Ecology and Pollution

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Ecology is the scientific study of the interactions of organisms with each other and their physical environment. Ecology is one of the two biological sciences of most interest to the public today.

Environment is the surroundings of an organism that affect its life and development.

Environmental health comprises those aspects of human health including quality of life, that are determined by physical, biological social, and psychosocial factors in the environment.

Ecosystem is the community of organisms in an area and the physical factors with which those organisms interact in the environment.

Ecosystem ecology emphasizes energy flow and chemical cycling between organisms and the environment.

Community is a group of populations of different species in an area.

Population is a group of individuals of the same species living in an area.

Population ecology analyzes factors that affect population size and how and why it changes through time.

An environment is characterized by the Biotic and Abiotic factors.
Biotic factors are *living* and can be categorized within an *ecosystem structure… Species , Population and Community*
Abiotic factors are *non-living*. Abiotic factors include science like chemistry, physics and geology.
Pollution may be defined as addition of undesirable material into the environment as a result of human activities. The agents which cause environmental pollution are called **pollutants**.
A **pollutants** may be defined as a physical, chemical or biological substance unintentionally released into the environment which is directly or indirectly harmful to humans and other living organisms.

Types of pollution
Pollution may be of the following types:

- Air pollution
- Noise pollution
- Water pollution
- Soil pollution
- Thermal pollution
- Radiation pollution
- Light pollution

Air pollution may be defined as the presence of any solid, liquid or gaseous substance including noise and radioactive radiation in the atmosphere in such concentration that may be directly and indirectly injurious to humans or other living organisms.

Control measures for air pollution

Air pollution can be controlled by two fundamental approaches: preventive techniques and effluent control.

One of the effective means of controlling air pollution is to have proper equipment in place. This includes devices for removal of pollutants from the flue gases though scrubbers, by use of dry and wet collectors, filters electrostatic precipitators, etc.

Noise pollution

Noise is one of the most pervasive pollutant. A musical clock may be nice to listen during the day, but may be an irritant during sleep at night. Noise by definition is "sound without value" or "any noise that is unwanted by the recipient". Noise in industries such as stone cutting and crushing steel forgings , loudspeakers, shouting .

Noise Control techniques

There are four fundamental ways in which noise can be controlled: Reduce noise at the source, block the path of noise, increase the path length and protect the recipient.

Water pollution.

Water pollution is one of the most serious environmental problems.

Water pollution is caused by a variety of human activities such as industrial, agricultural and domestic. The specific contaminants leading to pollution in water include a wide spectrum of chemicals, pathogens, and physical changes such as elevated temperature and discoloration.

Natural sources of pollution of water are soil erosion, leaching of minerals from rocks and decaying of organic matter. Rivers, lakes, seas, oceans, estuaries and ground water sources may be polluted by point or non-point sources.

Pathogens

Disease-causing microorganisms are referred to as pathogens. Although the vast majority of bacteria are either harmless or beneficial, a few pathogenic bacteria can cause disease. Coliform bacteria, which are not an actual cause of disease, are commonly used as a bacterial indicator of water pollution. Other microorganisms sometimes found in surface waters that have caused human health problems include:

- *Burkholderia pseudomallei*
- *Cryptosporidium parvum*
- *Giardia lamblia*
- *Salmonella*
- *Norovirus* and other viruses
- *Parasitic worms including the Schistosoma type*

Control measures for preventing water pollution

While the foremost necessity is prevention, setting up effluent treatment plants and treating waste through these can reduce the pollution load in the recipient water. The treated effluent can be reused for either gardening or cooling purposes wherever possible.

Soil pollution.

Generally polluted water also pollute soil. Solid waste is a mixture of plastics, cloth, glass, metal and organic matter, sewage, sewage sludge, building debris, generated from households, commercial and industries establishments add to soil pollution.

