TOPIC: AIR POLLUTION

Bsc Part 1 Notes

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Developmental activities such as construction, transportation and manufacturing not only deplete the natural resources but also produce large amount of wastes that leads to pollution of air, water, soil, and oceans; global warming and acid rains. Untreated or improperly treated waste is a major cause of pollution of rivers and environmental degradation causing ill health and loss of crop productivity. In this lesson you will study about the major causes of pollution, their effects on our environment and the various measures that can be taken to control such pollutions

POLLUTION AND POLLUTANTS Human activities directly or indirectly affect the environment adversely. A stone crusher adds a lot of suspended particulate matter and noise into the atmosphere. Automobiles emit from their tail pipes oxides of nitrogen, sulphur dioxide, carbon dioxide, carbon monoxide and a complex mixture of unburnt hydrocarbons and black soot which pollute the atmosphere. Domestic sewage and run off from agricultural fields, laden with pesticide and 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 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.

10.2 TYPES OF POLLUTION

Pollution may be of the following types:

• Air pollution • Noise pollution • Water pollution • Soil pollution • Thermal pollution • Radiation pollution

AIR POLLUTION Air pollution is a result of industrial and certain domestic activity. An ever increasing use of fossil fuels in power plants, industries, transportation, mining, construction of buildings, stone quarries had led to air 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, plants, property or interferes with the normal environmental processes. Air pollutants are of two types (1) suspended particulate matter, and (2) gaseous pollutants like carbon dioxide (CO_2), NOx etc.

Particulate air pollutants, their sources and effects Pollutant Sources Effects Suspended particulate Smoke from domestic, Depends on specific composition matter/dust industrial and

vehicular soot Reduces sunlight and visibility, increases corrosion, Pneumoconiosis, asthma, cancer, and other lung diseases. Fly ash Part of smoke released from Settles down on vegetation, houses. Adds chimneys of factories and to the suspended participate matter (SPM) power plants in the air. Leachates contain harmful material

Particulate pollutants Particulate matter suspended in air are dust and soot released from the industrial chimneys. Their size ranges from 0.001 to 500 µm in diameter. Particles less than 10µm float and move freely with the air current. Particles which are more than 10µm in diameter settle down. Particles less than 0.02 µm form persisent aerosols. Major source of SPM (suspended particulate matter) are vehicles, power plants, construction activities, oil refinery, railway yard, market place, industries, etc. • Fly ash Fly ash is ejected mostly by thermal power plants as by products of coal burning operations. Fly ash pollutes air and water and may cause heavy metal pollution in water bodies. Fly ash affects vegetation as a result of its direct deposition on leaf surfaces or indirectly through its deposition on soil. Fly ash is now being used for making bricks and as a land fill material. • Lead and other metals particles Tetraethyl lead (TEL) is used as an anti-knock agent in petrol for smooth and easy running of vehicles. The lead particles coming out from the exhaust pipes of vehicles is mixed with air. If inhaled it produces injurious effects on kidney and liver and interferes with development of red blood cells. Lead mixed with water and food can create cumulative poisoning. It has long term effects on children as it lowers intelligence. Oxides of iron, aluminum, manganese, magnesium, zinc and other metals have adverse effect due to deposition of dust on plants during mining operations and metallurgical processes. They create physiological, biochemical and developmental disorders in plants and also contribute towards reproductive failure in plants.

Gaseous pollutants Power plants, industries, different types of vehicles – both private and commercial use petrol, diesel as fuel and release gaseous pollutants such as carbon dioxide, oxides of nitrogen and sulphur dioxide along with particulate matter in the form of smoke. All of these have harmful effects on plants and humans.

Pollutant Source Harmful effect Carbon compound Automobile exhaust • Respiratory problems (CO and CO2) burning of wood and coal • Green house effect Sulphur compounds Power plants and refineries • Respiratory problems in humans (SO2 and H2 S) volcanic eruptions • Loss of chlorophyll in plants (chlorosis) •Acid rain Nitrogen Compound Motor vehicle exhaust • Irritation in eyes and lungs (NO and N2O) atmospheric reaction • Low productivity in plants •Acid rain damages material (metals and stone) Hydrocarbons Automobiles and • Respiratory problem (benzene, ethylene) petroleum industries • Cancer causing properties SPM (Suspended Thermal power plants, • Poor visibility, breathing problems Particulate Matter) Construction activities, • Lead interfers with the development (Any soild and liquid) metalurgical processes of red blood diseases and cancer. particles suspended and automobiles • Smoge (skoke & fog) formation leads in the air, (flush, dust, to poor visibility and aggravates lead) asthma in patients Fibres (Cotton, wool) Textiles and carpet weaving • Lung disorders industries

Prevention and control of air pollution (i) 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. (ii) Prevention and control of indoor air pollution Use of wood and dung cakes should be replaced by cleaner fuels such as biogas, kerosene or electricity. But supply of electricity is limited. Similarly kerosene is also limited. Improved stoves for looking like smokeless chullahs have high thermal efficiency and reduced emission of pollutants including smoke. The house designs should incorporate a well ventilated kitchen. Use of biogas and CNG (Compressed Natural Gas) need to be encouraged. Those species of trees such as baval (Acacia nilotica) which are least smoky should be planted and used. Charcoal is a comparatively cleaner fuel. Indoor pollution due to decay of exposed kitchen waste can be reduced by covering the waste properly.

Segregation of waste, pretreatment at source, sterilization of rooms will help in checking indoor air pollution. (iii) Prevention and control of industrial pollution Industrial pollution can be greatly reduced by: (a) use of cleaner fuels such as liquefied natural gas (LNG) in power plants, fertilizer plants etc. which is cheaper in addition to being environmentally friendly. (b) employing environment friendly industrial processes so that emission of pollutants and hazardous waste is minimized. (c) installing devices which reduce release of pollutants. Devices like filters, electrostatic precipitators, inertial collectors, scrubbers, gravel bed filters or dry scrubbers are described below: (i) Filters – Filters remove particulate matter from the gas stream. The medium of a filter may be made of fibrous materials like cloth, granular material like sand, a rigid material like screen, or any mat like felt pad.

References :

Environmental Pollution: Definition, Causes, Effects, Solution (embibe.com)

Lesson 10.pmd (shivajicollege.ac.in)