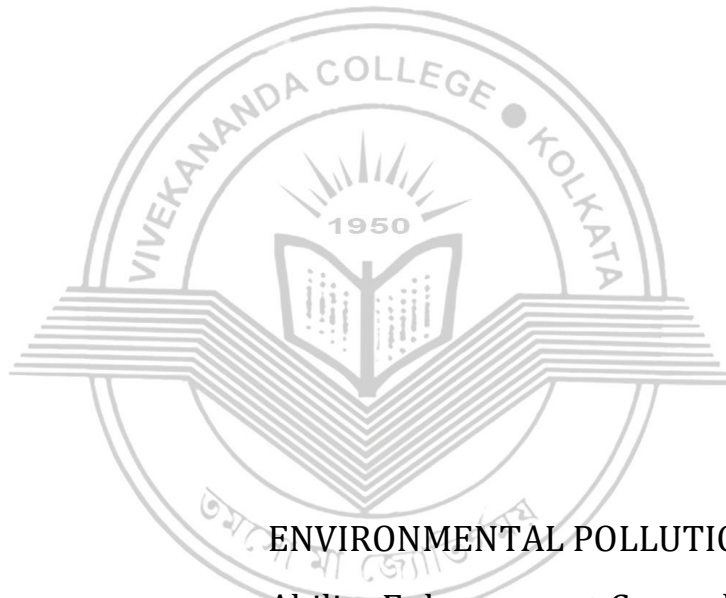


VIVEKANANDA COLLEGE
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NAAC ACCREDITED 'A' GRADE



Topic: ENVIRONMENTAL POLLUTION
Course Title: Ability Enhancement Compulsory Course
[Environmental Studies]
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Name of the Department: ENVIRONMENTAL SCIENCE

Introduction:

What is Environmental Pollution?

Environment Pollution is any undesirable changes in environment due to the addition of contaminants into the natural environment or elevated levels of natural components that causes detrimental effects to nature, natural resources and mankind.

Any unnatural and negative changes in all the dimensions like chemical, physical and biological characteristics of any component of the ecosystem i.e. air, water or soil which can cause harmful effects on various forms of life and property is called environmental pollution.

What is a Pollutant?

Any substance which causes harmful effects or uneasiness in the organisms, then that particular substance may be called as the pollutant.

Types of pollutants:

The materials that cause pollution are of two types:

1. **Persistent pollutants:** Those pollutants which remain consistent in the environment for a long period of time without any change in its original form are called persistent pollutants. For example pesticides, nuclear wastes, and plastics etc.
2. **Non-persistent pollutants:** These pollutants are the opposite of persistent pollutant and break down in the simple form. If this process of breaking down is done by living organisms, then such pollutants are referred to as biodegradable pollutants.

From another perspective, pollutants can be classified as follows:

1. **Primary Pollutants:** Primary pollutants are those which remain in the form in which they were added to the environment for ex. DDT, Plastic
2. **Secondary Pollutants:** Secondary pollutants are formed due to interaction of primary pollutants amongst themselves viz. PAN by the interaction of NO_x & Hydrocarbons.

According to their existence in nature:

1. **Quantitative Pollutants:** These substances are already present in the atmosphere but they become pollutant when their concentration level reaches to a particular level which is above a threshold limit.
2. **Qualitative Pollutants:** These are man-made pollutants eg. Fungicides, herbicides etc.

According to origin:

1. **Man-made Pollutants :** eg chemical pesticides, CFCs
2. **Natural Pollutants :** eg. Soot, ash, ground level ozone

According to the nature of disposal:

1. **Biodegradable Pollutants :** eg. Animal wastes
2. **Non-biodegradable Pollutants** eg. plastics



TYPES OF POLLUTION:(COMPONENT OF ENVIRONMENT)

AIR POLLUTION:

Air pollution refers to the release of harmful contaminants (chemicals, toxic gases, particulates, biological molecules, etc.) into the earth's atmosphere. These contaminants are quite detrimental and in some cases, pose serious health issues. Some causes that contribute to air pollution are:

