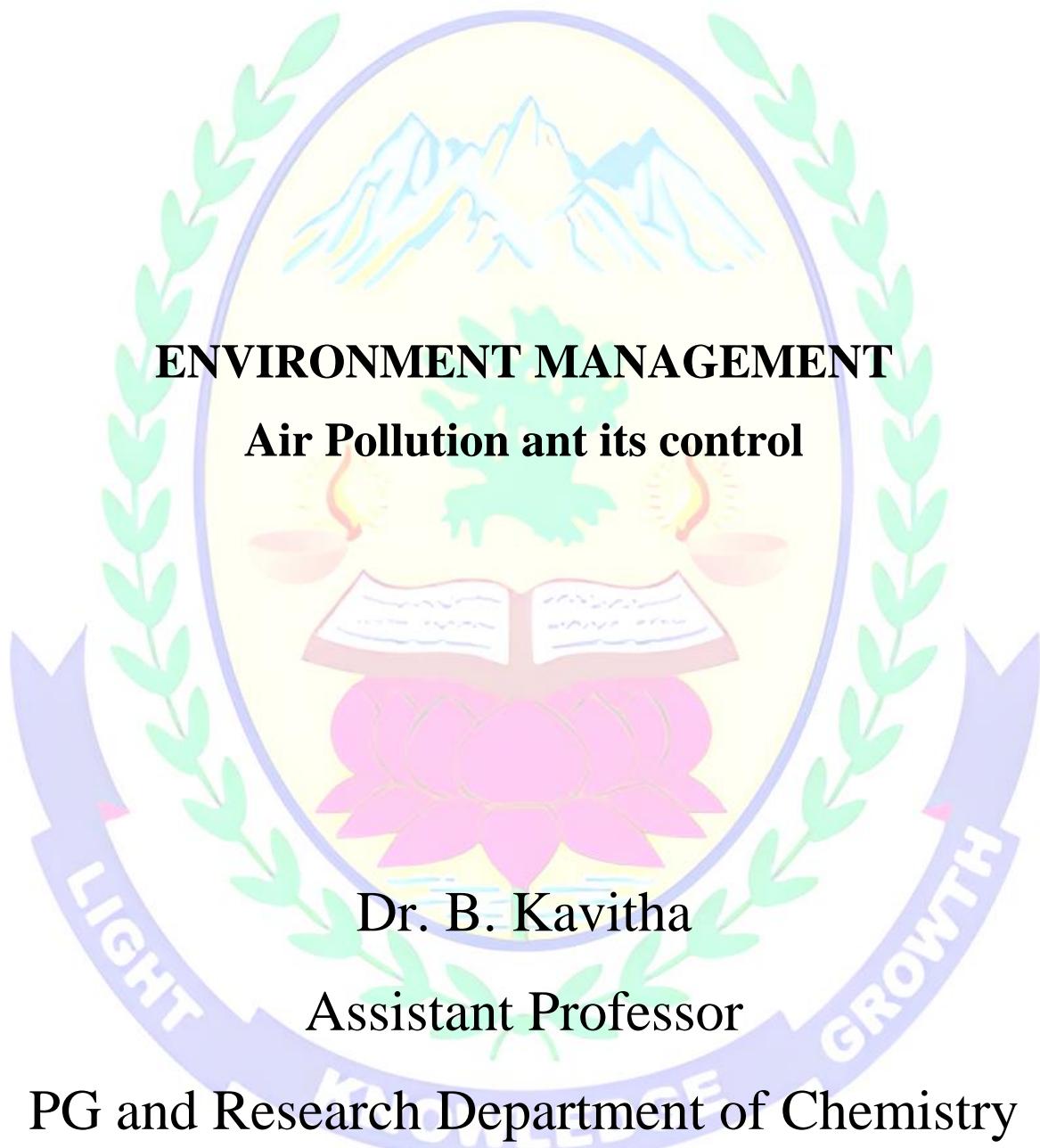




**Cardamom Planters' Association College
(Re-accredited with 'B' Grade by NAAC)
Pankajam Nagar, Bodinayakanur - 625 582.**



C.P.A. College, Bodinayakanur

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), NO_x etc. Some of the major air pollutants, their sources and effects are given in table.

