Environment studies (161MN205)

Module-I

Our environment provides us with a variety of goods and services necessary for our day to day lives. These **natural resources** include, air, water, soil, minerals, along with the climate and solar energy, which form the non-living or **'abiotic'** part of nature. The **'biotic'** or living parts of nature consist of plants and animals, including microbes. Plants and animals can only survive as communities of different organisms, all closely linked to each in their own **habitat**, and requiring specific abiotic conditions. Thus, forests, grasslands, deserts, mountains, rivers, lakes and the marine environment all form habitats for specialized communities of plants and animals to live in. Interactions between the abiotic aspects of nature and specific living organisms together form **ecosystems** of various types. Many of these living organisms are used as our food resources. Others are linked to our food less directly, such as pollinators and dispersers of plants, soil animals like worms, which recycle nutrients for plant growth, and fungi and termites that break up dead plant material so that micro-organisms can act on the detritus to reform soil nutrients.

Meaning of environment

`Everything surrounds us may be referred to as the environment'

It is the sum total of external conditions within which an object, organism or community exists. It is the complex of physical, chemical and biotic factors (climate, soil & living things etc.) that act upon an organism and ultimately determine its form and survival.

SCOPE OF ENVIRONMENTAL MANAGEMENT

The environment Management is related with

- science, economics, geography, technology, population and health education, etc.
- It helps to develop integrated knowledge and feeling of co- operation in the students. As a result environment education becomes practical and contextual.
- Environment management can be implemented through formal and non-formal educational means. The basic concepts of ecology, natural resources, population environmental health etc are some of the subject matters in this subject.
- The environment management helps students to develop integrated knowledge and attitude which will be more effective to the society**.**

Thus, the scope of environmental management can be divided into biological, physical and sociological aspects.They are described below:
>**Biological aspect**: Biological aspects is one of the most important aspects of environmental education. Human being, animals, birds, insects, microorganism, plants are some of the examples of biological aspects.

>Physical aspect: It can be further divided into natural aspects and human- made aspects. Air, water, land, climate etc are included in natural physical aspects. Likewise, Human made physical aspects cover all human made things such as roads, buildings, bridges, houses etc.

>Socio- cultural aspect: Socio- cultural aspects are man-made social practices, rules and laws, and other religious places etc. Human beings have created them with their effort.

The Seven Environmental Principles

1. Everything is connected to everything else

The intricate relationships of various elements of the ecosystem bind the components together into one functional unit.

- The trees in the forest are home to ferns, orchids, birds, insects and mammals.
- When these plants and animals die, their products after decomposition contribute to soil fertility.
- Plants provide oxygen to animals for aerobic respiration while animals furnish carbon dioxide to plants for
- The living component of the ecosystem affects and is affected by the abiotic components, such as air, temperature, land.

- All these relationships provide dependencies, check and balances that compose the details of our life-support systems.

2**. All forms of life are important**

- All living organisms were created for a purpose in relation to humans with other species on earth and global ecosystem in general.

- The variety of life forms called biological diversity contributes to the stability of the environment.

- Food webs, food chains and ecological relationships link plants and animals together in the web of life.

- Even bacteria, insects, snakes and rats have ecological functions even though humans perceive them as parasites or pests.

- **3. Everything must go somewhere**.

- By-products of consumption go back to the environment. Everything that we throw away – pieces of paper, left-over food, peelings of fruits, plastic wrappers, and used containers – have to go somewhere.

- It is the law of nature that the by-products of metabolism return to the soil, acted upon first by worms, bacteria and fungi, and then converted into minerals, to be again absorbed by plants and eaten by animals. In short, they enter into a material cycle that is an integral part of the ecosystem.

- But what happens if what we throw is an artificial product such as plastic? Then natural bacteria can not recognize them and may not be capable of breaking them apart. These non-biodegradable products must enter another material cycle – the one that goes to the factory to be manufactured into a new product.

- Thus the retrieval, collection and recycling of these materials become necessary so that they do not pollute land water and habitats.

4. Nature knows best.

- Nature manifests certain processes that enable it to maintain balance and remain in a state of equilibrium.

- The flow of energy from the sun enables light to be converted into sugar in plants through photosynthesis, and later for consumer organisms to obtain energy from plant starch.

- Food chains and food webs allow transfer of energy from producers and consumers and provide the means for all living organisms to acquire nutrition.

- Population control also occurs naturally through predator – prey relationships. Thus equilibrium in the ecosystem is maintained.

5. Nature is beautiful and we are stewards of God's creation.

- Creation presupposes the existence of a Creator. The beautiful nature around us, perfect by itself, has deteriorated due to the negative impacts of human use.

- This principle suggests how a Human-Creator relationship is translated in our attitude towards creation.

6. Everything changes.

- Changes in the biophysical world occur naturally. As they say, there is nothing more permanent in this world than change.

Consider the following examples.

- Metamorphosis of caterpillars to butterflies illustrates morphological changes that occur in living forms.
- The increase of vegetation on earth augmented the amount of oxygen in the atmosphere through time.
- Seasons are cyclic changes that contribute to the diversity of flowers, fruits, vegetables and other crops during the year.
- Random changes manifested by natural catastrophe such as typhoons destroy forests, coral reefs and mangrove.

TYPES OF ENVIRONMENT

1. **Physical Environment:** It includes aspect of natural environment such as climate, terrain, temperature, rainfall, flora, fauna, etc. Human races are greatly influenced by the climate. It affects colour, Physical and work efficiency of human being.
2. **Social –Cultural Environment:** It includes all aspects of cultural environment such as norms, customs, process of socialization, etc. It include all the aspects dealing with other people and their creations. It classifies society in to open and close society
3. **Environmental Orientations:** It refers to the beliefs that people hold about their environment. For example, some people hold environment equivalent to God and therefore they perceive all its aspects with respect and reverance and try to maintain it in a perfect form and do not degrade it.

4. **Environmental Behaviour:** It refers to the use of environment by people in the course of social interactions. For example, considering the environment as personal space, where

the individual identifies himself with it. It enables to understand personality of human being.

5. **Products of Behaviour:** These include the outcomes of people's actions such as homes, cities, dams, schools, etc. That is, these are products or outcomes dealing with the environment.

Environment and Its Components: The environment is defined as the whole physical and biological system surrounding man and other organisms along with various factors influencing them. The factors having influence are soil, air, water, light, temperature , all forms of life like plants, animals, microorganisms etc.

Man and Environment have very close relationship with each other. Thus, social life of man is affected by environment. This is the reason for various types of social and cultural activities around the world.

Hence, hilly people have different life styles than people in the plain area. Similarly people around the world differ in their food, cloth, festivals etc. All these are influenced by the factors around him.

The environment has three important components. These are:

1. **Physical**
2. **Biological**
3. **Social**

(a) The Physical component of environment

- It includes soil, water, air, climate, temperature, light etc. These are also called abiotic constituents of the environment.
- This part of the environment mainly determines the type of the habitat or living conditions of the human population.

This physical constituent of the environment is again divided into three parts.**These are:**

(i) Atmosphere (gas)- It includes air and other components of air which provides oxygen for respiration.

(ii) Hydrosphere (liquid) –It includes water which is required by all living organisms for their survival.

(iii) Lithosphere (solid) – It includes Soil which is most important for all living beings to create their habitat. It is the soil in which plant grows and man constructs houses to live in. It is the ground water present.

(iv) Biosphere: Biosphere is a space in entire atmosphere where biotic elements get convenient surrounding to complete their natural life cycle.

1) **Atmosphere:**

The atmosphere forms a protective shell over the earth. The lowest layer, the troposphere, the only part warm enough for us to survive in, is only 12 kilometers thick. The stratosphere is 50 kilometers thick and contains a layer of sulphates which is important for the formation of rain. It also contains a layer of ozone, which absorbs ultra-violet light known to cause cancer and without which, no life could exist on earth. The atmosphere is not uniformly warmed by the sun. This leads to air flows and variations in climate, temperature and rainfall in different parts of the earth. It is a complex dynamic system. If its nature is disrupted it affects all mankind. Most air pollutants have both global and regional effects.

Living creatures cannot survive without air even for a span of a few minutes. To continue to support life, air must be kept clean. Major pollutants of air are created by industrial units that release various gases such as carbon dioxide, carbon monoxide and toxic fumes into the air. Air is also polluted by burning fossil fuels. The buildup of carbon dioxide which is known as 'greenhouse effect' in the atmosphere is leading to current global warming. The growing number of scooters, motorcycles, cars, buses and trucks which run on fossil fuel (petrol and diesel) is a major cause of air pollution in cities and along highways.

Effect of atmosphere

- Oxygen for human respiration (metabolic requirements).
- Oxygen for wild fauna in natural ecosystems and domestic animals used by man as food.
- Oxygen as a part of carbon dioxide, used for the growth of plants (in turn are used by man).

