ENVIRONMENTAL POLLUTION

Define the terms pollution, pollutants

Describe the various types of pollution, sources, and harmful effects on human health, control and preventive measures

Introduction

Human activities directly or indirectly affect the environment adversely. Eg A stone crusher adds a lot of suspended particulate matter and noise into the atmosphere. Automobiles emit from their pipes oxides of nitrogen, carbon dioxide, carbon monoxide and black soot which pollute the environment. Land fertilizers, pollute water bodies. Effluents from tanneries contain many harmful chemicals and emit foul smell. These are only a few examples which show how human activities pollute the environment.

Pollution is addition of undesirable substance or material into the environment as a result of human activities. **OR**

It is an undesirable change in chemical, physical, and biological characteristics of air, water and soil, which causes the health problem to all the living beings.

Pollutants; Are physical, chemical or biological substance released into the environment which is directly or indirectly harmful to humans and other living organisms. **OR**

Any form of energy or matter or action that causes imbalance or disequilibrium in the required composition of natural objects such as air, water, etc. a pollutant creates damage by interfering directly or indirectly with the biogeochemical process of an organism

Pollutants may be;

Natural pollutants-caused by natural forces such as volcanic eruption and forest fire

Man-made pollutants; refer to the release of excess amount of gases or matter by human activities. Eg increase in the number of automobile adds excess carbon monoxide to the atmosphere causing harmful effects on vegetation and human health

Classification of pollutants

The pollutants may be classified as

Degradable or non-persistent pollutants: - these are broken down rapidly by the natural process e.g. Domestic waste, garbage and sewage.

Non-degradable pollutants: - these pollutants never get degraded by any natural process. E.g. Toxic elements like lead, mercury, nuclear waste.

TYPES OF POLLUTION

Different types of pollution are classified based on the part of the environment which they affect or result caused by a particular pollution. Each type of pollution has its own distinctive cause and consequences

The major types of pollution are as follows; air, water, noise, soil or land, nuclear pollution

AIR POLLUTION

Primary pollutants	secondary pollutants
Released direct in to the air	Added after they are formed as chemical reaction in the air btn primary pollutants
Ash	smog –sun light +NO2
Salt particles	acid rain
Pollen and spores	pollen and spores
Smoke	smoke
Windblown dust	windblown dust

SOURCES OF AIR POLLUTION

SOURCES OF PRIMARY POLLUTANT CREATED BY NATURE

Volcanoes, breaking seas, pollens (not in human control), blowing dust, bacteria c virus, fire

Sources of pollutants created by human

Combustion process, chemical process, nuclear or atomic processes, refining/heating roasting process, farming, mining, quarrying processes

Secondary pollutant; atmospheric H_2SO_4 formed by reaction of moisture or water + SO_2/SO_3

SECONDARY POLLUTANTS

Acid rain: Atmospheric H_2SO_4 formed by reaction of moisture or water + SO_2 / SO_3

Photochemical smog: - it is harmful mixture formed by gases of nitrogen and particulate matter due to photochemical reactions under influence of strong sunlight.

Ozone contributes majorly to photochemical smog

Every day, every moment, we breathe polluted air and may become a victim of air pollution.

Air pollution is one of the most wide spread forms of pollution all over the world. Wind is the main agent of air pollution. It gathers and moves pollutants from one area to another, sometimes reducing the concentration of pollutants in one location, while increasing it in another.

Causes of air pollution

Apart from the natural causes of pollutants, human interaction and resources utilization is perhaps adding more pollutants to the atmosphere

Industrialization. Industries big or small require steam to run. The steam is produced by burning fossil fuels such as coal, coke and furnace, oil. These fuels while burning release toxic gases in large amount in to the atmosphere

Automobiles; to meet the demands of exploding human population, the number of automobile is increasing at a great space. The automobile exhausts are responsible for about sixty percent of air pollution. Released carbon monoxide from the automobile pollutes the air and harms trees and the natural vegetation. It also has ill effects on human health

Chlorofluorocarbons; scientists are alarmed regarding the increased concentration of chemical substances together called chlorofluorocarbon in the atmosphere. These substances are responsible for creating holes in the ozone layer causing unwanted imbalance in the heat budget. These are produced by modern gadgets such as air conditioners, refrigerators, dyers etc

