmaea)
- White-rumped vulture (Gyps bengalensis)
- **Indian** vulture (Gyps indicus)
- Slender-billed vulture (Gyps tenuirostris)

ENDEMIC SPECIES:

- Endemic species are those that are found in just one region and nowhere else in the world. For example, kangaroos are originally endemic to Australia and are found nowhere else in the world. The cases where they have been spotted outside their natural habitat is due to humans introducing them when the animal was in captivity.
- There are also other marsupials that are endemic only to Australia and its surrounding islands. The Tasmanian Tiger is one such animal that was endemic to Australia, Tasmania and New Guinea.

INSITU & EXSITU CONSERVATION OF BIODIVERSITY:

- he process of protecting an endangered plant or animal species in its natural habitat is commonly known as **in situ conservation**. On the other hand, **ex situ conservation** is the relocation of endangered or rare species from their natural habitats to protected areas equipped for their protection and **preservation**.

Unit- 4

Environmental pollution

Definition – Cause, effects and control measures of :-

- Air Pollution
- Water pollution
- Soil pollution
- Marine pollution
- Noise pollution
- Thermal pollution
- Soil waste management

Air Pollution:-

- Air pollution refers to any physical, chemical or biological change in the air. It is the contamination of air by harmful gases, dust and smoke which affects plants, animals and humans drastically.
- There is a certain percentage of gases present in the atmosphere. An increase or decrease in the composition of these gases is harmful to survival. This imbalance in the gaseous composition has resulted in an increase in earth's temperature, which is known as global warming.

Causes of Air Pollution:-

- **Burning of Fossil Fuels:-**

The combustion of fossil fuels emits a large amount of sulphur dioxide. Carbon monoxide released by incomplete combustion of fossil fuels also results in air pollution.

- **Automobiles:-**

The gases emitted from vehicles such as jeeps, trucks, cars, buses, etc. pollute the environment. These are the major sources of greenhouse gases and also result in diseases among individuals.

- **Agricultural Activities:-**

Ammonia is one of the most hazardous gases emitted during agricultural activities. The insecticides, pesticides and fertilizers emit harmful chemicals in the atmosphere and contaminate it.

- **Factories and Industries:-**

Factories and industries are the main source of carbon monoxide, organic compounds, hydrocarbons and chemicals. These are released into the air, degrading its quality.

- **Mining Activities:-**

In the mining process, the minerals below the earth are extracted using large pieces of equipment. The dust and chemicals released during the process not only pollute the air, but also deteriorate the health of the workers and people living in the nearby areas.

- **Domestic Sources:-**

The household cleaning products and paints contain toxic chemicals that are released in the air. The smell from the newly painted walls is the smell of the chemicals present in the paints. It not only pollutes the air but also affects breathing.

Effects of Air Pollution:-

- **Diseases:-**

Air pollution has resulted in several respiratory disorders and heart diseases among humans. The cases of lung cancer have increased in the last few decades. Children living near polluted areas are more prone to pneumonia and asthma. Many people die every year due to the direct or indirect effects of air pollution.

- **Global Warming :-**

Due to the emission of greenhouse gases, there is an imbalance in the gaseous composition of the air. This has led to an increase in the temperature of the earth. This increase in earth's temperature is known as global warming. This has resulted in the melting of glaciers and an increase in sea levels. Many areas are submerged underwater.

- **Acid Rain:-**

The burning of fossil fuels releases harmful gases such as nitrogen oxides and sulphur oxides in the air. The water droplets combine with these pollutants, become acidic and fall as acid rain which damages human, animal and plant life.

- **Ozone Layer Depletion:-**

The release of chlorofluorocarbons, halons, and hydro chlorofluorocarbons in the atmosphere is the major cause of depletion of the ozone layer. The depleting ozone layer does not prevent the harmful ultraviolet rays coming from the sun and causes skin diseases and eye problems among individuals.

- **Effect on Animals:-**

The air pollutants suspend on the water bodies and affect the aquatic life. Pollution also compels the animals to leave their habitat and shift to a new place. This renders them stray and has also led to the extinction of a large number of animal species.