2) **Hydrosphere:**

The hydrosphere covers three quarters of the earth's surface. A major part of the hydrosphere is the marine ecosystem in the ocean, while only a small part occurs in fresh water. Fresh water in rivers, lakes and glaciers, is perpetually being renewed by a process of evaporation and rainfall. Some of this fresh water lies in underground aquifers. Human activities such as deforestation create serious changes in the hydrosphere. Once land is denuded of vegetation, the rain erodes the soil which is washed into the sea.

Chemicals from industry and sewage find their way into rivers and into the sea. Water pollution thus threatens the health of communities as all our lives depend on the availability of clean water. This once plentiful resource is now becoming

Effect of Hydrosphere

- Clean water for drinking (a metabolic requirement for living processes.
- Water for washing and cooking.
- Water used in agriculture and industry.
- Food resources from the sea, including fish, Crustacea, sea weed, etc.
- Food from fresh water sources, including fish, crustacea and aquatic plants.
- Water flowing down from mountain ranges harnessed to generate electricity in hydroelectric projects.

3) Lithosphere

The lithosphere began as a hot ball of matter which formed the earth about 4.6 billion years ago. About 3.2 billion years ago, the earth cooled down considerably and a very special event took place - life began on our planet. The crust of the earth is 6 or 7 kilometers thick and lies under the continents. Of the 92 elements in the lithosphere only eight are common constituents of crustal rocks. Of these constituents, 47% is oxygen, 28% is silicon, 8% is aluminum, 5% is iron, while sodium, magnesium, potassium and

calcium constitute 4% each. Together, these elements form about 200 common mineral compounds. Rocks, when broken down, form soil on which man is dependent for his agriculture. Their minerals are also the raw material used in various industries.

Effect of Lithosphere

- Soil, the basis for agriculture to provide us with food.
- Stone, sand and gravel, used for construction.
- Micronutrients in soil, essential for plant growth.
- Microscopic flora, small soil fauna and fungi in soil, important living organisms of the lithosphere, which break down plant litter as well as animal wastes to provide nutrients for plants.
- A large number of minerals on which our industries are based.
- Oil, coal and gas, extracted from underground sources. It provides power for vehicles, agricultural machinery, industry, and for our homes.

4) **Biosphere:**

This is the relatively thin layer on the earth in which life can exist. Within it the air, water, rocks and soil and the living creatures, form structural and functional ecological units, which together can be considered as one giant global living system, that of our Earth itself. Within this framework, those characterized by broadly similar geography and climate, as well as communities of plant and animal life can be divided for convenience into different bio geographical realms. These occur on different continents. Within these, smaller bio geographical units can be identified on the basis of structural differences and functional aspects into distinctive recognizable ecosystems, which give a distinctive character to a landscape or waterscape. Their easily visible and identifiable characteristics can be described at different scales such as those of a country, a state, a district or even an individual valley, hill range, river or lake. The simplest of these ecosystems to understand is a pond. It can be used as a model to understand the nature of any other ecosystem and to appreciate the changes over time that are seen in any ecosystem. The structural features of a pond include its size, depth and the quality of its water. The periphery, the shallow part and the deep part of the pond, each provide specific conditions for different plant and animal communities. Functionally, a variety of cycles

such as the amount of water within the pond at different times of the year, the quantity of nutrients flowing into the pond from the surrounding terrestrial ecosystem, all affect the 'nature' of the pond.

Effect of Biosphere

• Food, from crops and domestic animals, providing human metabolic requirements.

• Food, for all forms of life which live as interdependent species in a community and form food chains in nature on which man is dependent.

• Energy needs: Biomass fuel wood collected from forests and plantations, along with other forms of organic matter, used as a source of energy.

• Timber and other construction materials.

Man environment Relationship

Man cannot be considered in isolation from his environment. Over the world, the needs of people still differ enormously.

At one time, the environmental problems debated in international organizations would predominantly have been those recognized by the developed countries—the need to control pollution and the desirability of conserving samples of the ecological and genetic richness and the natural beauty of the earth.

Since the United Nations Conference of the Human Environment, however, it has been increasingly realized that and that over much of the world the environ-mental problems are still those associated with poverty—poor housing, bad public health, malnutrition and inadequate employment.

Both the creation and the recognition of environmental problems depend on Changes on the relationship between man and his physical environment depends to a large degree on changes in the aims of society.

Changes on the relationship between man and his physical environment depend to a large degree on changes in the organisation and aims of society.

The net effect of these changes, particularly during the second half of the twentieth century, was an increase in exposure to many hazards and increased potential for catastrophic losses.

Changes in human and environment relationship happen due to:-

1. Over-Exploitation of Natural Resources:

Mining of earth resources, large scale urbanisation, network of roadways were built at the cost of fertile agriculture or forest lands.

Inundation of millions of acres of land, villages and human settlements by dams and hydroelectric projects are glaring examples of the cost of human progress

2. Intervention with Biogeochemical Cycles:

CO_2 - cycles maintaining the steady state environmental conditions and, therefore, sustaining life on earth, have been drastically interfered by man for need as well as greed.

3. Pollution of the Environment:

Anthropogenic pollution of air, water and land has taken colossal dimensions. Man is constantly increasing the greenhouse gases in the atmosphere by which Comfort seeking modern humans are paving the way of O_3 layer depletion.

Man is dumping industrial and city sewage wastes into lakes, rivers and seas. Toxic chemicals used in modern agriculture for combating pests, diseases and weeds plus synthetic fertilizers are silently killing useful microbes maintaining the biogeochemical cycles, useful insects, birds, butterflies of the forests and fishes in the streams and lakes.

Causes of Environmental Destruction/Destruction

It is defined as any change or disturbance to the environment perceived to be deleterious or undesirable.

It is indicated by the equation; I=PAT

This equation represents:-

(I) ,environmental impact or degradation is caused by the combination of an already very large and increasing human population

(P), continually increasing economic growth or per capita affluence

(A), the application of depletig resource

(T), polluting

Environmental degradation implies the deterioration of the environment through depletion of resources such as air, water and soil; the destruction of ecosystems; habitat destruction; the extinction of wildlife; pollution and technology.

Causes of environmental destruction

Environmental changes are based on many factors including:

A) Urbanization

B) Population growth

c) Economic growth

d) Intensification of agriculture

e) Increase in energy use

f) Increase in transportation

The primary cause of environmental degradation is human disturbance. The degree of the environmental impact varies with the cause, the habitat, and the plants and animals that inhabit it. There are a number of ways in which environmental degradation works. Air, water, and soil are all resources which are vulnerable to depletion through overuse, as are natural resources like minerals and oil deposits.

Habitat pressures which force animals into a small area can also contribute to environmental degradation. Pollution is another cause of environmental degradation. When the environment becomes polluted, it means that toxic substances have rendered it unhealthy. Pollution can come from a variety of sources, including vehicle emissions, agricultural runoff, and accidental chemical release from factories and poorly managed harvesting of natural resources.

Humans and their activities are a major source of environmental degradation. They is prime elements of:-

1. Water and Air Pollution

Water and air pollution are unfortunately the common causes of environmental degradation.

Pollution introduces contaminants into the environment that can maim or even kill plant and animal species. The two often go hand in hand.

2. Acid Rain

Acid rain occurs when sulphur dioxide from coal plant emissions combines with moisture present in the air. A chemical reaction creates this acid precipitation. Acid rain can acidify and pollute lakes and streams. It causes similar effects to the soil.

According to the U.S. Environmental Protection Agency (EPA), if enough acid rain falls in a given environment, it can acidify the water or soil to a point where no life can be sustained. Plants die off. The animals that depend upon them disappear. The condition of the environment deteriorates.

3-Agricultural Runoff

Farming creates agriculture runoff issues. Agricultural runoff is a deadly source of pollutants which can degrade environments, so much so that the EPA identifies agriculture as the primary source of water pollution. Surface water washes over the soil and into lakes and streams. When it does so, it carries the fertilizers and pesticides used on the farm lands in to water resources. Introducing poisons into waterways will have dire consequences. Fertilizers, whether or not they are organic, carry equal risks. Fertilizers containing large amounts of phosphorus can cause explosions of algae in lakes. As the algae die, bacteria start to breakdown the organic material. It soon develops into a situation where bacteria are using up the available dissolved oxygen in the water. Plants, fish, and other organisms begin to die off.

4. Urban Development

According to many noted ecologists, urban development is one of the primary causes of environmental degradation. As populations increased, so did the need for land for homes and farms. Wetlands were drained. Grasslands were ploughed over.

5. Natural Sources

While environmental degradation is most commonly associated with the activities of humans, the fact is that environments are also constantly changing over time. With or without the impact of human activities, some ecosystems degrade over time to the point where they cannot support the life that is "meant" to live there.

Environmental Ethics

Ethics (the ancient Greek word **"ethikos"** meaning arising from habit) is the study of value or quality, and it is a major branch of philosophy. Ethics are concerned with what is right and what is wrong, irrespective of the culture and society. For example, it is ethical to have reverence for all forms of life and any killing is unethical.

Moral principles that try to define one's responsibility towards the environment are called **"environmental ethics"** or 'environmental philosophy' and the natural environment.

This field emerged most significantly in the year 1960 from an increasing awareness of the global environment condition.