- Burning fossil fuels
- Mining operations
- Exhaust gases from industries and factories

The effects of air pollution vary based on the kind of pollutant. But generally, the impact of air pollution ranges from:

- Increased risk of respiratory, skin, cardiovascular and other health related issues
- May increase the risk of cancer
- Global warming
- Acid rain
- Ozone depletion
- Hazards to wildlife

Air pollution is the presence of one or more disadvantageous content in such quantity and for such duration, as it is catastrophic, or tend to be catastrophic, to human health and welfare, animal or plant life. It is the contaminants of air by the discharge of detrimental substances (Table 1).

Control measures

- Policy measures
- Modification of industrial process and selection of suitable fuels and its utilization.
- Collection of pollutants and convert it into less toxic forms by different methods.

Table 1: Some of the air pollutants, their sources and effects:

Name of the pollutants	Sources	Health effects
Nitrogen oxides	Industries, vehicles and power plants	Problems in the lungs, respiratory systems and causes asthma and bronchitis.
Carbon monoxide	Emission and burning of fossil fuels	Severe headache, irritation to mucous membrane, unconsciousness and death.
Carbon dioxide	Burning of fossil fuels	Vision problem, severe headache and heart strain.
Suspended particulate matter	Vehicular emission and burning of fossil fuels.	Lung irritation reduces development of RBC and pulmonary malfunctioning.
Sulphur oxide	Industries and power plant	Irritation in eyes and throat, allergies, cough etc.
Smog	Industries and vehicular pollution	Respiratory and eye problems
Hydrocarbons	Burning of fossil fuels	Kidney problems, irritation in eyes, nose and throat, asthma, hypertension and carcinogenic effects on lungs.
Chlorofluorocarbons	Refrigerators, emission from jets	Depletion of ozone layer, global warming

Other pollutants are cadmium, lead, mercury, silica, coal dust and particles and radioactive pollutants

WATER POLLUTION:

Addition of certain substances such as organic, inorganic, biological and radiological to the water, which degrades the water quality and makes it unhealthy for use.

Water pollution is not only confined to surface water but also spread to groundwater, sea and ocean.

Sources

Point sources: These are directly pointed towards the water bodies from the source of origin of pollution and are thus easy to regulate.

Non-point sources: These sources are related to many diffuse sources and are thus difficult to regulate.

Some of the sources are:

- Industrial and community wastewater: Industries like mining, iron and steel, pharmaceuticals, food processing, soap and detergent and paper and pulp.
- Agricultural sources, thermal pollution (discharge of hot water by thermal power plants cause deficiency of dissolved oxygen in water) and underground water pollution.
- Marine pollution: river discharge, manmade pollution and oil spills etc.

Effects

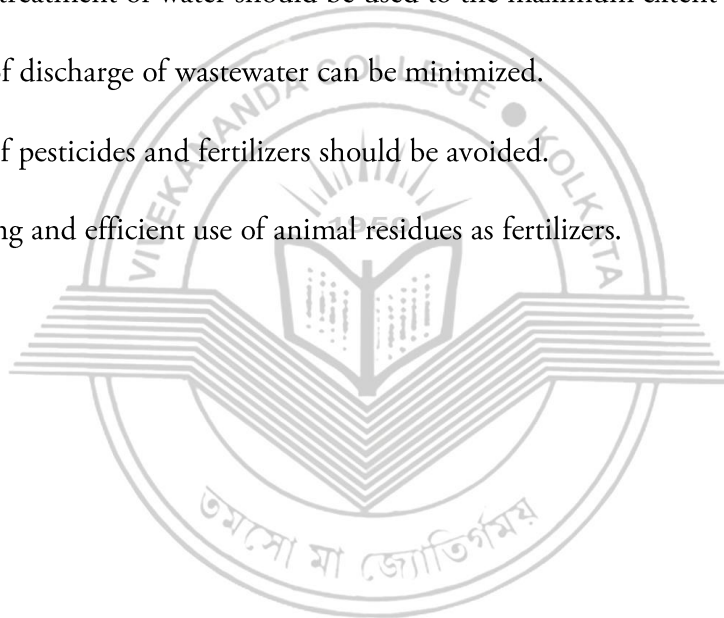
- Disruption of the ecosystem
- Increased risk of water-borne diseases like cholera, jaundice etc
- Increases toxic chemicals like different organic and inorganic compounds in water bodies
- An excessive amount of mercury in water can cause Minamata disease in humans and dropsy in fishes; Lead in large amount can cause dyslexia, Cadmium poisoning causes Itai – Itai disease etc.
- Polluted water has less amount of Dissolved oxygen (DO) content which is important for sensitive organisms, thereby eliminates sensitive organisms.