Control measures of air Pollution:-

- By minimizing and reducing the use of fire and fire products.
- Since industrial emissions are one of the major causes of air pollution, the pollutants can be controlled or treated at the source itself to reduce its effects. For example, if the reactions of a certain raw material yield a pollutant, then the raw materials can be substituted with other less polluting materials.
- Fuel substitution is another way of controlling air pollution. In many parts of India, petrol and diesel are being replaced by CNG – Compressed Natural Gas fueled vehicles. These are mostly adopted by vehicles that aren't fully operating with ideal emission engines.
- Although there are many practices in India, which focus on repairing the quality of air, most of them are either forgotten or not being enforced properly. There are still a lot of vehicles on roads which haven't been tested for vehicle emissions.

Water Pollution:-

- Water pollution can be defined as the contamination of water bodies. Water pollution is caused when water bodies such as rivers, lakes, oceans, groundwater, and aquifers get contaminated with industrial and agricultural effluents.

- When water gets polluted, it adversely affects all lifeforms that directly or indirectly depend on this source. The effects of water contamination can be felt for years to come.

Causes of water pollution:-

- One of the primary causes of water pollution is the contamination of water bodies by toxic chemicals. As seen in the example mentioned above, the dumped plastic bottles, tins, water cans and other wastes pollute the water bodies. These result in water pollution, which harms not just humans, but the whole ecosystem.
- Toxins drained from these pollutants, travel up to the food chain and eventually affect humans. In most cases, the outcome is destructive to only local population and species, but it can have an impact on a global scale too.

- Nearly 6 billion kilograms of garbage is dumped every year in the oceans. Apart from industrial effluents and untreated sewage, other forms of unwanted materials are dumped into various water bodies.
- These can range from nuclear waste to oil spills – the latter of which can render vast areas uninhabitable.

Effects Of Water Pollution:-

- The effect of water pollution depends upon the type of pollutants and its concentration. Also, the location of water bodies is an important factor to determine the levels of pollution.
- Water bodies in the vicinity of urban areas are extremely polluted. This is the result of dumping garbage and toxic chemicals by industrial and commercial establishments.
- Water pollution drastically affects aquatic life. It affects their metabolism, behaviour, causes illness and eventual death. Dioxin is a chemical that causes a lot of problems from reproduction to uncontrolled cell growth or cancer. This chemical is bioaccumulated in fish, chicken and meat.
- Chemicals such as this travel up the food chain before entering the human body.

- The effect of water pollution can have a huge impact on the food chain. It disrupts the food-chain. Cadmium and lead are some toxic substances, these pollutants upon entering the food chain through animals (fish when consumed by animals, humans) can continue to disrupt at higher levels.
- Humans are affected by pollution and can contract diseases such as hepatitis through faecal matter in water sources. Poor drinking water treatment and unfit water can always cause an outbreak of **infectious diseases** such as cholera etc.
- The ecosystem can be critically affected, modified and destructured because of water pollution.

Control Measures of Water Pollution:-

- Water pollution, to a larger extent, can be controlled by a variety of methods. Rather than releasing sewage waste into water bodies, it is better to treat them before discharge. Practising this can reduce the initial toxicity and the remaining substances can be degraded and rendered harmless by the water body itself. If the secondary treatment of water has been carried out, then this can be reused in sanitary systems and agricultural fields.
- A very special plant, the Water Hyacinth can absorb dissolved toxic chemicals such as cadmium and other such elements. Establishing these in regions prone to such kinds of pollutants will reduce the adverse effects to a large extent.
- Some chemical methods that help in the control of water pollution are precipitation, the ion exchange process, **reverse osmosis**, and coagulation. As an individual, reusing, reducing, and recycling wherever possible will advance a long way in overcoming the effects of water pollution.

Soil Pollution:-

- Soil pollution refers to the contamination of soil with anomalous concentrations of toxic substances. It is a serious environmental concern since it harbours many health hazards. For example, exposure to soil containing high concentrations of benzene increases the risk of contracting leukaemia. An image detailing the discolouration of soil due to soil pollution is provided below.
- It is important to understand that all soils contain compounds that are harmful/toxic to human beings and other living organisms. However, the concentration of such substances in unpolluted soil is low enough that they do not pose any threat to the surrounding ecosystem.

- When the concentration of one or more such toxic substances is high enough to cause damage to living organisms, the soil is said to be contaminated.