Elements of Environmental Ethics

Environmental ethics focuses on questions concerning how we ought to inhabit the world. what constitutes a good life or a good society; and who, where, or what merits of moral standing. It seeks to address questions such as

a) How a moral outcome can be achieved in a specific situation (applied ethics),

b) How moral values should be determined (normative ethics),

c) Which morals people actually hold to (descriptive ethics), and so on.

It has been applied to analyse human use of Earth's limited resources. This has led to the study of environmental ethics and social ecology.

Moral Consideration

- Who or what qualifies for moral consideration or direct moral standing, and what does that consideration entail?
- How are we, as moral agents, obliged to act toward or with other humans, all other living beings, and ecological systems, or to the world as a whole?
- Answers to these questions reveal much about how we see our responsibilities to non-human others, both individual and collective, and to the well-being of future generations.
- A primary conceptual differentiation in environmental ethics is whether humans are at the center of a circle of moral consideration or not, and who or what is allowed in the circle with us.
- Much argument in environmental ethics concerns how far the circle may be extended.

Role in center stage of environmental Ethics

a) Anthropocentrists draw the line for direct moral standing at all, but only, humans. They believe only human beings are capable enough to protect the environment and handle problems related to it.

b) Zoocentrists allow for the inclusion of various nonhuman animals, but argue over the foundation for that inclusion, with some suggesting it is the ability to experience pleasure and pain that nets animals moral standing, others that it is the fact that they are experiencing subjects-of-a-life.

c) Biocentrists enlarge the circle to all individual living beings—plants and animals—and out of necessity, they begin to plot ways to sort out the inevitable competing moral claims made by the now crowded moral community.

d) Ecocentrists expand the circle to include ecological collectives (i.e.,species, populations, biotic communities, etc.), often focusing on the metaphysical inseparability of an organism from its associated species and from the land that supports it. Though we are often unaware of it, assumptions about the moral standing of the human and nonhuman world underpin much of public decision making, from various environmental policies to management directions.

Environmental Cultures:

A cultural environment is a set of beliefs, practices, customs and behaviors that are found to be common to everyone that is living within a certain population.

A cultural environment is a set of beliefs, practices, customs and behaviors that are found to be common to everyone that is living within a certain population. Cultural environments shape the way that every person develops, influencing ideologies and personalities. Cultural environments are determined by the culmination of many different aspects of culture that influence personal choices and behaviors.

Religious beliefs are an important building block of a specific cultural environment. For many cultures, a certain religion has been a critical part of everyday living for generations. Outsiders need to be aware of the customs and traditions related to specific religion in order to respectfully navigate a certain cultural environment.

Family and the relationship within the family are additional factors that determine a cultural environment. Many cultures are structured around families, while others promote individuality and self-sustainability. Like religion and family, language is the third most important element of a cultural environment. Outside of these components, educational and social systems affect the structure of a cultural environment. Social systems may determine customs or taboos that are important to a particular region, while education may determine what types of ideologies are publicly shared. When visiting a new country or region, it is important for visitors to understand the cultural environment in order to protect themselves from shame, embarrassment or the act of offending a stranger.

Features of Environment culture

1. Every species has a right to live or at least struggle to live. Simply because it exists.

2. We should work to preserve as much of the earth's genetic variety as possible because it is the raw material for all future evolution.

3. We have the right to defend ourselves against individuals of species that do us harm and to use individuals of species to meet our vital needs but we should strive not to cause premature extinction of any wild species.

4. The best way to protect species and individuals of species is to protect the ecosystem in which they live and to help restore those we have degraded.

5. No human culture should b Individual Responsibility:

Guide to Environment culture

1. We should not inflict unnecessary suffering or pain on any animal we raise or hunt for food or use for scientific or other purposes.

2. We should use no more of the earth's resources than we need and not waste such resources.

3. We should leave the earth as good as—or better—than we found it.

4. We should work with the earth to help heal ecological wounds we have inflicted extinct because of our actions. What is Environmental Awareness?

Environment Awareness

To define environmental awareness we must first understand the environmentalist movement. Environmentalism is an ideology that evokes the necessity and responsibility of humans to respect, protect, and preserve the natural world from its anthropogenic (caused by humans) afflictions.

Environmental awareness is an integral part of the movement's success. By teaching our friends and family that the physical environment is fragile and indispensable we can begin fixing the problems that threaten it.

Resource of Environmental Awareness

Numerous resources are available to promote environmental awareness; Group learning (in or outside of class), Informational and inspirational seminars, such as our Awakening the Dreamer Program, and Environmental books and brochures are just a few of the tools that can get you involved in promoting the environment.

Module-II

Environmental issues and controlling measures

Human population size has grown enormously over the last hundred years. This means increase in demand for food, water, home, electricity, roads, automobiles and numerous other commodities. These demands are exerting tremendous pressure on our natural resources, and are also contributing to pollution of air, water and soil. The need of the hour is to check the degradation and depletion of our precious natural resources and pollution without halting the process of development.

Air Pollution and its control

We are dependent on air for our respiratory needs. Air pollutants cause injury to all living organisms.

Effect of Air Pollution

They reduce growth and yield of crops and cause premature death of plants.

Air pollutants also deleteriously affect the respiratory system of humans and of animals. effects depend on the concentration of poll

Source of Air Pollution

1) Smokestacks of thermal power plants,

2) Smelters and

3) Other industries

4) Automobile

5) Noise

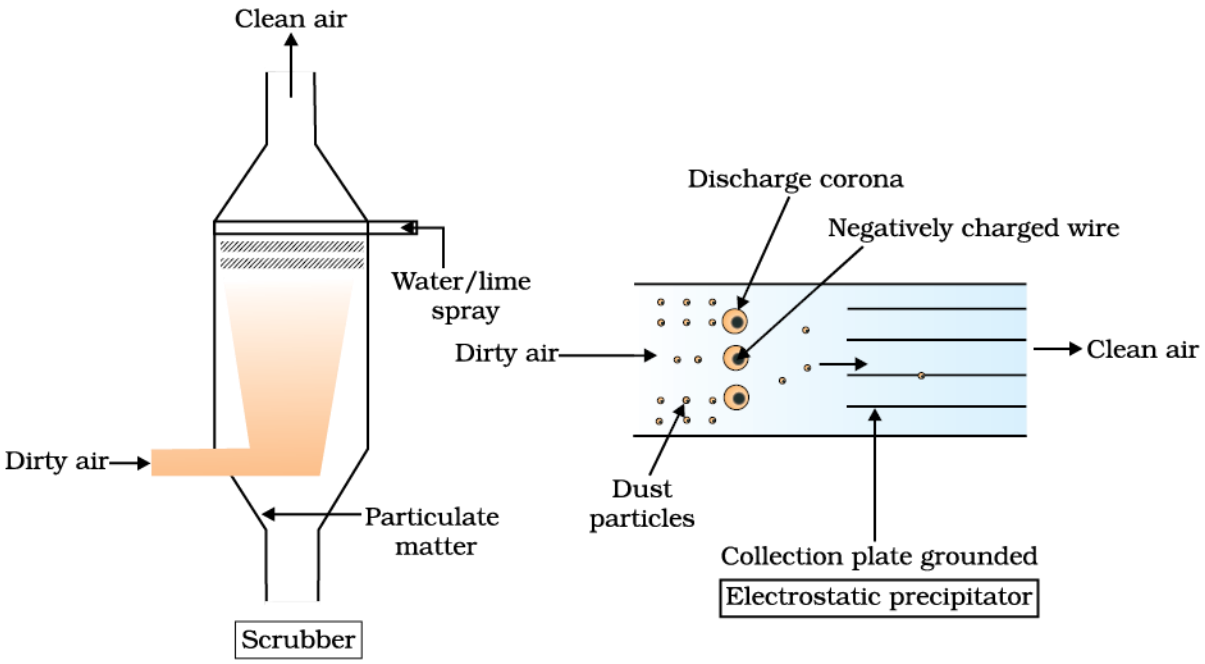
They release particulate and gaseous air pollutants together with harmless gases, such as nitrogen, oxygen, etc. These pollutants must be separated/filtered out before releasing the harmless gases into the atmosphere. Unfiltered particulate causes fatigue and, neurological problem.

According to Central Pollution Control Board (CPCB), particulate size 2.5 micrometers or less in diameter (PM 2.5) are responsible for causing the greatest harm to human health. These fine particulates can be inhaled deep into the lungs and can cause breathing and respiratory symptoms, irritation, inflammations and damage to the lungs and premature deaths, utants, duration of exposure and the organism. Measures to minimise Air Pollution

There are several ways of removing particulate matter;

The most widely used of which is the electrostatic precipitator (Figure), which can remove over 99 per cent particulate matter present in the exhaust from a thermal power plant. It has electrode wires that are maintained at several thousand volts, which produce a corona that releases electrons. These electrons attach to dust particles giving them a net negative charge. The collecting plates are grounded and attract the charged dust particles. The velocity of air between the plates must be low enough to allow the dust to fall. A scrubber (Figure in) can remove gases like sulphur dioxide. In a scrubber, the exhaust is passed through a spray of water or lime.