The adverse effect of air pollution appears in the form of poor quality of air. Acidic precipitation (rain, snow and hail) and deposition and other health hazards

The main pollutants of air are carbon dioxide (CO_2), carbonic acid (H_2SO_2), water (H_2O), nitric acid (HNO_3O) and sulphuric acid (H_2SO_4), dust, smoke, soot

Air pollution has harmful effects on natural vegetation and human health such as respiratory illnesses, acidic precipitation is highly fatal for aquatic flora and fauna, monuments and also for natural vegetation

Indoor air pollution

Poor ventilation due to faulty design of buildings leads to pollution of the confined space. Paints, carpets, furniture, etc. in rooms may give out volatile organic compounds (VOCs). Use of disinfectants, fumigants, etc. may release hazardous gases.

In hospitals, pathogens present in waste remain in the air in the form of spores. This can result in hospital acquired infections and is an occupational health hazard.

In congested areas, slums and rural areas burning of firewood and biomass results in lot of smoke. Children and ladies exposed to smoke may suffer from acute respiratory problems which include running nose, cough, sore throat, lung infection, asthama, difficulty in breathing, noisy respiration and wheezing.

Air pollution control

Air pollution control is a tedious task as there are large number of pollutants involved in air pollution. Some of these are even difficult to detect. However there can be some basic approaches to control air pollution. They are as follows

Preventive approach; changing raw materials used in industries or the ingredients of fuel from conventional to non-conventional sources of energy,

Maintenance of vehicles and roads and efficient transport system,

Reduction in garbage burning and shifting cultivation areas,

Afforestation

Well ventilated kitchen

Improved stoves

Dispersal approach; raising heights of smoke stacks (chimney) in industries so as to release the pollutants high in to the atmosphere

Collection approach; Designing the equipment and machinery to trap pollutants before they escape in to the atmosphere.

To meet the standards, automobile engines have been redesigned and new cars have been equipped with devices such as the catalytic converter, which changes the pollutants in to harmless substances, because of these new devices, air pollution from car exhaust has also been reduced

Legislation approach; There have been many initiatives in different countries for making laws, setting standards and norms to check air pollution and ensure quality air. All the highly industrialized countries of the world have certain legislation to prevent and control air pollution. As pollutants of air are carried by the wind from one country to another for thousands of miles, there should be global initiative s agreed upon by all countries to save the earth from the menace of air pollution

WATER POLUTION

This is the alteration in physical, chemical and biological characteristics of water, which may cause harmful effects on human and aquatic life OR

Addition or presence of undesirable substance in water

Pollutants in water

1- Disposal of sewage and sludge in to water bodies such as river, streams and lakes
2- Inorganic compounds and minerals by mining and industrial activities
3- Use of chemical fertilizers for agricultural purposes
4- Synthetic organic compounds from industrial, agricultural and domestic garbage
5- Oil and petroleum from tankers accident, offshore drilling, combustion engine etc
6- Radioactive wastes
7- Natural sources of pollution of water are soil erosion, leaching of minerals from rocks and decaying of organic matter. Rivers, lakes, seas, oceans, Ground water sources may be polluted by point or non-point sources. When pollutants are discharged from a specific location such as a drain pipe

carrying industrial effluents discharged directly into a water body it represents point source pollution. In contrast non-point sources include discharge of pollutants from diffused sources or from a larger area such as run off from agricultural fields, grazing lands, construction sites, abandoned mines and pits, roads and streets

Water pollution control

Environmental education; individuals and the masses should be educated about the significance of quality of water and its impact on the economy, the society and ecology

Sewage treatment; the household water should be treated properly to make it environmentally safe. Necessary steps should be taken to ensure that effective sewage treatment process is put in place and contaminated water doesn't get mixed with the fresh water bodies

Accountability of industrial units; the industrial setups should make provisions for treatment of wastes materials and water and for its safe drainage

Afforestation; planting trees can reduce the water pollution to a large extent as they check surface soil run off by running water

Soil conservation; soil conservation add many inorganic substances in the surface and underground water. Soil conservation reduces water pollution

Reduced use of chemical fertilizers; chemical fertilizers add nitrates in water bodies, use of compost manures can help reduce the problem of eutrophication in the water bodies

Finance support; governments should make provisions for adequate funds to the civic bodies for water pollution control