The root cause of soil pollution is often one of the following:

1. Agriculture (excessive/improper use of pesticides)
2. Excessive industrial activity
3. Poor management or inefficient disposal of waste

- The challenges faced in soil remediation (decontamination of soil) are closely related to the extent of soil pollution. The greater the contamination, the greater the requirement of resources for remediation.

Causes of soil pollution:-

- Improper disposal of industrial waste: industries are believed to be one of the leading causes of soil pollution due to improper management and disposal of the toxic wastes generated during industrial activities.
- Excessive and inefficient usage of pesticides and fertilizers: the agriculture industry makes extensive use of chemical fertilizers and pesticides for the growth and maintenance of crops. However, excessive and inefficient use of these toxic chemicals can seriously contaminate the soil.
- Petroleum or diesel spills: leaks in fuel transportation pipes can cause fuel spills. These fuels are known to contain toxic hydrocarbons which can cause soil contamination.

Effects of soil pollution:-

- The contaminants found in polluted soil can enter human bodies through several channels such as the nose, the mouth, or the skin.
- Exposure to such soils can cause a variety of short-term health problems such as headaches, coughing, chest pain, nausea, and skin/eye irritation. Prolonged exposure to contaminated soil can lead to the depression of the central nervous system and damage to vital organs (such as the liver).
- Long-term exposure to polluted soils has also been linked to cancer in humans.

Control Measures of Soil pollution:-

Several technologies have been developed to tackle soil remediation. Some important strategies followed for the decontamination of polluted soil are listed below.

- Excavation and subsequent transportation of polluted soils to remote, uninhabited locations.
- Extraction of pollutants via thermal remediation – the temperature is raised in order to force the contaminants into the vapour phase, after which they can be collected through vapour extraction.
- Bioremediation or phytoremediation involves the use of microorganisms and plants for the decontamination of soil.
- Mycoremediation involves the use of fungi for the accumulation of heavy metal contaminants.

Marine pollution :-

- Marine Pollution occurs when harmful effects result from the entry into the ocean of chemicals, particles, industrial, agricultural and residential waste, noise, or the spread of invasive organisms.
- Eighty percent of marine pollution comes from land. Air pollution is also a contributing factor by carrying off iron, carbonic acid, nitrogen, silicon, sulfur, pesticides or dust particles into the ocean.
- Land and air pollution have proven to be harmful to marine life and its habitats.

Causes of Marine Pollution:-

- Municipal waste and sewage from residences and hotels in coastal towns are directly discharged into sea.
- Pesticides and fertilizers from agriculture which are washed off by rain enter water courses and finally to sea. India is estimated to use 55,000 tons of pesticides annually and about 25 percent of it is carried to-ocean.
- Petroleum and oil washed off from roads normally enter sewage system and finally into seas.
- Ship accidents and accidental spillage at sea can therefore be very damaging to the marine environment.
- Off shore oil exploration also pollute the sea water to a large extent,
- Dry docking: All ships periodic dry docking servicing; cleaning the hulls etc. during this period when cargo compartments are emptied, residual oil goes into sea.

- Pollution due to organic wastes: When O_2 concentration falls 1.5 mg/L, the rate of aerobic oxidants reduced and replaced by the anaerobic bacteria that can oxidize the organic molecules without the use of oxygen.
- Pollution due to oil: Crude oil is transported by sea after a tanker has unloaded its cargo of oil; it has to take on sea water ballast for return journey. This ballast water is stored in cargo compartments that previously contained oil.
- During unloading of cargo certain amount of oil remains clinging to the walls of container and this may amount to 8oot in a 200,000t tankers. The ballast water thus contaminated with oil. When fresh crag of oil is to be loaded these compartments are clean with water which discharges the dirty ballast along with oil into sea.
- Tanker accidents: In the natural process, a large no. of oil tanker accidents happens every year. Sometimes this can results in major disasters.
- Volcanic eruptions in the sea.
- Deep sea mining is a relatively new mineral retrieval process that takes place on the ocean floor. Ocean mining sites are usually done at about 1,400 – 3,700 meters below the ocean's surface. The vents create sulfide deposits, which contain precious metals such as silver, gold, copper, manganese, cobalt, and zinc. These raise questions about environment damage to surrounding areas. Removal of parts of the sea floor will result in disturbances to the benthic layer, and habitat of benthic organisms. Beside from direct impact of mining the area, leakage, spills and corrosion would alter the mining area's chemical makeup.