Recently we have realised the dangers of particulate matter that are very very small and are not removed by these precipitators.



Automobiles

Automobiles are a major cause for atmospheric pollution at least in the metro cities. As the number of vehicles increase on the streets, this problem is now shifting to the other cities too. Proper maintenance of automobiles along with use of lead-free petrol or diesel can reduce the pollutants they emit. Catalytic converters, having expensive metals namely platinum-palladium and rhodium as the catalysts, are fitted into automobiles for reducing emission of poisonous gases. As the exhaust passes through the catalytic converter, unburnt hydrocarbons are converted into carbon dioxide and water, and carbon monoxide and nitric oxide are changed to carbon dioxide and nitrogen gas, respectively. Motor vehicles equipped with catalytic converter should use unleaded petrol because lead in the petrol inactivates the catalyst.

Noise

Considering the many dangerous effects of noise pollution can you identify the unnecessary sources of noise pollution around you which can be reduced immediately without any financial loss to anybody?

Measures to check noise pollution

Reduction of noise in our industries can be affected by use of sound-absorbent materials or by muffling noise. Stringent following of laws laid down in relation to noise like; delimitation of horn-free zones around hospitals and schools, permissible sound-levels of crackers and of loudspeakers, timings after which loudspeakers cannot be played, etc.,

These measures need to be enforced to protect ourselves from noise pollution

Water Pollution and its control

Human beings have been abusing the water-bodies around the world by disposing into them all kinds of waste. We tend to believe that water can wash away everything not taking cognizance of the fact that the water bodies are our lifeline as well as that of all other living organisms.

Can you list what all we tend to try and wash away through our rivers and drains? Due to such activities of human kind, the ponds, lakes, stream, rivers, estuaries and oceans are becoming polluted in several parts of the world.

Realising the importance of maintaining the cleanliness of the water bodies, the Government of India has passed the Water (Prevention and Control of Pollution) Act, 1974 to safeguard our water resources...

Water pollutant-

I (Sewage water)

As we work with water in our homes in the cities and towns, we wash everything into drains.

Have you ever wondered where the sewage that comes out of our houses go? What happens in villages? Is the sewage treated before being transported to the nearest river and mixed with it?

A mere 0.1 per cent impurities make domestic sewage unfit for human use (Figure in slid).

Solids are relatively easy to remove, what is most difficult to remove are dissolved salts such as nitrates, phosphates, and other nutrients, and toxic metal ions and organic compounds.

Domestic sewage primarily contains biodegradable organic matter, which readily decomposes – thanks to bacteria and other micro-organisms, which can multiply using these organic substances as substrates and hence utilize some of the components of sewage.

It is possible to estimate the amount of biodegradable organic matter in sewage water by measuring Biochemical Oxygen Demand (BOD). Can you explain how?

It is known fact that micro-organisms.

II Algal bloom)

Presence of large amounts of nutrients in waters also causes excessive growth of planktonic (free-floating) algae, called an algal bloom (Figure in slide) which imparts a distinct colour to the water bodies. Algal blooms cause deterioration of the water quality and fish mortality. Some bloom-forming algae are extremely toxic to human beings and animals

These plants which were introduced into India for their lovely flowers have caused havoc by their excessive growth by causing blocks in our waterways. They grow faster than our ability to remove them. These are plants of water hyacinth (Eichhornia crassipes), the world's most problematic aquatic weed, also called 'Terror of Bengal'. They grow abundantly in eutrophic water bodies, and lead to an imbalance in the ecosystem dynamics of the water body. have the relation between BOD.

iii- industrial waste

Unlike domestic sewage, waste water from industries like petroleum, paper manufacturing, metal extraction and processing, chemical manufacturing, etc., often contain toxic substances, notably, heavy metals (defined as elements with density > 5 g/cm3 such as mercury, cadmium, copper, lead, etc.) and a variety of organic compounds.

A few toxic substances, often present in industrial waste waters, can undergo biological magnification (Bio-magnification) in the aquatic food chain. Bio-magnification refers to increase in concentration of the toxicant at successive trophic levels. This happens because a toxic substance accumulated by an organism cannot be metabolized or excreted, and is thus passed on to the next higher trophic level. This phenomenon is well known for mercury and DDT.

Soil Pollution

With the rise of concrete buildings and roads, one part of the Earth that we rarely see is the soil. It has many different names, such as dirt, mud and ground. However, it is definitely very important to us. The plants that feed us grow in soil and keeping it healthy is essential to maintaining a beautiful planet. However, like all other forms of nature, soil also suffers from pollution. The pollution of soil is a common thing these days, and it happens due to the presence of man made elements.

The main reason why the soil becomes contaminated is due to the presence of man made waste. The waste produced from nature itself such as dead plants, carcasses of animals and rotten fruits and vegetables only adds to the fertility of the soil. However, our waste products are full of chemicals that are not originally found in nature and lead to soil pollution. -known for mercury and DDT.

Main Causes of Soil Pollution

1. Industrial Activity:- Industrial activity has been the biggest contributor to the problem in the last century, especially since the amount of mining and manufacturing has increased. Most industries are dependent on extracting minerals from the Earth. Whether it is iron ore or coal, the by products are contaminated and they are not disposed off in a manner that can be considered safe. As a result, the industrial waste lingers in the soil surface for a long time and makes it unsuitable for use.

2. Agricultural Activities

Chemical utilization has gone up tremendously since technology provided us with modern pesticides and fertilizers. They are full of chemicals that are not produced in nature and cannot be broken down by it. As a result, they seep into the ground after they mix with water and slowly reduce the fertility of the soil. Other chemicals damage the composition of the soil and make it easier to erode by water and air. Plants absorb many of these pesticides and when they decompose, they cause soil pollution since they become a part of the land.

2. Waste Disposal

Finally, a growing cause for concern is how we dispose of our waste. While industrial waste is sure to cause contamination, there is another way in which we are adding to the pollution. Every human produces a certain amount of personal waste products by way or urine and feces.

While much of it moves into the sewer the system, there is also a large amount that is dumped directly into landfills in the form of diapers. Even the sewer system ends at the landfill, where the biological waste pollutes the soil and water. This is because our bodies are full of toxins and chemicals which are now seeping into the land and causing pollution of soil.

4. Accidental Oil Spills

Oil leaks can happen during storage and transport of chemicals. This can be seen at most of the fuel stations. The chemicals present in the fuel deteriorate the quality of soil and make them unsuitable for cultivation. These chemicals can enter into the groundwater through soil and make the water undrinkable.

4. Acid Rain

Acid rain is caused when pollutants present in the air mixes up with the rain and fall back on the ground. The polluted water could dissolve away some of the important nutrients found in soil and change the structure of the soil.

Effects of Soil Pollution

1. Effect on Health of Humans

Considering how soil is the reason we are able to sustain ourselves, the contamination of it has major consequences on our health. Crops and plants grown on polluted soil absorb much of the pollution and then pass these on to us. This could explain the sudden surge in small and terminal illnesses.

Long term exposure to such soil can affect the genetic make-up of the body, causing congenital illnesses and chronic health problems that cannot be cured easily. In fact, it can sicken the livestock to a considerable extent and cause food poisoning over a long period of time. The soil pollution can even lead to widespread famines if the plants are unable to grow in.

2. Effect on Growth of Plants

The ecological balance of any system gets affected due to the widespread contamination of the soil. Most plants are unable to adapt when the chemistry of the soil changes so radically in a short period of time. Fungi and bacteria found in the soil that bind it together begin to decline, which creates an additional problem of soil erosion.

The fertility slowly diminishes, making land unsuitable for agriculture and any local vegetation to survive. The soil pollution causes large tracts of land to become hazardous to health. Unlike deserts, which are suitable for its native vegetation, such land cannot support most forms of life.

3. Decreased Soil Fertility

The toxic chemicals present in the soil can decrease soil fertility and therefore decrease in the soil yield. The contaminated soil is then used to produce fruits and vegetables which lacks quality nutrients and may contain some poisonous substance to cause serious h

4.Toxic Dust

The emission of toxic and foul gases from landfills pollutes the environment and causes serious effects on health of some people. The unpleasant smell causes inconvenience to other people.

5. Changes in Soil Structure

The death of many soil organisms (e.g. earthworms) in the soil can lead to alteration in soil structure. Apart from that, it could also force other predators to move to other places in search of food.

A number of ways have been suggested to curb the current rate of pollution. Such attempts at cleaning up the environment require plenty of time and resources to be pitched in. Industries have been given regulations for the disposal of hazardous waste, which aims at minimizing the area that becomes polluted.Organic methods of farming are being supported, which do not use chemical laden pesticides and fertilizers. Use of plants that can remove the pollutants from the soil is being encouraged. However, the road ahead is quite long and the prevention of soil pollution will take many more years.

Causes, effects and management of nuclear hazards and industrial wastes.