Legislation and implementation of stringent environmental laws; the need f the hour is that the government should legislate and implement strict environmental laws for the protection of water bodies etc, the violators of such laws should be given exemplary punishment

NOISE POLLUTION

Refers to any unwanted and unpleasant sound that brings discomfort and restlessness to human beings. Like air and water pollution, noise pollution is harmful to human and animal life

Noise pollution is also an important environmental hazard, which is becoming growingly injurious in many parts of the world. Noise beyond a particular level or decibel (unit of noise) tends to become a health and environmental hazard

Sources of noise pollution

Noise in industries such as stone cutting and crushing, steel forgings , loudspeakers, shouting by hawkers selling their wares, movement of heavy transport vehicles, railways and airports

- Household appliances such as grinders, electric motor, washing machines
- Social gathering s such as marriages and other social parties
- Places of worship
- Commercial activities
- Power generators
- Agricultural equipment's

It is therefore of utmost importance that excessive noise is controlled. Noise level is measured in terms of decibels (dB). W.H.O. (World Health Organization) has prescribed optimum noise level as 45 dB by day and 35 dB by night. Anything above 90 dB is hazardous.

Effects

Irritation, increased blood pressure, loss of temper or annoyance, loss of hearing from partial to permanent, causes accidents, lack of concentration, intensive causes destruction of ear drum, disturbs sleep, affects efficiency

Noise pollution control (house hold level)

1- Turning off sound making appliances when they are not in use
2- Shutting the door when noisy machine are being used
3- Lowering the volume of appliances such as television to a desirable level
4- Using earplugs while listening to music

At mass level it can be checked by

1- Planting trees in large number to create vegetation buffer zones, which absorb noise
2- Public awareness about the need of control of noise pollution
3- Application of engineering control technique such as alteration and modification of design to reduce noise from equipment and machinery, and by construction of sound barriers or the use of sound absorbers in industrial and factory sites can reduce exposure to noise to great extent
4- Construction of institutions and hospitals away from airports, railways and highways
5- Improved building design may also reduce the impact of noise pollution
6- Stringent legislations at central and state levels to check air pollution at workplaces, urban centers etc
7- Use of ear plugs, ear muffs,
8- Industries should be located far from residential areas

SOIL POLLUTION

Undesirable decrease in the quality of soil, either by man induced sources of natural sources or by both

Soil is vital not only for the growth of plants and growing food but also cultivating raw materials for agro-based industries, Health, soil is a significant prerequisite for human survival

Causes of soil pollution

- Deforestation at large scale
- Overgrazing
- Mining
- Decrease in soil microorganisms
- Excessive use of fertilizers
- Excessive use of irrigation
- Lack of humus content
- Improper and unscientific rotation of crops

Soil pollution leads to many harmful consequences such as decrease in agricultural production, reduced nitrogen fixation, reduction in biodiversity, silting of tanks, lakes and reservoirs, diseases and deaths of consumers in the food chain due to use of chemical fertilizers and pesticides

Soil pollution control

- Adoption of soil friendly agricultural practices
- Treatment of sewage
- Use of compost manures in place of fertilizers, use of bio fertilizers and natural pesticides help in minimizing the usage of chemical fertilizers and pesticides
- Scientific rotation of crop to increase soil fertility
- Proper disposal of industrial and urban solid and liquid wastes
- Planting of trees to check soil erosion in slopes and mountainous regions
- Controlled grazing
- Reduction in the heaps of garbage and refuse
- The principle of three Rs-recycle, reuse and reduce –help in minimizing generation of solid waste
- Formulation and effective implementation of stringent pollution control legislation
- Improved sewage and sanitation system in urban areas

RADIATION/ E WASTE

Radiation is a form of energy travelling through space. The radiation emanating from the decay of radioactive nuclides are 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. These waves have energies enough to excite the atoms and molecules of the medium through which they pass, causing them to vibrate faster but not strong enough to ionize them.

Radiation damage; 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. Affected cells can mutate and result in cancer.

A large enough dose of radiation can kill the organism. 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

Radiation dose; the biological damage caused by the radiation is determined by the intensity of radiation and duration of the exposure.

Nuclear explosions and accidents in nuclear reactors are a serious source of radiation hazard.

Examples of ionizing agents, x-ray radioactive isotopes