Effects of Marine Pollution:-

- Apart from causing Eutrophication, a large amount of organic wastes can also result in the development of 'red tides'. These are phytoplankton blooms because of which the whole area is discolored.
- Commercially important marine species are also killed due to clogging of gills and other structures.
- When oil is spilled on the sea, it spreads over the surface of the water to form a thin film called as oil slick. This damages marine life to a large extent. Commercial damage to fish by tainting which gives unpleasant flavor to fish and sea food reduces market values of sea food and causes death of birds through its effect on feathers. Birds often clean their plumage by pruning and in the process consume oil which can lead to intestinal, renal and liver failure.
- For salt marshy plants oil slick can affect the flowering, fruiting and germination.

- Organic waste addition results in end products such as hydrogen sulphide, ammonia and methane which are toxic to many organisms. This process results in the formation of an anoxic zone which is low in its oxygen content; from which most life disappears except for anaerobic microorganisms and renders the water foul smelling.
- The coral reefs are the productive ecosystems offer many benefits to people. These coral reefs are threatened by (a) the sediments from deforestation carried by the runoffs, (b) the agricultural and industrial chemicals reaching through river discharges. To mention an example. River Ganga is estimated to carry 1.5 billion tons of sediments due to deforestation and intensive farming in India, Bangladesh and Nepal through which it flows to Bay of Bengal.
- Drill cuttings dumped on the seabed result in the production of toxic sulphides in the bottom sediment thus eliminating the benthic fauna.

Control Measures of Marine Pollution:-

- Introduction of sewage treatment plants to reduce BOD of final product before discharging into sea.
- Cleaning oil from surface waters and contaminated beaches can be accelerated through the use of chemical dispersants which can be sprayed on the oil.
- Load on top system reduce oil pollution cleaned with high pressures jets of water.
- Crude oil washing: The clingage is removed by jets of crude oil while the cargo is being unloaded.
- Skimming off the oil surface with a section device.
- Spreading a high density powder over the oil spill, so that oil can I be sunk to the bottom.

Noise Pollution:-

The word noise is derived from a Latin word ‘Nausea’ which means sickness in which one feels to vomit. Noise is the unpleasant and undesirable sound which leads to discomfort to human beings. **The intensity of sound is measured in decibels (dB)**. The faintest sound which can be heard by the Human ear is 1 Db. Due to increasing noise around the civilizations; noise pollution has become a matter of concern. Some of its major causes are vehicles, aircraft, industrial machines, loudspeakers, crackers, etc. Some other appliances also contribute to noise pollution like television, transistor, radio, etc. when used at high volume.

Causes of Noise Pollution:-

- **Industrialisation:** Industrialisation has led to an increase in noise pollution as the use of heavy machinery such as generators, mills, huge exhaust fans are used, resulting in the production of unwanted noise.
- **Vehicles:** Increased number of vehicles on the roads are the second reason for noise pollution.
- **Events:** Weddings, public gatherings involve loudspeakers to play music resulting in the production of unwanted noise in the neighbourhood.
- **Construction sites:** Mining, construction of buildings, etc add to the noise pollution.

Examples of noise pollution:-

- Unnecessary usage of horns
- Using loudspeakers either for religious functions or for political purposes
- Unnecessary usage of fireworks
- Industrial noise
- Construction noise
- Noise from transportation such as railway and aircraft

Effects of Noise Pollution on Human Health:-

- **Hypertension:** It is a direct result of noise pollution which is caused due to elevated blood levels for a longer duration.
- **Hearing loss:** Constant exposure of human ears to loud noise that are beyond the range of sound that human ears can withstand damages the eardrums resulting in loss of hearing.
- **Sleeping disorders:** Lack of sleep might result in fatigue and low energy level throughout day affecting everyday activities. Noise pollution hampers the sleep cycles leading to irritation and uncomfortable state of mind.
- **Cardiovascular issues:** Heart-related problems such as blood pressure level, stress, and cardiovascular diseases might come up in a normal person and person suffering from any of these diseases might feel the sudden shoot up in the level.