The spontaneous emission of particles and rays by an unstable nucleus is called Radioactivity and such substances are called Radioactive Substances eg. Radium, Uranium, Thorium. Radioactive pollution can be defined as the release of radioactive substances or high-energy particles into the air water, or earth as a result of human activity, either by accident or by design. Sometimes natural sources of radioactivity, such as radon gas emitted from beneath the ground, are considered pollutants when they become a threat to human health.

The sources of Radioactive wastes are:

1) Natural sources: Solar radiation, Radionuclides in the earth Crust, Human Internal radiation, environmental Radiations.

2) Anthropogenic Sources: The sources of such waste include :

a) Nuclear weapon testing or detonation;

b)The nuclear fuel cycle, including the mining, separation, and production of nuclear materials for use in nuclear power plants or nuclear bombs;

c) Accidental release of radioactive material from nuclear power plant.

Types of radioactive waste:

a)Low level Waste (LLW) is generated from hospitals and industry, as well as the nuclear fuel cycle. It comprises paper, rags, tools, clothing, filters etc which contain small amounts of mostly short-lived radioactivity. It does not require shielding during handling and transport and is suitable for shallow land burial. To reduce its volume, it is often compact

b)Transuranic Waste arises mainly from weapons production, and consists of clothing, tools, rags, residues, debris and other such items contaminated with small amounts of radioactive elements -- mostly plutonium. These elements have an atomic number greater than uranium -- thus transuranic (beyond uranium). Because of the long half-lives of these elements, this waste is not disposed of as either low level or intermediate level waste. It does not have the very high radioactivity of high level waste, nor its high heat generation. The United States currently permanently disposes of transuranic waste at the ed or incinerated before disposal.

c) High level Waste (HLW) arises from the use of uranium fuel in a nuclear reactor and nuclear weapons processing. It contains the fission products and transuranic elements generated in the reactor core. It is highly radioactive and hot. It can be considered the "ash" from "burning" uranium. HLW accounts for over 95% of the total radioactivity produced in the process of nuclear electricity generation.

The possible general effects of radioactive wastes are categorised into ;-

1) Somatic Effect

2) Genetic Effect

3) Bio-magnification

Somatic effect: Affects somatic cells. It appears within individual and disappears with the death of the individual. **Immediate effects**: Anaemia, Reduced immune response, Haemorrhage , skin burn, mouth ulcers , CNS Damage .**Delayed effects** : Eye cataract, Leukemia, Cardiovascular disease, Premature ageing ,Reduced life span , reduction of fertility

Genetic Effects: The radiation affects the genes of the gamete cells. The changes are not apparent in the individual. The effects are exhibited by offspring and in the subsequent generations. They affect the DNA, RNA replication and chromosome. It causes

• Mutation

• Chromosomal aberration

• Chromosomal fragmentation

• Inhibition of RNA, DNA synthesis

Control of Radioactive pollution

The main objective in managing and disposing of radioactive (or other) waste is to protect people and the environment. This means isolating or diluting the waste so that the rate or concentration of any radionuclides returned to the biosphere is harmless. To achieve this for the more dangerous wastes, the preferred technology to date has been deep and secure burial. Transmutation, long-term retrievable storage, and removal to space have also been suggested.

• Nuclear devices should never be exploded in air. If these activities are extremely necessary they should be exploded underground.

• In nuclear reactions, closed-cycle coolant system with gaseous coolants of very high purity may be used to prevent extraneous activation products.

• In nuclear and chemical industries, the use of radio-isotopes may be carried under a set of soil or water instead of power or gaseous forms.

• In Nuclear mines, wet drilling may be employed along the underground drainage.

• Nuclear reactors must be enclosed in broad concrete walls to prevent the radiations that emerge out.

• Workers should wear protective garments and glass spectacles should be screened from radiation.

• Extreme care should be exercised in the disposal of industrial waste contaminated with radionuclides. The spend rods are very radioactive containing about 1% U 235 and 1% plutonium.

CAUSES, EFFECTS AND CONTROL MEASURES OF URBAN AND INDUSTRIAL WASTE

In ancient cities, food scraps and other wastes were simply thrown into the unpaved streets where they accumulated. Around 320 B.C. in Athens, the first known law forbidding this practice was established and a system of waste removal began to evolve in several eastern Mediterranean cities. Disposal methods were very crude and often were just open pits outside the city walls. As populations increased, efforts were made to transport the wastes out further thus creating city dump.

Modern methods of disposal such as **incineration** and the development of **sanitary landfills**, etc. are now attempting to solve these problems.

But Lack of space for dumping solid waste has become a serious problem in several cities and towns all over the world.

Yet again dumping and burning wastes is not an acceptable practice today from either an environment or its ecosystem.

Today disposal of solid waste should be part of an integrated waste management plan. The method of collection, processing, resource recovery and the final disposal should mesh with one another to achieve a common objective.

Integrated waste management

An integrated waste management strategy includes three main components:

1. Source reduction

2. Recycling

3. Disposal of waste

4. Hazardous waste management

Source reduction

It is one of the fundamental ways to reduce waste. This can be done by using less material when making a product, reuse of products on site, designing products or packaging to reduce their quantity.

On an individual level we can reduce the use of unnecessary items while shopping, buy items with minimal packaging, avoid buying disposable items and also avoid asking for plastic carry bags.

Recycling

It is reusing some components of the waste that may have some economic value.

Recycling has readily visible benefits such as conservation of resources reduction in energy used during manufacture and reducing pollution levels.

Some materials such as aluminum and steel can be recycled many times. Metal, paper, glass and plastics are recyclable.

Mining of new aluminum is expensive and hence recycled aluminum has a strong market and plays a significant role in the aluminum industry. Paper recycling can also help preserve forests as it takes about 17 trees to make one ton of paper. Crushed glass (cullet) reduces the energy required to manufacture new glass by 50 percent.

Disposal of solid waste

It is done most commonly through a sanitary landfill or through incineration.

A modern sanitary landfill is a depression in an impermeable soil layer that is lined with an impermeable membrane.

The three key characteristics of a municipal sanitary landfill that distinguish it from an open dump are:

• Solid waste is placed in a suitably selected and prepared landfill site in a carefully prescribed manner.

• The waste material is spread out and compacted with appropriate heavy machinery.

• The waste is covered each day with a layer of compacted soil.

The problems with older landfills are associated with groundwater pollution. Pollutants seeping out from the bottom of a sanitary landfill (leachates) very often percolate down to the groundwater aquifer no matter how thick the underlying soil layer. Today it is essential to have suitable bottom liners and leachate collection systems along with the installation of monitoring systems to detect groundwater pollution.

Hazardous wastes

Modern society produces large quantities of hazardous waste which are generated by chemical manufacturing companies, petroleum refineries, paper mills, smelters and other industries.

Hazardous wastes are those that can cause harm to humans or the environment. Wastes are normally classified as hazardous waste when they cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of.

Characteristics of hazardous wastes

A waste is classified as a hazardous waste if it exhibits any of the four primary characteristics based on the physical or chemical properties of

a)Toxicity,

b) Reactivity,

c) Ignitability and

d) Corrosivity.

In addition to this waste products that are either infectious or radioactive are also classified as hazardous

Toxic wastes

Toxic Waste is those substances that are poisonous even in very small or trace amounts. Some may have an acute or immediate effect on humans or animals causing death or violent illness. Others may have a chronic or long term effect slowly causing irreparable harm to exposed persons.

Acute toxicity: It is readily apparent because organisms respond to the toxin shortly after being exposed.

Chronic toxicity: It is much more difficult to determine because the effects may not be seen for years. Certain toxic wastes are known to be carcinogenic, causing cancer and others may be mutagenic causing biological changes in the children of exposed people and animals.

Reactive wastes

Reactive waste are those that have a tendency to react vigorously with air or water, are unstable to shock or heat, generate toxic gases or explode during routine management. For example,gunpowder, nitroglycerine, etc.

Ignitable wastes

Ignitable waste are those that burn at relatively low temperatures (less than 60 C) and are capable of spontaneous combustion during storage, transport or disposal. For example, gasoline, paint thinners, and alcohol..

Corrosive wastes

Corrosive waste is those that destroy materials and living tissue by chemical reaction. For example, acids and bases.

Hazardous waste management

Today the most common methods for disposing off hazardous wastes are;

(a) land disposal (b) Incineration.

In countries where there is abundant land available for disposal for example, North America land disposal is the most widely used method. In countries like Europe and Japan where land is not readily available and is expensive, incineration is the preferred method for disposal. In spite of strong laws however illegal dumping of these wastes continues.

Hazardous waste management must move beyond burying and burning. Industries need to be encouraged to generate less hazardous waste in their manufacturing processes.

Although toxic wastes cannot be entirely eliminated, technologies are available for minimizing, recycling and treating wastes. An informed public can also contribute in a big way towards this end.

Natural hazard

Natural hazard is a natural phenomenon that might have a negative effect on humans or the environment.

Natural hazard events can be classified into two broad categories:[

1) Geophysical; Geophysical hazards encompass geological and meteorological phenomena such as earthquakes, volcaniceruptions, wildfires, cyclonicstorms, floods, droughts, avalanches and landslides

2) Biological: Biological hazards can refer to a diverse array of disease, infection, infestation and invasive species.