- Excess of nitrate in drinking water is dangerous for infants and human health, excess fluoride cause neuromuscular disorder and teeth deformity, hardening of bones and painful joints.
- Biological magnification and eutrophication.

Domestic waste discharge, agricultural waste, land drainage and industrial waste in a water body leads to a rapid increase in nutrients in a water body which initiates early ageing of water bodies.

Control measures

- Usage of water should be minimized by changing the techniques involved.
- Recycling and treatment of water should be used to the maximum extent possible.
- The quantity of discharge of wastewater can be minimized.
- Excessive use of pesticides and fertilizers should be avoided.
- Organic farming and efficient use of animal residues as fertilizers.



SOIL POLLUTION

Addition of unwanted substances to the soil which negatively affects physical, chemical and biological properties of soil and reduces its productivity is called soil pollution. The factors which disturb the biological balance of the soil and deteriorate the quality, texture and mineral content are called soil pollutants.

soil contamination, refers to the degradation of land due to the presence of chemicals or other man-made substances in the soil. The xenobiotic substances alter the natural composition of soil and affect it negatively. These can drastically impact life directly or indirectly. For instance, any toxic chemicals present in the soil will get absorbed by the plants. Since plants are producers in an environment, it gets passed up through the food chain.

Use of fertilizers, pesticides, insecticides, dumping of solid waste, deforestation and pollution due to urbanization and other anthropogenic substances causes soil pollution and contamination.

Sources

- Industrial waste: lead, cadmium, mercury, alkalis, organic substances and chemicals.
- Agricultural waste: fertilizers, pesticides, insecticides and manures.
- Discarded materials and radioactive elements and plastic bags.

Effects

- Agriculture: It reduces soil fertility and thus crop yields; increase soil erosion and salinity.
- Ecological imbalance and imbalance in flora and fauna further increases.
- Problems in urban areas like clogging in drains, release of gases, foul smells and problems in wastewater management.
- Release of radioactive rays, biomagnification and pollutant gases cause health problems.

Control measures

- Afforestation, reforestation and use of organic farming.
- Solid waste management and reduction of waste from the construction area.
- Stop the use of plastic bags and use bags of degradable materials like paper and cloth.
- Biomedical waste should be collected and incinerated in incinerators.

NOISE POLLUTION

Noise pollution refers to the excessive amount of noise (high intensity and frequency sound energy) in the surrounding that disrupts the natural balance. Usually, it is man-made, though certain natural calamities like volcanoes can contribute to noise pollution. Intensity determines the loudness of sound and frequency determines the sharpness or shrillness.

In general, any sound which is over 85 decibels is considered to be detrimental. Also, the duration an individual is exposed plays an impact on their health. For perspective, a normal conversation is around 60 decibels, and a jet taking off is around 150 decibels. The protective auditory reflex action of our body can protect us only upto a certain level only.

Sources

Noise pollution has several contributors, which include:

- Industry-oriented noises such as heavy machines, mills, factories, etc.
- Transportation noises from vehicles, aeroplanes, etc.
- Construction noises
- Noise from social events (loudspeakers, firecrackers, etc.)
- Household noises (such as mixers, TV, washing machines, etc.)
- Noisy habits like rock musics.

