

Chapter – 15: Pollution in Environment

- Contamination – air, water, soil – harmful substances – pollution
- Pollution – increased over years – by-product of industrial, technological advances
- Air, water pollution – major issues – affecting our lives – efforts taken to control them

Air Pollution

- Atmosphere – complex, dynamic, natural gaseous system – required for supporting life
- Pure air – nitrogen, oxygen, other inert gases – definite proportions
- Lots of harmful things – pollutants – mixed in these gases
- This mixing – result – air pollution
- All over the world – air pollution – affect lives – living organisms – including humans
- Some pollutants – gaseous – carbon dioxide, carbon monoxide, sulphur dioxide
- Some others – solid – carbon particles, tiny dust particles, etc
- Areas – far from industries – more trees – much cleaner air – less pollution

Sources of air pollution

- Natural sources –
 - Natural processes – harmful gases released – lead to air pollution
 - Some ways –
 - Wildfires – lots of smoke, carbon monoxide
 - Volcanic activity – Sulphur, chlorine, ash
 - Radon gas – radioactive decay – inside earth's crust
- Human and Industrial sources –
 - Burning – different fuels – release pollutants
 - Sources –
 - Stationary sources – power plants, factories, refineries, etc
 - Mobile sources – automobiles, airplanes, etc
 - Other reasons – burning of fuels, aerosols, etc
 - Deforestation – no pollution – BUT – less trees – increased air pollution – trees – clean air
 - Suspended Particulate Matter (SPM) –
 - Small, solid particles – released from exhausts, factories, incomplete burning
 - Suspended matter contain – dust, mist, smoke, etc
 - Harmful chemical components – lead, nickel, arsenic – lung and respiratory damage
 - Smog – combination of smoke and fog
 - Chlorofluorocarbons (CFCs) and aerosols –
 - Chemicals – harm ozone layer – banned by many countries
 - Generally used – refrigerators, spray cans, ACs, etc

Effects of Air Pollution

- Primary effect – direct impact – quality, length of life
- Air pollutants – serious damages

- Affect – lungs, respiratory system – pumped throughout the body
- Deposited in soil, plants, water – further exposed to humans
- Also affect plants – premature leaf fall – growth problems
- Dust – absorption of sunlight – affect photosynthesis
- Common pollutant – affect humans – cigarette smoke – burning of tobacco – cause cancer

Global Warming

- Long-term air pollution – some changes in environment
- Avg. temp. – increasing over years – increase in release of gases – carbon dioxide, etc
- Carbon dioxide – released during respiration and burning – used by green plants – photosynthesis
- This way – carbon dioxide – recycled in nature – same levels
- BUT – now – humans – disturbing balance
- Amount of carbon dioxide – increasing – burning of fuels, deforestation
- Gases – trap sun's heat – maintain balance – greenhouse effect
- Greenhouse – glass structure – cold climate – let the sunlight in – BUT – does not let the heat out – warm from inside
- Gases – trap heat – greenhouse gases
- Increase in greenhouse gases – increase in global temperature – global warming
- Global warming – serious concern – change in natural energy balance
- Change in weather patterns – droughts, floods, diseases, extinction of species
- Melting of ice – result in floods
- Govt. – all countries – getting together – control emission of gases

Acid rain

- Pollutants – sulphur dioxide, nitric dioxide – react with water vapour – produce sulphuric acid, nitric acid
- These acids – fall down with rain – acid rain
- Effects –
 - Damage marble, cement structure
 - Taj Mahal, Agra – getting yellow
 - Called marble cancer
 - Limestone – dissolves in acid rain
 - Damage crops and trees
 - Washes away minerals – magnesium, calcium
 - Crops – do not receive proper nutrients
 - Aluminium – washed away
 - Reaches the water – harmful for marine life
 - Acidic water
 - Falls on water bodies – lakes, rivers, etc
 - Damage aquatic plants, animals

Depletion of ozone layer

- Ozone layer – protects the earth – UV radiations of Sun
- Excessive use – CFCs – holes in ozone layer
- These holes – allow UV rays to enter atmosphere – harmful – eye, skin diseases

