CHAPTER I

INTRODUCTION

1.1 GENERAL INTRODUCTION

Environment comprises air, water and land. It is not easy to give a precise definition of "pollution" or of the word "polluting". The oxford English Dictionary defines 'pollute' and 'pollution' as follows.

Pollute: destroy the purity or sanctity; makes (water etc.) foul or filthy.

Pollution: the act of polluting.

It is easier to describe pollution than to define it. Environmental pollution may be described as the unfavourable alteration of our surroundings and occur mainly because of the action of man. Environmental pollution takes place through changes in energy patterns, radiation levels, chemicals and physical constitutions an abundances of organisms. Pollution, sometimes causes visible harm; sometimes if the air and poisons fish and other aquatic animals in rivers and lakes. Pollution includes release of materials into atmosphere which make the air unsuitable for breathing, harm the quality of water or soil; and give out substances which damage the health of human beings, plants and animals. Through the other environmental pollutants, odour and noise only irritate or disturb they can also sometimes, be a danger to health. The effects of pollution to
our biosphere are numerous and are increasing tremendously. Unless otherwise checked, they could make the whole planet uninhabitable.

Air pollution in cities has mounted as more and more people have crowded in. Water pollution has increased with the growth of industry as well as of population. The disposal of solid waste from industrial, commercial and household sources has become a major concern. In addition to these, noise has become more acute due to a tremendous increase in numbers of motor vehicles, industrial operations and building constructions. Radioactive materials and certain other pollutants have begun to spread widely through the atmospheric and ocean systems of the world to cause mutations and other birth defects.

A substance present in nature in greater than natural abundance due to human activity, which ultimately has a detrimental effect on the environment and there from on living organisms and mankind. For example lead, mercury, sulphur dioxide, carbon dioxide, etc.

Contaminant of the material which does not occur in nature, but is introduced by human activity into the environment, affecting its composition. A contaminant is classified as a pollutant when it exerts a detrimental effect. For example, chlorine gas escaped from a derailed railway tank can near Youngstown, Florida in 1978 and killed eight persons
driving on a nearby road. This gas does not occur in the atmosphere; so it is undoubtedly a contaminant because of its dangerous effect; it is also a pollutant.

Receptor is the medium which is affected by a pollutant. Man is the receptor of photochemical smog causing irritation of the eyes and respiratory tract. Trout fingerlings are receptors of dieldrin in water which causes their death.

Oxygen is a vitally important species in water. It is consumed by oxidation of organic matter/reducing agents etc. it is an important water quality parameter. The optimum value for good water quality is 4-6 mg/1 of dissolved oxygen, which ensures healthy aquatic life in a water body. Lower dissolved oxygen value indicate water pollution.

Chemical oxygen demand is an index of the organic content of water and is an important water quality parameter. The test is based on the chemical oxidation of material in water by K2Cr2O7 in 50% H2So4.

Biochemical oxygen demand is also a water quality parameter for organic mater in water, which is empirical in nature. It is measured by the quantity of oxygen utilized by suitable aquatic microorganisms during a five-day period.
1.2. THE ENVIRONMENT

The environment (from the French environment to en circle or surround) can be defined as (1) The circumstances or conditions that surround an organism or group of organisms (2) The complex of social or cultural conditions that affect an individual or community. Since humans inhabit the natural world as well as built or technological, social and cultural world, all constitute important parts of our environment.

1.3. ENVIRONMENTAL SCIENCE

Environmental science is the systematic study of our environment and our proper place in it. A relatively new field, environmental science is highly interdisciplinary, integrating natural sciences, social sciences, and humanities in a broad, holistic study of the world around as. In contrast to more the critical disciplines, environmental sciences is mission-oriented. That is, it seeks new, valid contextual knowledge about the natural world and our impacts on it, but obtaining this information creates a responsibility to get involved in trying to do something about the problems we have created.

Environment etymologically means surrounding. It is the sum total of external factors, substances and conditions, which influence organisms without becoming their intrinsic part. Because of its being a complex of various components, environment is also referred to as
environmental complex. Environment is usually divide into two parts, physical and biotic.

1. The physical environment: The physical environment consists of (1) forces of nature like wind and (2) grallity conditions like temperature and light (3) time and (4) nonliving materials alike soil and water.