Control measures for preventing for Soil pollution

To control soil pollution, it is essential to stop the use of plastic bags and instead use bags of degradable materials like paper and cloth. Sewage should be treated properly before using as fertilizer and as landfills. The organic matter from domestic, agricultural and other waste should be segregated and subjected to vermicomposting which generates useful manure as a by product.

Thermal pollution

The waste heat from the boilers and heating processes increases the temperature of the cooling water. Discharge of hot water may increase the temperature of the receiving water by 10 to 15 °C above the ambient water temperature. Increase in water temperature decreases dissolved oxygen in water which adversely affects aquatic life.

Unlike terrestrial ecosystems, the temperature of water bodies remain steady and does not change very much.
Thermal pollution is defined as the addition of excess of undesirable heat to water thereby making it harmful to man, animal or aquatic life. Thermal pollution may also cause significant departures from nor activities of aquatic communities.

Control measures

Thermal pollution can be controlled by passing the heated water through a cooling pond or a cooling tower after it leaves the condenser. The heat is dissipated into the air and the water can then be discharged into the river or pumped back to the plant for reuse as cooling water.

Radiation

Radiation is a form of energy travelling through space. The radiation emanating from the decay of radioactive nuclides are a major sources of radiation pollution. Radiations can be categorized into two groups namely the non-ionizing radiations and the ionizing radiations.

Non-ionizing radiations are constituted by the electromagnetic waves at the longer wavelength of the spectrum ranging from near infra-red rays to radio waves.

Ionizing radiations cause ionization of atoms and molecules of the medium through which they pass. Electromagnetic radiations such as short wavelength ultra violet radiations (UV), X-rays and gamma rays and energetic particles produced in nuclear processes, electrically charged particles like alpha and beta particles produced in radioactive decay and neutrons produced in nuclear fission, are highly damaging to living organisms.

The biological damage resulting from ionizing radiations is generally termed as **radiation damage**. Large amounts of radiation can kill cells that can dramatically affect the exposed organism as well as possibly its offspring.
Radiation damage can be divided into two types: (a) **somatic damage** (also called *radiation sickness*) and (b) **genetic damage.** Somatic damage refers to damage to cells that are not associated with reproduction. Effects of somatic radiation damage include reddening of the skin, loss of hair, ulceration, fibrosis of the lungs, the formation of holes in tissue, a reduction of white blood cells, and the induction of cataract in the eyes. This damage can also result in cancer and death. Genetic damage refers to damage to cells associated with reproduction. This damage can

subsequently cause genetic damage from gene mutation resulting in abnormalities. Genetic damages are passed on to next generation.

Control measures for Radiation Pollution

- Use of high chimney and ventilations at the working place where radioactive contamination is high.

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

- Fission reactions should be minimized.

- In nuclear mines, wet drilling may be employed along with underground drainage.

- Nuclear medicines and radiation therapy should be applied when absolutely necessary and earth minimum doses.

It is only through prevention that safety can be assured. The regulations and other standards are put in place to make sure there is no way for radioactive matter to be released.

Light pollution is a broad term that refers to multiple problems, all of which are caused by inefficient, unappealing, or (arguably) unnecessary use of artificial light. Specific categories of light pollution include light trespass, over-illumination, glare light clutter, and sky glow. A single offending light source often, light clutter, and sky glow. A single offending light source often falls into more than one of these categories. Health effects of over-illumination or improper spectral composition of light may include: harmful for eyes, increased headache incidence, worker fatigue, medically defined stress, decrease in sexual function and increase in anxiety.

Control and reducing light pollution

implies reducing sky glow, glare, reducing light trespass, and reducing clutter. The method for best reducing light pollution, therefore, depends on exactly what the problem is in any given instance. Possible solutions include:

- Utilizing light sources of minimum intensity necessary to accomplish the light's purpose.
- Turning lights off using a timer or occupancy sensor or manually when not needed.
- Improving lighting fixtures, so that they direct their light more accurately towards where it is needed, and with fewer side effects.

- Adjusting the type of lights used, so that the light waves emitted are those that are less likely to cause severe light pollution problems.

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