Control of Noise Pollution:-

- Honking in public places like teaching institutes, hospital, etc. should be banned.
- In commercial, hospital, and industrial buildings, adequate soundproof systems should be installed.
- Musical instruments sound should be controlled to desirable limits.
- Dense tree cover is useful in noise pollution prevention.
- Explosives should be not used in forest, mountainous, and mining areas.

Thermal pollution:-

An increase in the optimum water temperature by industrial process (steel factories, electric power houses and atomic power plants) may be called as “Thermal Pollution.” Many industries generate their own power and use water to cool their generator.

This hot water is released into the system from where it was drawn, causing a warming trend of surface water. If the system is poorly flushed, a permanent increase in the temperature may result. However, if the water is released into the well flushed system, permanent increase in temperature does not occur.

Causes of Thermal Pollution:

(1) Coal-fired Power Plants:
Some thermal power plants use coal as fuel. Coal-fired power plants constitute the major source of the thermal pollution.

(2) Industrial Effluents:
Industries generating electricity require large amount of Cooling water for heat removal. Other industries like textile, paper, and pulp and sugar industry also release heat in water, but to a lesser extent.

(3) Nuclear Power Plants:
Nuclear power plants emit a large amount of unutilized heat and traces of toxic radio nuclear into nearby water streams. Emissions from nuclear reactors and processing installations are also responsible for increasing the temperature of water bodies.

(4) Hydro Electric Power:
Generation of hydro-electric power also results in negative thermal loading of water bodies.

(5) Domestic Sewage:
Domestic sewage is often discharged into rivers, lakes, canals or streams without waste treatment. The municipal water sewage normally has a higher temperature than receiving water. With the increase in temperature of the receiving water the dissolved oxygen content (DO) decreases and the demand of oxygen increases and anaerobic conditions occur.

Effects of thermal pollution:-

Many organisms are killed instantly by the hot water resulting into a high mortality. It may bring other disturbance in the ecosystem. The egg of fish may hatch early or fail to hatch at all. It may change the diurnal and seasonal behaviour and metabolic responses of organisms. It may lead to unplanned migration of aquatic animals. Macro-phytic population may also be changed. As temperature is an important limiting factor, serious changes may be brought about even by a slight increase in temperature in a population. For minimising thermal pollution, hot water should be cooled before release from factories and removal of forest canopies and irrigation return flows should be prohibited.

Control of Thermal Pollution:-

(1) Cooling Ponds:

Cooling ponds or reservoirs constitute the simplest method of controlling thermal discharges. Heated effluents on the surface of water in cooling ponds maximize dissipation of heat to the atmosphere and minimize the water area and volume. This is the simplest and cheapest method which cools the water to a considerable low temperature. However, the technique alone is less desirable and inefficient in terms of air-water contact.

(2) Cooling Towers:

Using water from water sources for cooling purposes, with subsequent return to the water body after passing through the condenser is termed as cooling process. In order to make the cooling process more effective, cooling towers are designed to control the temperature of water. In-fact, cooling towers are used to dissipate the recovered waste heat so as to eliminate the problems of thermal pollution.

(3) Artificial Lake:

Artificial lakes are man-made bodies of water which offer possible alternative to once through cooling. The heated effluents may be discharged into the lake at one end and the water for cooling purposes may be withdrawn from the other end. The heat is eventually dissipated through evaporation.

These lakes have to be rejuvenated continuously. A number of methods have been suggested and developed for converting the thermal effluents from power plants into useful heat resources for maximing the benefits.

Solid-waste management:-

Solid waste management the collecting, treating, and disposing of solid material that is discarded because it has served its purpose or is no longer useful. Improper disposal of municipal solid waste can create unsanitary conditions, and these conditions in turn can lead to pollution of the environment and to outbreaks of vector-borne disease—that is, diseases spread by rodents and insects. The tasks of solid-waste management present complex technical challenges. They also pose a wide variety of administrative, economic, and social problems that must be managed and solved.

Disaster management:-

- Floods
- Earthquake
- Cyclone
- Landslides

Floods:-

Floods can be measured for height, peak discharge, area inundated, and volume of flow. These factors are important to judicious land use, construction of bridges and dams, and prediction and control of floods. Common measures of flood control include the improvement of channels, the construction of protective levees and storage reservoirs, and, indirectly, the implementation of programs of soil and forest conservation to retard and absorb runoff from storms.