2. The biotic environment: The biotic environment is made of all living beings including their reactions interactions and interrelated actions. Any constituent or condition of the environment, which affects directly on indirectly the form of functioning of the organism in any specific way is called environmental or ecological factor.

1.4. MAN-ENVIRONMENT RELATIONSHIP

Man enjoys a dominant position over living and non-living world around him since prehistoric time. Darwin (1871) wrote, man could never have attained his present dominant position in the world without the use of his hands, which are so admirably adapted to act in obedience to his will. According to him the uniqueness of man in nature thus involves primarily his pibedral gait that made the arms and whole upper part of the body. Freeing of hand for the use of self-produced tools was one distinguished character that made man, out of all organisms, to make profound changes in the natural relationships that took millions of years to evolve.
Modern socio-economic development of humanity, which is the highest form of vital activity, has most vigorously stimulated changes in the manner of interaction between man and the nature, with far reaching consequences for the latter. Today, naturalists fear that in the name of this socio-economic revolution mankind is engaged in programme of self-defeat. The harmony between world population, per capita demand, and environmental resources is disintegrating fast resulting in inadequate living standards in respect of food, water, clothing, shelter, and Medicare. According to a report, today, two-third of the human race lives in underdeveloped areas of the world, most of the these populations drink unsafe water, eat in adequate and unsafe food, live in unsafe dwellings, and dispose wastes recklessly.

1.5. WHAT IS POLLUTION?

Water, Air, or soil pollution means the introduction of materials that harm the health or survival of plants, animals and humans, too often, only those of economic importance to humans. An upstream chemical company that pollutes a river by discharging wastes into it harms not only people downstream who drink river water but also fish in the river, birds who eat the fish, and thousands of other organisms that live in or near the river. People changing their own car oil cause pollution of nearby lakes, rivers or bays when they dump used oil in storm drains.
1.6. ROLE IN PUBLIC AWARENESS

In developing countries there is widespread water pollution problem specially in dirty water. It is the source of 90 per cent of all disease there, and it helps to kill millions of children every year due to various disease. There is a need to clean water and to develop awareness among general public for this hazard. For this purpose we need help or environmental lists.

Population of developing countries has lack of awareness about environment, however, large increase in environmental pressure groups and public opinion surveys show that environmentalist can help to make them aware.

1.7. PRINCIPLES OF EMS (ENVIRONMENTAL MANAGEMENT SYSTEMS)

According to the draft ISO 14001 standard and ISO 14004 guidance, an EMS should be based upon the following principles

1. Rank environmental management among corporate priorities.
2. Emphasize pollution prevention
3. Establish communication within the organization and constituents.
4. Enhance management and employee commitment to environmental protection.
5. Encourage environmental planning throughout the life cycle of the product and/or process, and

6. Improve the EMS by proper auditing and review procedures.

1.8. HYDROLOGICAL CYCLE OR WATER CYCLE

Water moves from the ocean to air to land to ocean in a set cyclic pattern called hydrologic cycle. In other words, this cycle represents a continuous process of exchange of water from the earth's surface to the atmosphere and vice versa under the influence of solar heat.

It is estimated that of the total available water 97.3 per cent is contained in the oceans and out of remaining 2.7 per cent most is in solid form. The amount of water actually available in the atmosphere is a very minute fraction and estimated to be only $1 \times 10^5$ of the world's total water.

1.9. POLLUTION OF OCEANS

The oceans are the ultimate since into which all wastes in rivers and much of that in the air are likely to find their way. Presently the attitude has been changed because of the fact that pollutants are added in such high concentrations in local areas that environment of the ocean is highly attached. There are six types of major pollutants which can pollute ocean: (1) sewage and fertilizers (ii) chlorinated hydrocarbons and pesticides including DDT. (iii) Heavy metals (iv) oil and petroleum products (v) Radioactive substances, and (vi) Plastics.
1.10. EXPLOITATION OF MINERALS AND ENVIRONMENTAL PROBLEMS

Mining is the selective recovery of minerals and materials, other than recently formed organics materials, from the crust of the earth. Mining always involves the physical removal of materials from the crust of the earth, frequently in huge amounts for the recovery of only small amounts of the desired products. Most mining accident are related to human error. It is therefore essential that there be extensive training of all people who work in mines. Today's mining graduates are traced in the latest technology to reduce accident.