(1)Geographical Hazards

Earthquake

Earthquake is the sudden release of energy stored as lithospheric stress that radiates seismic waves. At the Earth's surface, earthquakes may manifest with a shaking or displacement of the ground; when the earthquake occurs on the seafloor, the resulting displacement of water can sometimes result in a tsunami. Coastal erosion.

Coastal erosion

Coastal erosion is a physical process by which shorelines in coastal areas around the world shift and change, primarily in response to waves and currents that can be influenced by tides and storm surge. Coastal erosion can result from long-term processes as well as from episodic events such as tropical cyclones or other severe storm.

Volcanic eruption

Volcanic eruption is the point in which a volcano is active and releases its power, and the eruptions come in many forms. They range from daily small eruptions which occur in places like Kilauea in Hawaii, to mega colossal eruptions, which are high-temperature clouds of ash and steam that can travel down mountainsides at speed exceeding an airliner.

Heat wave-

Heat wave is a hazard characterized by heat which is considered extreme and unusual in the area in which it occurs. Heat waves are rare and require specific combinations of weather events to take place.

Cyclonic storm

Cyclone is a large scale air mass that rotates around a strong center of low atmospheric pressure.Hurricane Katrina, Hurricane, tropical cyclone, and typhoon are different names for the cyclonic storm system that forms over the oceans. It is caused by evaporated water that comes off of the ocean and becomes a storm.

Ice storm-Ice storm is a particular weather event in which precipitation falls as ice, due to atmosphere conditions. It causes damage.

Flood - A flood results from an overflow of water beyond its normal confines of a body of water such as a lake, or the accumulation of water over land areas.

Wildfire- Wildfire is a fire that burns in an uncontrolled and unplanned manner. Wildfires can result from natural occurrences such as lightning strikes or from human activity.

(2)Biological Hazards

Disease is a natural hazard that can be enhanced by human factors such as urbanization or poor sanitation. Disease affecting multiple people can be termed an Managing natural Hazards

Managing natural Hazards

Each of the natural hazard types outlined above have very different characteristics, in terms of the spatial and temporal scales they influence, hazard frequency and return period, and measures of intensity and impact.

These complexities result in;-

"single-hazard- These hazards are often treated as isolated or independent.

"multi-hazard"- It seeks to identify all possible natural hazards and their interactions or interrelationships.

Effective hazards management requires;-

Hazard analysis- It intends in any given area (e.g., for the purposes of disaster risk reduction) should ideally include an examination of all relevant hazards and their interactions. To be of most use for risk reduction,

Risk assessment -Hazard analysis should be extended to risk assessment wherein the vulnerability of the built environment to each of the hazards is taken into account. This step is well developed for seismic risk, where the possible effect of future earthquakes on structures and infrastructure is assessed, as well as for risk from extreme wind and to a lesser extent flood risk. For other types of natural hazard the calculation of risk is more challenging, principally because of the lack of functions linking the intensity of a hazard and the probability of different levels of damage (fragility curves).[

ThinkHazard! is an online tool that provides an overview of the hazards from eight natural hazards (river floods, earthquakes, water scarcity, cyclones, coastal floods, tsunamis, volcanoes and landslides) developed by the Global Facility for Disaster Reduction and Recovery in partnership with other institutions.

International campaigns.

In 2000, the United Nations launched the International Early Warning Programme to address the underlying causes of vulnerability and to build disaster-resilient communities by promoting increased awareness of the importance of disaster risk reduction as an integral component of sustainable development, with the goal of reducing human, economic and environmental losses due to hazards of all kinds (UN/ISDR, 2000).

Industrial waste

Industrialization Waste: Industrialization coupled with the development of the means of transport and communication has not only polluted the environment, but also has led to the shrinking of the natural resources. Both ways, the loss is really heavy. Increasing level of heat fluxes, carbon dioxide and particulate, radioactive nuclear wastes and the like create environment hazards. On the other hand, the consumption of conventional source of energy leads to the loss of natural resource. We are building a world without caring for future gen

MODULE-III

Environmental protection – policy legislation

Environmental policy

Policy:- A formal set of general plan and principle to address problems and guide Decision making .

Public policy: it includes Govt law, regulation, orders, incentives, practice to advance societal welfare.

National Environmental policy:

National environmental policy includes:

-Regulate resource use reduce pollution.

-To promote human welfare and protect resource of utilities.

-Use of science , ethics ,Economic help to formulate policy

-Little incentive to minimize impact

Environmental legislations

Several environment protection legislations existed even before Independence of India.

However, the true thrust for putting in force a well-developed framework came only after the UN Conference on the Human Environment (Stockholm, 1972). for Environmental Policy and Planning was set up in 1972 within the Department of Science and Technology to establish a regulatory body to look after the environment-related issues.

This Council later evolved into a full-fledged Ministry of Environment and Forests (MoEF)

MoEF was established in 1985, which today is the apex administrative body in the country for regulating and ensuring environmental protection and lays down the legal and regulatory framework for the same.

Some of the important legislations for environment protection are as follows:

The National Green Tribunal Act, 2010

The Air (Prevention and Control of Pollution) Act, 1981

The Water (Prevention and Control of Pollution) Act, 1974

The Environment Protection Act, 1986

The Hazardous Waste Management Regulations, etc.

These important environment legislations have been briefly expained in the succeeding paragraphs l

The National Green Tribunal Act, 2010

The National Green Tribunal Act, 2010 (No. 19 of 2010) (NGT Act) has been enacted with the objectives to provide for establishment of a National Green Tribunal (NGT) for the effective and expeditious disposal of cases relating to environment protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental thereto.

The Air (Prevention and Control of Pollution) Act, 1981

The Air (Prevention and Control of Pollution) Act, 1981 (the "Air Act") is an act to provide for the prevention, control and abatement of air pollution and for the establishment of Boards at the Central and State levels with a view to carrying out the aforesaid purposes and to counter the problems associated with air pollution.

The Water (Prevention and Control of Pollution) Act, 1974

The Water Prevention and Control of Pollution Act, 1974 (the "Water Act") has been enacted to provide for the prevention and control of water pollution and to maintain or restore wholesomeness of water in the country.

The Water Act prohibits the discharge of pollutants into water bodies beyond a given standard, and lays down penalties for non-compliance.

Further, the Water (Prevention and Control of Pollution) Cess Act was enacted in 1977 to provide for the levy and collection of a cess on water consumed by persons operating and carrying on certain types of industrial activities The Environment Protection Act, 1986

The Environment Protection Act, 1986 (the "Environment Act")

It provides for the protection and improvement of environment. The Environment Protection Act establishes the framework for studying, planning and implementing long-term requirements of environmental safety and laying down a system of speedy and adequate response to situations threatening the environment

Under the Environment Act, the Central Government is empowered to take measures necessary to-protect and improve the quality of environment by setting standards for emissions and discharges of pollution in the atmosphere by any person carrying on an industry or activity;

a)Regulating the location of industries;

b)Management of hazardous wastes,

c)Protection of public health and welfare.

In case of any non-compliance or contravention of the Environment Act, or of the rules or directions under the said Act, the violator will be punishable with imprisonment up to five years or with fine up to Rs 1,00,000, or with both. In case of continuation of such violation, an additional fine of up to Rs 5,000 for every day during which such failure or contravention continues after the conviction for the first such failure or contravention, will be levied.

The Air Act-2010

It empowers the State Government, after consultation with the SPCBs, to declare any area or areas within the Sate as air pollution control area or areas.

Under the Act, establishing or operating any industrial plant in the pollution control area requires consent from SPCBs. SPCBs are also expected to test the air in air pollution control areas, inspect pollution control equipment, and manufacturing processes.

The Act received the assent of the President of India on June 2, 2010, and was enforced by the Central Government vide Notification no. S.O. 2569(E) dated October 18, 2010, with effect from October 18, 2010.

The Act envisages establishment of NGT (Natoinal Green Tribunal) in order to deal with all environmental laws relating to air and water pollution, the Environment Protection Act, the Forest Conservation Act and the Biodiversity Act as have been set out in. schedule- I of NGT Acy

Hazardous Wastes (Management, Handling and Transboundary) Rules, 2008,

This act is brought out a guide for manufacture, storage and import of hazardous chemicals and for management of hazardous wastes.

Biomedical Waste (Management and Handling) Rules, 1998,

This act was formulated along parallel lines, for proper disposal, segregation, transport, etc, of infectious wastes.

Municipal Solid Wastes (Management and Handling) Rules, 2000,

This act aim at enabling municipalities to dispose municipal solid waste in a scientific manner .

The Wildlife Protection Act, 1972

The Wild Life (Protection) Act, 1972 was enacted with the objective of effectively protecting the wild life of this country and to control poaching, smuggling and illegal trade in wildlife and its derivatives. The Act was amended in January 2003 and punishment and penalty for offences under the Act have been made more stringent.