The discharge volume of an individual stream is often highly variable from month to month and year to year. A particularly striking example of this variability is the flash flood, a sudden, unexpected torrent of muddy and turbulent water rushing down a canyon or gulch. It is uncommon, of relatively brief duration, and generally the result of summer thunderstorms or the rapid melting of snow and ice in mountains. A flash flood can take place in a single tributary while the rest of the drainage basin remains dry. The suddenness of its occurrence causes a flash flood to be extremely dangerous.

Earthquake:-

Earthquake, any sudden shaking of the ground caused by the passage of seismic waves through Earth's rocks. Seismic waves are produced when some form of energy stored in Earth's crust is suddenly released, usually when masses of rock straining against one another suddenly fracture and "slip." Earthquakes occur most often along geologic faults, narrow zones where rock masses move in relation to one another. The major fault lines of the world are located at the fringes of the huge tectonic plates that make up Earth's crust.

Little was understood about earthquakes until the emergence of seismology at the beginning of the 20th century. Seismology, which involves the scientific study of all aspects of earthquakes, has yielded answers to such long-standing questions as why and how earthquakes occur.

About 50,000 earthquakes large enough to be noticed without the aid of instruments occur annually over the entire Earth. Of these, approximately 100 are of sufficient size to produce substantial damage if their centres are near areas of habitation. Very great earthquakes occur on average about once per year. Over the centuries they have been responsible for millions of deaths and an incalculable amount of damage to property.

Cyclone:-

Cyclone, any large system of winds that circulates about a centre of low atmospheric pressure in a counterclockwise direction north of the Equator and in a clockwise direction to the south. Cyclonic winds move across nearly all regions of the Earth except the equatorial belt and are generally associated with rain or snow. Also occurring in much the same areas are anticyclones, wind systems that rotate about a high-pressure centre. Anticyclones are so called because they have a flow opposite to that of cyclones—i.e., an outward-spiralling motion, with the winds rotating clockwise in the Northern Hemisphere and counterclockwise in the Southern. These winds are usually not as strong as the cyclonic variety and commonly produce no precipitation. A brief treatment of cyclones follows. For full treatment, *see* climate: Cyclones and anticyclones.

Cyclones occur chiefly in the middle and high latitude belts of both hemispheres. In the Southern Hemisphere, where most of the terrestrial surface is covered by the oceans, cyclones are distributed in a relatively uniform manner through various longitudes. Characteristically, they form in latitudes 30° to 40° S and move in a generally southeasterly direction, reaching maturity in latitudes around 60°. The situation is quite different in the Northern Hemisphere. There, continental landmasses extend from the Equator to the Arctic, and large mountain belts interfere with the midlatitude air currents, giving rise to significant variations in the occurrence of cyclones (and anticyclones). Certain tracks are favoured by the wind systems. The principal cyclone tracks lie over the oceans, regularly traversing to the east of both mountain barriers and continental coastlines.

Landslides:-

A landslide is the movement of rock, earth, or debris down a sloped section of land. Landslides are caused by rain, earthquakes, volcanoes, or other factors that make the slope unstable.

Geologists, scientists who study the physical formations of the Earth, sometimes describe landslides as one type of mass wasting. A mass wasting is any downward movement in which the Earth's surface is worn away. Other types of mass wasting include rockfalls and the flow of shore deposits called alluvium.

Near populated areas, landslides present major hazards to people and property. Landslides cause an estimated 25 to 50 deaths and $3.5 billion in damage each year in the United States.

UNIT-5

SOCIAL ISSUES & IN THE ENVIRONMENT

CLIMATE CHANGE:

- Global climate change has already had observable effects on the environment. Glaciers have shrunk, ice on rivers and lakes is breaking up earlier, plant and animal ranges have shifted and trees are flowering sooner.
- Effects that scientists had predicted in the past would result from global climate change are now occurring: loss of sea ice, accelerated sea level rise and longer, more intense heat waves.

GLOBAL WARMING:

- **Global warming** is the long-term heating of Earth's **climate** system observed since the pre-industrial period (between 1850 and 1900) due to human activities, primarily fossil fuel burning, which increases heat-trapping greenhouse gas levels in Earth's atmosphere.