The mining is done on the surface of buried deep under the ground. Mines may recover loose, Unconsolidated material. This causes accidents. All mines have safety problems, but underground mines tend to be thought to as especially dangerous. The danger stems from the nature of the mine— a construction in natural ro, which is not a good engineering material.

The major causes of accidents in most mines are falls of ground, that is, large rocus falling off sidewalls of the openings. Included in this category of accidents are those caused by falling rocus from other sources, such as transport mechanisms. Other hazards are explosives, water
inruses, and explosions due to gases such as methane, which can be given off by the rocus in all mines but which are common in coal mines.

In addition to the hazard of accidents there are a number of work place-related disease that may be contracted by miners. All mines produce dust and this may be inhaled to cause a number of ling disease, such as black large in coal mines, silicosis, asbestosis and others. many mines, and particularly those for uranium, may have radiation problems, radioactive radon gas given off by the rocus.

1.11. TYPES OF WASTES

Wastes are classified into (i) Energy wastes (2) material wastes. The main source of energy in various parts of world is petroleum oil, followed by coal. In India about 50 per cent oil, is imported each year. Coalmines are concentrate only in a few regions. Coal is used in generation of electricity, steam engines and fire. Most potential energy of coal is wasted during electric generation in thermal power plants. Thermal loss in India is about 20-30 per cent because of lack of suitable technologies.

1.12. CLASSIFICATION BASED ON CHEMICAL NATURE

1. Inorganic wastes: Those generated by metallurgical and chemical industries, coal mines, etc.,

2. Organic wastes: Agricultural products, dairy and milk products, slaughter houses, sewage, forestry etc.
3. **Mixed wastes**: Those discharged from industries dealing with textiles, dyes, cake, and gas, leather etc.

**CLASSIFICATION BASED ON PHYSICAL STATE**

1. The solid wastes can be burnt, thermally decomposed an aerobically digested to get methane and other combustible gases or biologically converted to a variety of products.

2. Liquid wastes are most troublesome, because of the presence of non-retractable chemicals and their further return such as NO₃, NO₂, NH₃, COₓ, SO₂ etc.

3. When concentration of these gases increases in the atmosphere, they cause gaseous pollution, which has its bad impact on plant and animal lives.

4. The organic wastes and residues are the major sources of renewable energy.

**1.13. SOIL POLLUTION**

Soil is the uppermost layer of the Earth's crust. It provides nourishment and shelter to numerous micro-organisms, plants and animals. There is more life under the soil than one land. Numerous insets and burrowing animals live in soil.

Land (soil) pollution is caused by solid wastes and chemicals. There are many examples of land that have been misused by industrial development and disposal of wastes.
1.14. WATER POLLUTION

Water pollution means such contamination of water or such alternation of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely to create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial industrial, agricultural or other legitimate uses, or to the life and health or animals or plants or of aquatic organisms.

The used water becomes contaminated and is called waste water which contains residuals of the activities taking place in each of them. Thus passing through these industries, agricultural lands and the urban settlements the water gets soiled up and is rendered harmful to plants, animals and men. These waters get loaded with organics and inorganic chemicals, pathogenic and non-pathogenic organisms including viruses and cysts. Usually, these waters do not remain fit for human consumption and for the life of plants and animals.

1.15. NOISE POLLUTION

Noise pollution, adverse effects of noise in our living and working environment. Noise is, by definition, unwanted sound. It may be annoying, it may interterm with speech communication, leisure, or
relaxation and at very high levels which may occur at work or during certain noisy leisure activities, it may result in hearing loss by causing damage to the hair cells in the cochlea in the inner ear. Rather than leading to significant adverse physiological responses. However, noise is more often a major problem in terms of quality of human life in specific localities.

1.16. THERMAL POLLUTION

Thermal pollution is however on the increase because of the era of "globalization", Thermal pollution is somewhat difficult to explain and define with precision. Discharge of heated water from industrial process can kill or injure human and aquatic life organisms.

Environmental engineers and chemical engineers take a narrow view of thermal pollution, unfortunately. Their jobs are to remove heat from waste streams so that discharge regulations are satisfied.