The Forest Conservation Act, 1980

The Forest Conservation Act, 1980 was enacted to help conserve the country's forests. It strictly restricts and regulates the de-reservation of forests or use of forest land for non-forest purposes without the prior approval of Central Government.

State pollution control Board

(1)Constitution of Central Board:

Board shall consist of the following Members:

(a) A full time Chairman (to be nominated by the Government) having knowledge or practical experience in matters related to environmental pro-tection or having knowledge and experience in administration of institu-tions dealing with aforesaid matters.

(b) Not more than five officials nominated by the govt

(c) Not more than three non-officials nominated by the government to repre-sent interests of agriculture, fishery, agriculture-trade etc.

(d) Two persons nominated by the government to represent the companies or corporations owned by the l Government.

(e) One full time Member-Secretary (to be appointed by the Govt. hav-ing knowledge and experience of scientific engineering or management as-pects of pollution control. Functions of the State Pollution Boards:

The following are the functions of a State Board:

(a) Planning a comprehensive programme for prevention, control and abate-ment of pollution of streams and wells.

(b) Advising the State Government regarding water pollution control or loca-tion of industries.

(c) Conducting and encouraging investigations and research relating to differ-ent aspects of water pollution.

(d) To collaborate with the Central Board for training personnel for handling water pollution programmes and organising related mass education pro-grammes.

(e) Inspecting trade effluents and waste water treatment plants.

(f) Prescribing effluent standards for the sewage and trade effluents.

(g) Evolving economical and reliable methods of disposal, treatment and reuse of waste water in agriculture

(h) Laying down the standards of treatment of sewage and trade effluents to be discharged into any stream.

(i) Making, varying or revoking any order for preservation or control of dis-charge of waste into streams and wells or construction of systems for dis-posal of effluents.

(j) Establishing or recognizing laboratories for analysis of samples.

(k) Performing such functions as may be entrusted by Central Board or State governments .

Directions to CPCB

The Central Board shall be bound by directions given by the Central Govt, whereas the State Board shall be bound by directions given by the Central Board or the State Government

Power of State pollution control Board (SPCB)

- **Power to Take Samples:**

Under Section 21(1) A, the State Government has the power to take samples of water of any stream or well or any effluent being discharged into such a stream or well, for analysis. Under Section 22.4, the State Board further has the power to obtain a report of the result of the analysis by a recognised laboratory.

- **Power of Entry and Inspection:**

According to Section 23.5, the State Board is empowered by the State Govt., with the right to enter any place for the pur-pose of performing any of the functions entrusted

- **Power of Prohibition on Disposal of Polluting Matter into a Stream or Well:**

(a) No person shall knowingly allow entry of any poisonous, noxious or pollut-ing matter directly or indirectly into any stream, well or sewer or on land.

(b) No person shall knowingly allow entry of any matter into any stream, which may impede the proper flow of water resulting in substantial aggravation of pollution.

(c) No person shall establish any industry, operation or process or any treat-ment disposal system, which is likely to discharge any sewage or effluent into stream or well or on land.

(d) No person shall use any new outlet for discharge of sewage.

(e) No person shall begin to make any new discharge of sewage.

Consent of State pollution control Board:

(a) Board must decide an application for consent within four months failing which consent will be deemed to have been given.

(b) Persons already discharging any sewage or effluent into any stream or well or on land will have to seek the consent of the State Board.

(c) While giving consent, if any work is required to be executed and the applicant fails to do so, the Board may itself execute it and recover the expenses alongwith interest.

(d) The State Board must be informed in case due to an accident in any indus-try or treatment or disposal system, any polluting matter is likely to be discharged into any stream, well or on land which in turn may pollute wa-ter. The Board may take remedial measures wherever necessary.

(e) The Board may approach a court for restraining a person who is likely to cause pollution by disposal discharge of polluting matter into a stream, well or on lane.

Penalties for Violation of the Provisions of the Act:

(a) In case of failure to give information by a person discharging effluents into stream or well or regarding construction or establishment of a disposal sys-tem the penalty is imprisonment up to 3 months or fine up to Rs. 10,000/- or both. If the omission continues, the penalty is an additional fine up to Rs. 5000/- per day.

(b) In case of destroying or damaging the property of the Board, obstructing the performance of the Board's functions, failure to furnish information about accidents under section 31, giving wrong information or making false state-ments to get Board's consent, the penalty is, imprisonment up to 3 months or fine up to Rs. 10,000/- or both.

Role of NGO in Protection of Environment

According to Asian Development Bank (ADB) in its broadest sense the term Non Governmental Organization refers to Organizations;

(1) not based in government

(2) not created to earn profit

Role of The NGOs that work to save the environment

- **Conduct campaigns across the country to create**
- **Create awareness among people about the depleting natural resources.**
- **Check chemical waste gets mixed with clean drinking water causing health problems.**
- **Reducing deforestation, soil erosion**
- **Educate the people on the significance of segregating waste material into biodegradable waste.**
- **Taking steps to educate people and make them aware of the perishing environment.**
- **preserving the environment**
- **Creating awareness among the public on current environmental issues and solutions.**
- **Facilitating the participation of various categories of stakeholders in the discussion on environmental issues.**

NGOs in India for Environmental

There are NGOs in India working in the field of environmental protection at national and local levels. These organizations use various means to achieve their objective. The environmental NGOs in different areas and the impact they have created in the respective locale is enumerated below.

(1)Assam science society

Assam science society is a voluntary organization established as Gauhati Science Society in the year 1953 and subsequently renamed as Assam Science Society in the year 1956 to encompass entire

state of Assam to crater its humble service by developing scientific temperament and also to create an environment for scientific research.

They impart;

-Environmental education and training through camps for teachers and students and conduct

-Surveys on environment.

-Publications of Science books and journals.

(2)Bombay Natural History Society

It was founded on15th September 1883 .It is largest non-governmental organizations in India engaged in conservation and biodiversity research.

-It supports many research efforts through grants and publishes the Journal of the Bombay Natural History Society.

-Many prominent naturalists, including the ornithologists Sálim Ali and S. Dillon Ripley have been associated with it.

- The society is commonly known by its initials, BNHS.

-It aims to disseminate knowledge of flora and fauna by means of lectures, field trips, literature and expeditions and to study wildlife related problems and recommend management plans to conserve wildlife and its habitat.

-It conducts field research projects on bird migration and studies on the movement and population **structure of Indian.**

(3)Centre for Environmental Education (CEE)

Centre for Environment Education was established in August 1984 as a Centre of Excellence supported by the Ministry of Environment and Forests, Government of India. CEE iS a national institution with its headquarters in Ahmedabad, has a mandate to promot environmental awareness nationwide.

(4) Centre for Science and Environment (CSE)

Centre for Science and Environment (CSE) is an independent, public interest organization which aims to increase public awareness on science, technology, environment and development. The centre was started in 1980.For more than two decades, CSE has been creating awareness about the environmental challenges facing our nation. Searching for solutions that people an communities can implement themselves.

CSE Imparts;

-Creating public environmental awareness,

-pushing the government to create frameworks for individual and community actions and seeking balanced and informed analysis of the global politics of environment.

(5) Winrock International India (WII)

Winrock International India (WII) is a nonprofit organization and working in the areas of natural resources management, clean energy and climate change.

Winrock International India has been accorded recognition as a Scientific and Industrial Research Organization (SIRO) by the Department of Scientific and Industrial Research (DSIR),Ministry of Science and Technology.

(6)Kalpavriksh

Kalpavriksh is a nonprofit organization working on environmental and social issues.

The group began in 1979 with a campaign led by students to save Delhi's Ridge Forest. They work on local, national and global levels, and are based in Delhi and Pune. It is a citizen action group set up to inculcate understanding and concern on environmental issues, especially among the youth.

(9)World wide fund for nature India

WWF-India is one of the largest conservation organizations engaged in wildlife and nature conservation in the country. It has been working tirelessly to promote harmony between human beings and nature for more than four decades.

It promotes :

-Heritage value of fast diminishing wild life and

-It campaigns against the systematic and the senseless destruction of natural resources by sheer lethargy or human greed or industrial development can lead to grave consequences.

-It makes world awakened to a realization of the fact that industrial development and preservation of the environment can go hand in hand by adopting a balanced approach.

-Its main aim is the promotion of conservation of nature and environmental protection as the basis for sustainable and equitable development.

International convention on environment

An international environmental agreement or sometimes environmental Protocol, is a type of Treaty binding in International law allowing them to reach an Environmental goal. In other words, it is "an intergovernmental document intended as legally binding with a primary stated purpose of preventing or managing human impacts on natural resources.

-An agreement between two nations is known as a bilateral environmental agreement.

-If the agreement is made among three or more nations, it is called a multilateral environmental agreement (MEA).

Such agreements, primarily produced by the United Nations, cover subjects such as;

-Atmospheric policies,

-Freshwater policies,

- Hazardous and substance policies,

-The marine environment,

-Nature conservation policies,

-Noise pollution and nuclear safety.