ACID RAIN:

- **Acid rain**, or **acid deposition**, is a broad term that includes any form of **precipitation** with **acidic** components, such as sulfuric or nitric **acid** that fall to the ground from the atmosphere in wet or dry forms. This can include **rain**, snow, fog, hail or even dust that is **acidic**.

OZONE LAYER:

- The **ozone layer** is a thin part of the Earth's atmosphere that absorbs almost all of the sun's harmful ultraviolet light. "**Ozone** holes" are popular names for areas of damage to the **ozone layer**. This is inaccurate. **Ozone layer** damage is more like a really thin patch .

DEPLETION:

- **Depletion** is an accrual accounting technique used to allocate the cost of extracting natural resources such as timber, minerals, and oil from the earth. Like depreciation and amortization, **depletion** is a non-cash expense that lowers the cost value of an asset incrementally through scheduled charges to income

WASTELAND RECLAMATION:

- **Wasteland reclamation**
  Reclamation of **wasteland** means re-claiming it or to use it for productive purpose. **Wasteland reclamation** is the process of turning barren, sterile **wasteland** into something that is fertile and suitable for habitation and cultivation.

CONSUMERISM:

- **Consumerism** is a social and economic order that encourages the acquisition of goods and services in ever-increasing amounts. With the industrial revolution, but particularly in the 20th century, mass production led to overproduction—the supply of goods would grow beyond consumer demand, and so manufacturers turned to planned obsolescence and advertising to manipulate consumer spending

WASTE PRODUCT:

- **waste product** - any materials unused and rejected as worthless or unwanted; "they collect the **waste** once a week"; "much of the **waste** material is carried off in the sewers" **waste**, **waste** material, **waste** matter.

USE & THROW PLASTICS:

- Single-**use plastics**, commonly known as 'one-**use plastics**', are the **use**-and-**throw** types of **plastic** that are mainly used for packaging and other daily routine activities. They are easy to produce, **use** less resources and are not expensive at all.

ENVIRONMENT PROTECTION ACT:

- The **Environment** (**Protection**) **Act**, 1986 authorizes the central government to **protect** and improve **environmental** quality, control and reduce pollution from all sources, and prohibit or restrict the setting and /or operation of any industrial facility on **environmental** ground.

THE AIR PREVENTION AND CONTROL OF POLLUTION :

- The **Act** provides for the **prevention**, **control** and abatement of **air pollution**. ... It also provides for the establishment of Boards with a view to carrying out the aforesaid purposes

THE WATER (PREVENTION & CONTROL OF POLLUTION :

- An Act to provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water, for the establishment, with a view to carrying out the purposes aforesaid, of Boards for the prevention and control of water pollution, for conferring on and assigning to such Boards powers.

WILD LIFE PROTECTION ACT:

- he **Wild Life Protection Act, 1972** is an Act of the Parliament of India enacted for protection of plants and animal species. Before 1972, India had only five designated national parks. Among other reforms, the Act established schedules of protected plant and animal species; hunting or harvesting these species was largely outlawed. [1] The Act provides for the protection of wild animals, birds and plants; and for matters connected there with or ancillary or incidental thereto. It extends to the whole of India.

FOREST CONSERVATION ACT:

- An Act to provide for the conservation of forests and for matters connected therewith or ancillary or incidental thereto. This Act may be called the Forest (Conservation) Act, 1980.
- It extends to the whole of India except the State of Jammu and Kashmir.

POPULATION EXPLOISION:

- the rapid increase in numbers of a particular species, especially in the world's human **population** since the end of World War II, attributed to an accelerating birthrate, a decrease in infant mortality, and an increase in life expectancy.

FAMILY WELFARE PROGRAMMES:

- **Family Welfare Programmes** Mainly include: **Family** planning information, counselling and services to women for healthy reproduction. Education about safe delivery and post delivery of the mother and the baby and the treatment of women before pregnancy.

HUMAN RIGHTS:

- Human rights are moral principles or norms that describe certain standards of human behaviour and are regularly protected in municipal and international law.They are commonly understood as inalienable, fundamental rights "to which a person is inherently entitled simply because she or he is a human being and which are "inherent in all human beings regardless of their age, ethnic origin, location, language, religion, ethnicity, or any other status.They are applicable everywhere and at every time in the sense of being universal, and they are egalitarian in the sense of being the same for everyone.