DEPARTMENT OF PHYSICS

23CHT103-Environmental Science and Sustainability

1.1 INTRODUCTION

The word environment is derived from the French word "Environ" meaning "Surroundings". Each and everything around us is called as environment.

Cow eats plants for its survival. The plant requires nourishment from the soil. Nourishment is provided by nitrogenous mater excreted by animal or by the dead bodies of other plants and animals.

Thus for the survival of an animal (or) a plant, (or) a microbe, it requires a supply of materials and removal of waste products from its environment.

Degradation of the environment has become a serious problem. Pollution of soil, water and air leads to loss of valuable natural resources.

1.2 DEFINITIONS

1. Environment

Environment is defined as, "***the sum of total of all living and non - living things around us influencing one another.***"

Environmental science is the ***study of the environment, its biotic (ie., biological) and abiotic (ie., non biological) components and their interrelationship.***

Every organisms is surrounded by materials and forces which constitute its environment, from which it must derive its needs. Environment creates favourable conditions for the existence and development of living organisms.

Environmental engineering is ***the application of engineering principles to the protection and enhancement of quality of the environment and to the enhancement and protection of public health and welfare.***

3. Environmental Engineering

Environmental studies are ***the process of educating the people for preserving quality environment.***

4. Environmental Studies (or) Environmental Education

1.3 TYPES OF ENVIRONMENT

Environment can be divided into two categories

1. Natural environment
2. Man - made environment

1. Natural environment

Natural environment is characterized by natural components. All biotic (living) and abiotic components (non-living) are created through a natural process. Creation of these biotic and abiotic components do not require any human support.

Soil, water, air, trees, radiations, noise, etc.,

2. Man - made environment

Man is the most powerful environmental agent. He modifies the environment using modern technologies, according to his needs to a great extent. Thus the man-made environment is created by man.

House, road, schools, railway lines, parks, etc.,

1.4 SCOPE OF ENVIRONMENTAL STUDIES

Environmental study is an important tool to educate the people for preserving quality environment. The main scope of environmental studies include

1. To get an awareness and sensitivity to the total environment and its related problems.
2. To motivate the active participation in environmental protection and improvement.
3. To develop skills for identifying and solving environmental problems.

4. To know the necessity of conservation of natural resources.
5. To evaluate environmental programmes interms of social, economic, ecological, and aesthetic factors.

1.5 IMPORTANCE (or) SIGNIFICANCE OF ENVIRONMENTAL STUDIES

Air we breathe, water we drink, food we consume and land we live on are all contaminated by industrial activities. There is no zero pollution industry. Because of the lack of self discipline and not worrying about our future generation, the valuable resources are polluted.

To solve the above problems, knowledge of environmental studies is very important.

1. By environmental studies, people will understand the concept of "need of development without destruction of environment".
2. Through environmental studies, people can gain the knowledge of different types of environment and the effects of different environmental hazards.
3. Environmental studies inform the people about their effective role in protecting the environment by demanding changes in laws and enforcement systems.

4. Environmental studies have a direct relation to the quality of life we live.
5. Environmental studies develop a concern and respect for the environment.

1.6 RISK AND HAZARDS IN THE ENVIRONMENT

Hazard

Hazard is any substance that can hurt you or make you ill. It is expressed in degree. Degree of hazard is the function of risk, exposure, vulnerability and response.

$$\text{Hazard} = f\,(\text{risk} \times \text{exposure} \times \text{vulnerability} \times \text{response})$$

Risk

Risk is the frequency of events causing losses.

1.6.1 Types of Hazards

Hazards are of the following types

1. Physical hazards
2. Chemical hazards
3. Biological hazards (or) Bio-hazards

1. Physical hazards

Physical hazards are the substances (or) activities that threaten your physical safety. They will be present in most work places at one time or another. They can be detected through your senses of touch or sight.

1. Cold
2. Heat
3. Non-ionising radiation (electric field, IR, microwave, magnetic field, radio frequency)
4. Noise
5. Ionizing radiation (α, β, γ, X - ray)
6. Vibrations

Sl. No.	Physical Hazards	Health Effect
1.	Radioactive radiations	(a) Affects the cells in the body and the function of glands and organs. (b) Suffer from cancer.
2.	UV radiations	Skin cancer.
3.	Global warming	Increase in temperature causes famine, mortality.
4.	Chloro fluorocarbons	Damage O_3 layer, allows more UV rays, cause skin cancer.
5.	Noise	Painful and irreparable damage to human ear.

2. Chemical hazards

Chemical hazards are systems, where chemical accidents like fires, explosions, leakages could occur under certain circumstances. These are generally present when a worker is exposed to any chemical preparation in the work place in any form (solid, liquid, gas). Chemical hazard causes illness, skin irritation or breathing problems. A large number of chemicals are introduced in the environment by anthropogenic activities.

Examples

1. **Liquids like** cleaning products, paints, acids, solvents.
2. **Vapours and fumes** that come from welding or exposure to solvents.
3. **Gases** like acetylene, propane, carbon monoxide.
4. **Flammable materials** like gasoline, solvents and explosive chemicals.

Chemical hazards and their health effects

Sl. No.	Chemical Hazards	Health effects
1.	**Combustion of fossil fuels:** Liberates SO_2, NO_2, CO_2 and particulate matters.	Asthma, bronchitics and other lung diseases.
2.	**Industrial effluents (toxic)**	Kill cells and cause cancer, and death.
3.	**Pesticides like DDT and Chlorinated pesticides**	Affect the food chain.
4.	**Heavy metals** like Hg, Cd, Pb, fluoride and nitrate.	Contaminate water, cause ill effects.

3. Biological hazards

Materials derived from medical treatment of animal or human which cause harm to humans.

Entry of Biological hazards into body

There are three major routes through which micro organism enter in our body.

(i) Through the respiratory system.

(ii) Transmission through contact with body fluids of the infected.

(iii) Contact with contaminated objects.

Biological hazards and their health effects

Biological hazards	Health effects
Bacteria, viruses and parasites.	Diarrhoea, malaria, parasitic worms, anaemia, respiratory disease, cholera.

1.6.2 Prevention and control measures of hazards

1. Ventilation of the places should be improved.
2. Use of UV lamp and air conditioning systems.
3. Use of personal protective equipments, like masks, gloves, protective cloths, eye shield.
4. Elimination of the sources of contamination of biological hazards.