World Trade Organization

The World Trade Organization has been involved in MEA(ministry External Affirs) negotiations due to the agreements' trade implications. The organization has trade and environmental policies which promote the protection and preservation of the environment.

Its objective is to reduce trade barriers and coordinate trade-related measures with Environmental policies. Since MEAs protect and preserve the environment, they may help ease restrictions on trade.

The WTO's principles are based on;

-Non-discrimination.

-Free trade through reduction of trade barriers.

-Fair competition.

The WTO is working with and implementing over 350 MEAs worldwide. Most of the agreements involve countries which are committed to environmental improvement and free trade. WTO members are legally bound to respect negotiated reductions of barriers to trade.[However, conflict has arisen due to trade restriction.

GATT (General Agreement on Tariffs and Trade)

The General Agreement on Tariffs and Trade (GATT) was created after World War II to aid global economic recovery through reconstructing and liberalizing global trade.

GATT's main objective was to reduce barriers to international trade through the reduction of tariffs, quotas and subsidies.

BREAKING DOWN of (GATT)

The General Agreement on Tariffs and Trade (GATT) was formed in 1947 with a treaty signed by 23 countries, and signed into international law on January 1, 1948. GATT remained one of the focal features of international trade agreements until it was replaced by the creation of the World Trade Organization on January 1, 1995. By this time, 125 nations were signatories to its agreements, which covered about 90% of global trade.

(Module-IV)

Environmental Management System

ISO-14000

ISO 14000 *History*

The first environmental management system standard, BS 7750, was published in 1992 by the BSI group.

In 1996, the International Organization for Standardization (ISO) created the ISO 14000 family of standards.

ISO 14001 underwent revision in 2004.

The current revision of ISO 14001 was published in September 2015.

The primary objective of the ISO 14000 series of standards is to:

-Promote effective environmental management systems in organizations.

-The standards seek to provide cost-effective tools that make use of best practices for organizing and applying information about environmental management.

The ISO 14000 family was developed in response to a recognized industry need for standardization. With different organizational approaches to environmental management, comparisons of systems and collaboration had proved difficult.

ISO 14000 standards and practices can be applied to any organization, regardless of size of industry.

ISO 14001:2015 is the most popular standard of the ISO 14000 family, which also includes the following standards:

ISO 14004 - General guidelines on principles, systems and support techniques

ISO 14006 - Guidelines for incorporating ecodesign

ISO 14015 - Environmental assessment of sites and organizations (EASO)

ISO 14020 - Environmental labels and declarations

ISO 14031 - Environmental performance evaluation

ISO 14040 - Life cycle assessment

ISO 14050 - Vocabulary

ISO 14063 - Environmental communication

ISO 14064 - Greenhouse gases

ISO 19011 - Guidelines for auditing management systems

Environmental audit

Environmental audit is a general term that can reflect various types of evaluations to identify environmental compliance and management system implementation gaps along with related corrective actions. In this way they perform an analogous (similar) function to financial audits.
Environmental audit are generally two different types of environmental audits:

(1)compliance audits

(2)management systems audits.

Environmental compliance audits]

As the name implies, these audits are intended to review the site's/company's legal compliance status in an operational context. Compliance audits generally begin with determining the applicable compliance requirements against which the operations will be assessed.

Compliance audits may be;

Multimedia. Multimedia audits involve identifying and auditing all environmental media (air, water, waste, etc.) that apply to the operation/company

Programmatic. Programmatic audits (which may also be called thematic or media-specific) are limited in scope to pre-identified regulatory areas, such as air.

Management system audit

Audits are also focused on operational aspects of a company/site, rather than the status of the existing environment. It compares persisting environment in business establishment/site confirms to requirements of ISO 14001:2004.

MSA includes;-

-Identify and control the environmental impact of its activities, products or services;

-Improve its environmental performance continually.

-Implement a systematic approach to setting environmental objectives and targets, to achieving these and to demonstrating that they have been achieved.

-Organizations implementing ISO 14001 usually seek to obtain certification by independent Certification Bodies. Certification indicates that the documentation, implementation and effectiveness of the EMS conform to the specific requirements of ISO 14001.

Audit tool and Technology

The term "protocol" means the checklist used by environmental auditors as the guide for conducting the audit activities. There is no standard protocol, either in form or content. Audit firms frequently develop general protocols that can be applied to a broad range of companies/operations.

Audit tools

Current technology supports many versions of computer-based protocols that attempt to simplify the audit process by converting regulatory requirements into questions with "yes", "no" and "not applicable" check boxes. Many companies and auditors find these useful and there are several such protocol systems commercially available.

Other auditors (typically those with many years of environmental auditing experience) use the regulations/permits directly as protocols.

Environmental auditing in India

The Supreme Audit Institution (SAI) in India is headed by the Comptroller and Auditor General (CAG) of India who is a constitutional authority.

The CAG of India derives his mandate from Articles 148 to 151 of the Indian Constitution. The CAG's (Duties, Powers and Conditions of Service) Act, 1971 prescribes functions, duties and powers of the CAG.

While fulfilling his constitutional obligations, the CAG examines various aspects of government expenditure and revenues. The audit conducted by CAG is broadly classified into Financial, Compliance and Performance Audit. Environmental audit by SAI India is conducted within the broad framework of compliance and performance audit.

Eco Friendly Product

Eco-products literally means earth-friendly or not harmful to the environment. These eco products cause minimal harm to people and the environment. The production and/or consumption of these products have a minimal impact on the environment. They are called;-

(a) Green products,

(b)Eco-products,

(c)Sustainable products or Environmentally responsible products,

Although there are no universal certifications or standards to deem a product as eco-friendly, but there is a number of Eco labeling organizations that have certifications to help us in our search.

In India Centre for Pollution Control Board, Ministry of Environment & Forest has launched the eco-labelling scheme known as `Ecomark' in 1991 for easy identification of environment-friendly products to increase the consumer awareness. The Product categories covered under Indian Ecomark Scheme:

- Soaps & Detergents

-Paper

-Food Items

-Lubricating Oils

-Packaging Materials

-Architectural Paints and Powder Coatings

-Batteries

-Electrical/Electronic Goods

-Food Additives

-Wood Substitutes

-Cosmetics

-Aerosol Propellants

-Plastic Products

-Textiles

-Fire-extinguisher

-Leather

Green Industries And Green Industries Policy

Green industrial policy (GIP) is strategic government policy that attempts to accelerate the development and growth of green industries for transition towards a low-carbon economy.

GIP and industrial policy are similar, although GIP has unique challenges and goals. It emphasizes on;

-Spread of Green industries operating on renewable energy

-Development of low-carbon public transport infrastructure.

- Reconciling economic and environmental issues.

-Reduce degree of uncertainty about green investment profitability.

-Furthermore, it addresses the reluctance of industry to invest in green development, and it helps current governments influence future climate policy.

Advantages of GIP

(a)Energy transitions

The persistence of a carbon-based economy has led to environmentally destructive path dependency, and energy transitions are vital to divert from the reliance. Strategic niche management (SNM) offers an opportunity for energy transitions from Unsustainable technology to sustainable technologies.

(b)Environmental benefits

GIP has the potential for environmental benefits. Green technologies emit fewer greenhouse gases (GHG) and use fewer resources or economize on renewable resources. It protect the environment, and in turn, it can preserve the health, safety, and security of humans and other species..

(c)Worker benefits

GIP creates sunrise policies and sunset policies that produce benefits for employees. Sunrise policies aim to set up and develop new technologies or grow green sectors. The policies create new employment opportunities in green industries. Investment in innovation can also increase economic growth, which can create further benefits, such as job availability, job stability, and increased salaries. Sunset policies support declining industries to allow for a smooth economic transition away

(d)Risks

Proponents and sceptics of GIP acknowledge that it involves numerous risks. Arguments against GIP state that governments cannot make practical choices about which firms or industries to support, and subsequently, they will make mistakes and waste valuable resources from energy-intensive industries towards sustainable ones.

Additionally, GIP raises concerns about subsidy-seeking and regulatory capture.

Inadequate policy design can also lead to the failure of GIP.

If a policy does not have clear objectives, benchmarks to measure success, close monitoring, and exit strategies, it has too many risks, and will likely fail.

Risk Management of GIP

Governments can take several steps to lower risks of green investment and ensure success of GIP

1-They can make sufficient choices about which industries or companies to support to avoid failure.

2-Governments can also avoid using the wrong policy instruments if they experiment in select parts of the Industries before applying policy.

3-Subsidy-seeking can be an issue, but the creation of subsidy attracts investors into risky green technology fields Subsidy management can avoid the problem by dictating the correct amount of profit

4-Appropriately offering profit incentives, and withdrawing them when markets can function on their own .

5- **Governments must also work with the private sector, and the two should have a mutual interest and understanding of the issues each seeks to address.**

6-Independent monitoring of policy progress, strong institutions, consumer protection agencies, and a free press can deal with the risk .Furthermore, clear objectives, consistent monitoring, evaluation techniques, and exit strategies can strengthen policies

7-Policies can avoid trade disputes through the process of policy learning and by adhering to WTO rules.