Noise pollution has now become very common due to dense urbanisation and industrialisation.

Effects

Noise pollution can bring about adverse effects such as :

- Hearing loss: temporary or permanent
- Tinnitus: it is a continuous humming sound within ear which is a symptom of internal ear damage due to excessive noise exposure.
- Sleeping disorders
- Hypertension
- Elevated blood pressure due to adrenaline hormone secretion.
- Communication problems
- Reduced IQ in children
- Sonic boom: sudden very high intensity impulsive noise released by aircrafts which can cause permanent auditory impairment and even cracks in nearby constructions.
- Reduced population of migratory birds.

Control Measures

- Personal measures like avoiding noisy habits, using earplugs in noisy environment.
- Use of traditional ringing bells in trains and other vehicles to avoid airhorns
- Application of asphalt on roads
- Green belt development
- Reduction of noise at source in case of industries
- Strict implementation of law



MARINE POLLUTION

Marine pollution is a combination of chemicals and trash, most of which comes from land sources and is washed or blown into the ocean. Oilspill is one of the biggest contributor of marine pollution. It generally occurs during transport of petroleum and petroleum products. It consists various kinds of hydrocarbons like normal paraffins, cycloparaffins, aromatic hydrocarbons, naphthenes etc. This pollution results in damage to the environment, to the health of all organisms, and to economic structures worldwide.

Pollutants are dumped into the ocean. This waste affects the daily life of fish and other marine creatures. oceans are being flooded with two main types of pollution: chemicals and trash. Chemical contamination, or nutrient pollution, is concerning for health, environmental, and economic reasons. This type of pollution occurs when human activities, notably the use of chemical fertilizers, lead to the runoff of chemicals into waterways that ultimately flow into the ocean. The increased concentration of chemicals, such as nitrogen and phosphorus, in the coastal ocean promotes the growth of algal blooms, which can be toxic to wildlife and harmful to humans. The negative effects on health and the environment caused by algal blooms hurt local fishing and tourism industries.

Marine trash encompasses all anthropogenic products most of them plastics that end up in the ocean. Common types of marine debris include various plastic items like shopping bags and beverage bottles, along with cigarette butts, bottle caps, food wrappers, and fishing gear. Plastic waste is particularly problematic as a pollutant because it is so long-lasting. Plastic items can take hundreds of years to decompose.

Effects of Marine Pollution

1. This trash poses dangers to both humans and animals. Fish become tangled and injured in the debris, and some animals mistake items like plastic bags for food and eat them. Small organisms feed on tiny bits of broken-down plastic, called microplastic, and absorb the chemicals from the plastic into their tissues. Microplastics are less than five millimeters (0.2 inches) in diameter and have been detected in a range of marine species, including plankton and whales. When small organisms that consume microplastics are eaten by larger animals, the toxic chemicals then become part of their tissues. In this way, the microplastic pollution migrates up the food chain, eventually becoming part of the food that humans eat.
2. Oilspill quickly spreads over a large area and this floating oil layer prevents the gaseous exchange thus reduces the dissolved oxygen .

3. This oil layer also prevents the sunlight penetration hence inhibits photosynthesis..
4. Destroy phytoplanktons on water surface
5. Destroys biodiversity of marine ecosystem
6. Severely affects the life of sea birds as oil penetrates into their feather and reduces flexibility thus fail to fly.
7. The sea foods becomes contaminated with toxic hydrocarbons and enter into food chain.
8. The oilspill and tar lumps creates visual pollution.

Control

Solutions for marine pollution include prevention and cleanup. Disposable and single-use plastic is abundantly used in today's society, from shopping bags to shipping packaging to plastic bottles. Changing society's approach to plastic use will be a long and economically challenging process. Cleanup, in contrast, may be impossible for some items. Many types of debris (including some plastics) do not float, so they are lost deep in the ocean.

Bioremediation of oil spill by microbial degradation secreting oxygenase, hydrogenase enzymes.