Carbon monoxide poisoning (CO)

- Main air pollutant – poisonous, odourless gas – burning of charcoal indoors – incomplete combustion
- Inhalation – result in death – cuts off supply of oxygen

Poor visibility

- Smoke, other pollutants – result in poor visibility
- Nitrogen oxides – combine with other pollutants – form thick fog like layer – smog
- Smog – many breathing related issues – reduces visibility

Controlling Air Pollution

- Everyone – involve – controlling the dangers
- Ways to control –
 - Use unleaded petrol –
 - Lead – added to petrol – many benefits – BUT – more polluting
 - Unleaded petrol – less pollution
 - Use alternative fuels –
 - CNG (Compressed Natural Gas) and LPG (Liquified Petroleum Gas) – less harmful
 - Delhi govt. – compulsory – public vehicles – use CNG
 - This step – helps in control air pollution
 - Use catalytic converter –
 - Convert harmful gases into safe gases
 - Fitted in the exhaust pipes – petrol vehicles
 - Use scrubbers –
 - Used – remove SPM – factory emissions
 - SPM in air – removed by spraying water on air
 - SPM – gets wet – heavy – settle down
- Above methods – authorities – enforce
- Steps taken by common people –
 - Alternate sources of electricity – solar heaters, etc
 - Reduce rapid deforestation – more carbon dioxide absorbed
 - Replace wood, coal – more cleaner fuels – LPG, CNG, etc
- Van Mahotsav – another initiative – everyone plant new saplings – reduce air pollution

Water Pollution

- Water supplied to house – purified before supply
- Water – contain substance – harmful for humans, plants, animals – polluted
- Water – very important – when contaminated – affect our lives very much
- Major sources –
 - Municipal –
 - Wastewater, sewage, etc – homes, offices, hotels, etc – mixed with drinking water
 - Industrial –
 - Water, chemicals – factories, etc – enter directly into water bodies
 - Agricultural –

- Silt, fertilizers, chemicals – wash away – flows into water bodies

Effects of Water Pollution

- Water pollution – responsible – infectious diseases
- Most common – developing countries – sanitation – not proper
- Diseases – ingestion of contaminated water – cholera, typhoid, dysentery, etc
- Pesticides – affect marine life – also affect humans and animals – food chain
- Sometimes – sprayed knowingly – pest control
- Humans – various diseases – damage nervous, reproductive system – cancers, liver damage
- Water pollution – waste products – lead to reduction of oxygen
- This situation – eutrophication – responsible – killing marine life

Purification of Water

- Water sources – lakes, rivers, etc – lots of pollutants
- This water – purified before supply
- Municipal authorities – methods of purification –
 - Sedimentation –
 - Water – stored in reservoirs
 - Heavy impurities – rock particles, debris, etc – settle down
 - Water from above – sent to filter beds
 - Filtration –
 - Most common filter – rapid sand filter
 - Water – moves vertically – layers of sand – layer of activated carbon or anthracite charcoal
 - Top layer – removes organic matter – other contaminants – stick to sand particles
 - Disinfection –
 - Chemical disinfectant – added to filtered water – kill harmful microbes
 - Commonly – chlorine – used for chlorination
 - UV rays – any source – used for disinfection
- Water supplied this way – used for domestic purpose – BUT – not fit for drinking
- Water – safe for drinking – potable water
- Potable water – no pollutants, impurities – clean, clear, transparent, odourless, etc
- Methods – domestic purification –
 - Boiling –
 - Boil for 10-15 minutes – kill microbes – live at room temperatures
 - Effect of boiling – not long-lasting
 - Boiled water – stored for long – may acquire new microbes
 - Carbon filtering –
 - Charcoal – form of carbon – high surface area – absorbs toxic substances
 - Common household water filters – use activated charcoal
 - Reverse osmosis –
 - Large-scale water purification – most common method
 - Mechanical pressure – force impure water through semi-permeable membrane (SPM)