1.17. GLOBAL WARMING

Scientists have discovered that concentrations of minor greenhouse gases in the atmosphere, particularly carbon dioxide (CO2) are rising, Theoretically, these gases could trap more heat in the atmosphere, leading to a gradual warming of the Earth's atmosphere and, again theoretically, global warming could be harmful to the environment and to human health.
Global warming has emerged as the most serious environmental threat of the 21st century. Most countries on earth are discussing environmental problems and how to limit them. Environmental problems on a global scale can originate from any corner of the world and affect all eco systems on earth. Such problems directly or indirectly can affect human beings. Climate changes is greatest environmental challenge, which is facing mankind on earth, this climate change is rapid, continuous, and irreversible. It is called Global warming.

1.18. RADIOACTIVE POLLUTION

Most of the problems of radioactive pollution have arisen after the man has learnt splitting the atom and, thus, releasing the radioactivity in the environmental over the natural background levels.

Radioactive substances are among the most toxic substances known. The magnitude of their injurious effects is tremendously high as compared to ordinary organics poison; e.s. radium is 20555 times more lethal than arsenic. Much of the concern with the radioactive pollution lies in the fact that the radioactive substances produce high energy radiations which are harmful and capable of producing ionization in the bimolecular, affection organism. Preliminary inquires reveal a very high ration of cancers, asthma, allergies, dizziness, coughs and headaches among
people in the communities near air force bases. Bone malformation, hair loss and high lead levels in children have also occurred near Kelly.

1.19. CONTROL OF SOLID WASTE POLLUTION

Certain waste represent special hazards and require appropriate treatment, for example, clinical waste, which may be contaminated with pathogens and nuclear waste for which highly engineered burial facilities are required. Many countries are now adopting policies to encourage waste minimization, which consists of a hierarchy of management options ranging from cessation of waste production, reuse, recycling, combustion for fuel and disposal by landfill, and so on, to incineration (the least favored). To gather with other strategies, such as encouragement of recycling centers and domestic composting of organic matter. It is likely that there will be a substantial move away from traditional waste-disposal practices.

1.20. ACID RAINS

Acid rain is a form of air pollution, currently a subject of great controversy because of the widespread environmental damage for which it has been blamed. It forms when oxides of sulphur and nitrogen combine with atmospheric moisture to yield sulphuric and nitric acids, which may than be carried long distance from their source before they are deposited
by rain. The pollution may also take the form of snow or fog or be precipitated in dry forms. In fact although the term "acid rain" has been in use form more than a century- it is derived from atmospheric studies that were made in the region of manchester, England the more accurate scientific term would be "acid deposition". The dry form of such precipitation is just as damaging to the environment as the liquid form.

1.21. OZONE LAYER DEPLETION

Ozone depleter is a chemical that destroys the ozone in the stratosphere. Most ozone depletes are chemically stable compounds containing chlorine or bromine, which remain unchanged for long enough to drift up to the upper atmosphere. Once in the upper atmosphere, they are broken up by the intense solar radiation and form a cocktail of more active substances, which then react with ozone, causing its depletion. The best known are chlorofluorocarbons (CFCS) but many other ozone depletes are known, including haloans, used in some fire extinguishers; methyl chloroform and carbon tetrachloride, both solvents; some CRC substitutes; and the pesticide methyl bromide. Most research in to alternatives to ozone depletaters seeks chemical alternatives which will break up before they get into the upper atmosphere, but still have a useful working life as a refrigerant or propellant.
Reactions responsible for the destroy of ozone.

\[ \text{O}_2 \xrightarrow{\text{UV}} 2\text{O}. \]

\[ \text{O}_3 + \text{O}_2 \rightarrow \text{O}_3 \]

1.22. TYPICAL EFFECTS OF POPULATION GROWTH

Over exploitation of resources is imminent it the population is on increase. The realisation of the "population Bomb" exploding in India anytime has not dawned on the people in general. However, effects of population explosion can be described as under:

1. People living on the fringe or below poverty line are going to increase manifold.

2. Natural emergency will be caused by resource shortage such as water, fossil fuels (petrol, coal and gas) and most natural resources as well as food shortages will occur. There will be increased incidence of may natural and man made disasters.

3. The concept of ecosystem will undergo change as many animals and plants will be extinct

4. Human culture will also undergo change because it is this culture that decides the man-environment relationship.

5. Man's imprint on land will change the culture landscape.

6. There will be culturally produced perceptions about environment and its resources.
7. Settlements, house styles, field boundaries all are bound to undergo change.

8. While people are a resource by themselves, over population, brings its own problems.

The next chapter deals with review of related researches.