Particulate air pollutants, their sources and effects

Pollutant	Sources	Effects
Suspended particulate matter/dust	Smoke from domestic, industrial and vehicular soot	Depends on specific composition Reduces sunlight and visibility, increases corrosion, Pneumoconiosis, asthma, cancer, and other lung diseases.
Fly ash	Part of smoke released from chimneys of factories and power plants	Settles down on vegetation, houses. Adds to the suspended particulate matter (SPM) in the air. Leachates contain harmful material

Particulate pollutants

Environmental Science Senior Secondary Course

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 10 μm float and move freely with the air current. Particles which are more than 10 μm in diameter settle down. Particles less than 0.02 μm form persistent 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. Table lists some of these pollutants, their sources and harmful effects.

Gaseous air pollutants: their sources and effects

Pollutant	Source	Harmful effect
Carbon compound (CO and CO ₂)	Automobile exhaust burning of wood and coal	<ul style="list-style-type: none"> • Respiratory problems • Green house effect
Sulphur compounds (SO ₂ and H ₂ S)	Power plants and refineries volcanic eruptions	<ul style="list-style-type: none"> • Respiratory problems in humans • Loss of chlorophyll in plants (chlorosis) • Acid rain
Nitrogen Compound (NO and N ₂ O)	Motor vehicle exhaust atmospheric reaction	<ul style="list-style-type: none"> • Irritation in eyes and lungs • Low productivity in plants • Acid rain damages material (metals and stone)
Hydrocarbons (benzene, ethylene)	Automobiles and petroleum industries	<ul style="list-style-type: none"> • Respiratory problem • Cancer causing properties
SPM (Suspended Particulate Matter) (Any soild and liquid) particles suspended in the air, (flush, dust, lead)	Thermal power plants, Construction activities, metallurgical processes and automobiles	<ul style="list-style-type: none"> • Poor visibility, breathing problems • Lead interferes with the development of red blood diseases and cancer. • Smog (skode & fog) formation leads to poor visibility and aggravates asthma in patients
Fibres (Cotton, wool)	Textiles and carpet weaving industries	<ul style="list-style-type: none"> • Lung disorders

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, asthma, 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. Baghouse filtration system is the most common one and is made of cotton or synthetic fibres (for low temperatures) or glass cloth fabrics (for higher temperature up to 290°C).

(ii) **Electrostatic precipitators (ESP)**- The emanating dust is charged with ions and the ionized particulate matter is collected on an oppositely charged surface. The particles are removed from the collection surface by occasional shaking or by rapping

the surface. ESPs are used in boilers, furnaces, and many other units of thermal power plants, cement factories, steel plants, etc.

(iii) **Inertial collectors** – It works on the principle that inertia of SPM in a gas is higher than its solvent and as inertia is a function of the mass of the particulate matter this device collects heavier particles more efficiently. ‘Cyclone’ is a common inertial collector used in gas cleaning plants.

(iv) **Scrubbers** – Scrubbers are wet collectors. They remove aerosols from a stream of gas either by collecting wet particles on a surface followed by their removal, or else the particles are wetted by a scrubbing liquid. The particles get trapped as they travel from supporting gaseous medium across the interface to the liquid scrubbing medium. Gaseous pollutants can be removed by absorption in a liquid using a wet scrubber and depends on the type of the gas to be removed e.g. for removal of sulphur dioxide alkaline solution is needed as it dissolves sulphur dioxide. Gaseous pollutants may be absorbed on an activated solid surface like silica gel, alumina, carbon, etc. Silica gel can remove water vapour. Condensation allows the recovery of many by products in coal and petroleum processing industries from their liquid effluents. Apart from the use of above mentioned devices, other control measures are increasing the height of chimneys.

- closing industries which pollute the environment.
- shifting of polluting industries away from cities and heavily populated areas.
- development and maintenance of green belt of adequate width.

(iv) Control of vehicular pollution

- The emission standards for automobiles have been set which if followed will reduce the pollution. Standards have been set for the durability of catalytic converters which reduce vehicular emission.
- In cities like Delhi, motor vehicles need to obtain Pollution Under Control (PUC)

certificate at regular intervals. This ensures that levels of pollutants emitted from vehicle exhaust are not beyond the prescribed legal limits.

- The price of diesel is much cheaper than petrol which promotes use of diesel. To reduce emission of sulphur dioxide, sulphur content in diesel has been reduced to 0.05%.
- Earlier lead in the form of tetraethyl lead was added in the petrol to raise octane level for smooth running of engines. Addition of lead in petrol has been banned to prevent emission of lead particles with the vehicular emission.

