CHAPTER No - 5 Environmental Pollution

Pollution.

It is one of the most imp. issue of global concern of environmental degradation. Today. We are facing various problems caused by pollⁿ. everywhere. What is the pollution exactly means?

— Pollution is the effect of undesirable change in our surrounding, which is having harmful effect on living organisms, plants as well as on nonliving things also.

The term pollution is defined as — "Any undesirable change in the physical, chemical or biological characteristics of natural water air or soil, which can adversely affect the life or, can create a potential health hazard to any living organism or can cause damage to the non living things, material or property.

The term pollution is classified into 2 groups.

— Natural pollution.

eg. Dust coming from storms, heavy wind flow, smoke coming from forest fire. volcanic erruption. ~~pollen grains~~.

— Man made pollution — Air, water, soil.

Then we will see the term pollutant

The substances which causes pollution are termed as pollutants. Pollutants may be defined as " Any undesirable substances which are present in the wrong place, at the wrong ~~phase~~ time and in the wrong quantity.

Pollutants are classified in to 3 groups.

Biodegradable, Non biodegradable & slowly biodegradable.

* Biodegradable - These are degraded by the micro-organisms.
eg - Organic waste, domestic waste

* Non biodegradable - They are not degraded by the organisms. They are not naturally present in envt. but they are introduced to nature by various human activities.
eg:- Phenolic compounds, Al, Fe, mercury salt etc.

* Slowly biodegradable :- Their degradation takes place very slowly. These pesticides remains as it is for many years.
eg - D.D.T. (Dichloro Diphenyl Trichloroethane.
Some pesticides are these.

Then we will see the classification of pollut^n based on the on the pollutants
* eg - Radioactive, sewage, Noise, thermal, Plastic, marine, smoke, smog, chemical, Industrial, oceanic, biological etc.

We know air, water, land are 3 important comodities for existance of life. In past these imp. comodities were pure & uncontaminated. But now the situation is exact reverse. Because of the progress in science & technology. Environmental pollution is the result of urbani, industrial, technological revolution and speedy expditation of every bit of natural resources.

Three various types of pollution

- Air pollution
- ~~classificati~~
- Water pollution.
- Soil pollution.
- Marine pollution.
- Noise pollution.
- Thermal Pollution
- Nuclear Hazards
- Solid waste.

- Source of poll^n or causes
- Effect.
- Control measure.

Natural Hazards - flood, cyclones, landslide, Earthquake, Tsunami.

AIR - POLLUTION.

In the whole universe Earth is the only planet where atmosphere is present which supports life. Atmosphere is the gaseous layer which covers the whole earth. The gases are nothing but the air composed of varies gases.

The composition of air is

Major	N_2	78.09 %.
	O_2	20.94 %.
Minor	Ar	0.93 %.
	CO_2	0.031 %

other traces gases like Ne, He, CH_4, Kr, He, H_2O, CO, O_3, NH_3 NO_2, SO_2 etc. — < 0.01 %

This is the natural composition of air. But due to Human activities this composition has been altered. Some new gases are getting introduced to our atm. The change to natural

composition of air which is having adverse effect on life on Earth is nothing but the air pollution. So air pollu^{n} can be defined as "Change in the natural quality and composition of air due to presence of various polluting factors which are responsible to cause adverse effect on living organisms & non living things existing on Earth."

Classification of air pollutants - Generally air pollutants are classified on following basis.

1) Classifica^{n} based on the origin of source
2. classifica^{n} based on the addition into atmosphere.
3. classifica^{n} based on the state of matter.
4. classifica^{n} based on the chemical composition.

1. ~~Eg from book~~ :- Based on origin of source
   - Natural source
   - Manmade source or anthropogenic.

2. classifica^{n} based on addition into atmosphere - 2 gp.
   - Primary pollutants - These may be natural or man made. They enter in to atm as it is. ie without changing their physical, chemical & biological properties. They enter into atm in their natural form.
   eg of Natural primary pollutants - pollen grains, bacteria, virus, Dust due to volcanos etc.
   eg of manmade primary pollutants - dust particles from various industries, smoke, gases which includes SO_2, SO_3, NO, NO_2, Cl_2, CO, CO_2 etc.
   The primary pollutants are mixed directly to atm. They pollute atm without help of other pollutants. They are that much strong to affect the envt.

Pollution – Air pollution

nitrous oxide & other volatile organic compounds

* Secondary pollutants :- When 2 or more primary pollutants react with each other in the presence of atmospheric components like water vapours, humidity etc. They form secondary pollutants. The secondary pollutants are more toxic than primary pollutants.
eg — Ozone, PAN – Peroxy acetyl nitrate.

2. oxides of Nitrogen. These reacts with the atm. components to create the pollution.
eg — Photochemical smog, acid rain.
· ozone is formed when U.V. rays react with O_2 molecules.

3. classificⁿ based on the state of matter :-
This classificⁿ is based on physical nature of the pollutant. In this type there are 2 sub classes of pollutants.
– Gaseous pollutants eg — CO, CO_2, SOx, Nox etc
– Particulate matter -eg — dust particle, droplets, pollen grains. etc.

4. Classificⁿ based on chemical composition —
It includes depends upon the chemical nature of pollutants.
Organic pollutants – eg — Hydrocarbon, aldehydes etc.
Inorganic pollutants- eg - CO, CO_2, NO_2, H_2

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Sources of air Pollution :
A normal human being breathes about 22,000 times a day & inhales about 16 kg of oxygen.
Natural sources – They are introduce by natural activities. They are of 2 types
gaseous – smoke from forest fires, gases coming out of
Particulate matter (Particulate matter) - volcanic eruption dust storm, gases emitted from the

degradation of the organic matter like CO_2, NH_3, H_2S, CH_4, pollen grains of flowering plants, spores of fungus, algae, bacteria, viruses

The particulate matter introduced to air have 3 categories depending on their size.

- As Settlable particulate matter
- Suspended particulate matter &
- Respirable particulate matters.

The man made pollutant of anthropogenic contribute more than natural source & They are more dangerous to atm. & ultimately to our health. Manmade pollutants are introduced in ways - gaseous & particalate matter.

The gases sources includes - burning of fossil fuel like coal, kerosene. These are used in domestic as well as in industrial activity.

Then our vehicles are the major source of air pollution. They emmit the gases like CO, CO_2, oxides of Nitrogen, SOx, unburn hydrocarbons. These are emmited due to incomplete burning of fossil fuel.

The industries emmits large amount of gases to atm. which contains organic as well as inorganic gases, dust particles, salt particles, fly ash, carbon particles. There are some special gases are also emitted from the chemical industries during their production process. eg.

eg. acid fumes, & vapours of volatile chemicals, unused steam from boiler house.

The industries includes - Sugar, paper & pulp, textile mill, chemical industry etc., cement industry

N_2O — Dinitrogen oxide - monoxide

(4)

Then one modern agri. practice also contribute to air poll^n: spreading of pesticides, fertilizers in farm gives some part of it to air. These are very dangerous to our health.

The mining also contribute to air poll^n. It gives a more no. of dust particle which may contain the ore particles those to be mined. of metal particles.

Our domestic activities like burning of fossil fuel for cooking, heating, use of sprays; aerosols, room freshners, refrigerator (C F C) gas to atm.

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↳ The pollutants remains in to air depending upon their size, gases remains in to air but particulate matter remains depending on their size.

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The other sources are Thermal power plants, war, nuclear wapons or nuclear test - They introduce radioactive materials into air.

Effect of air poll^n :-

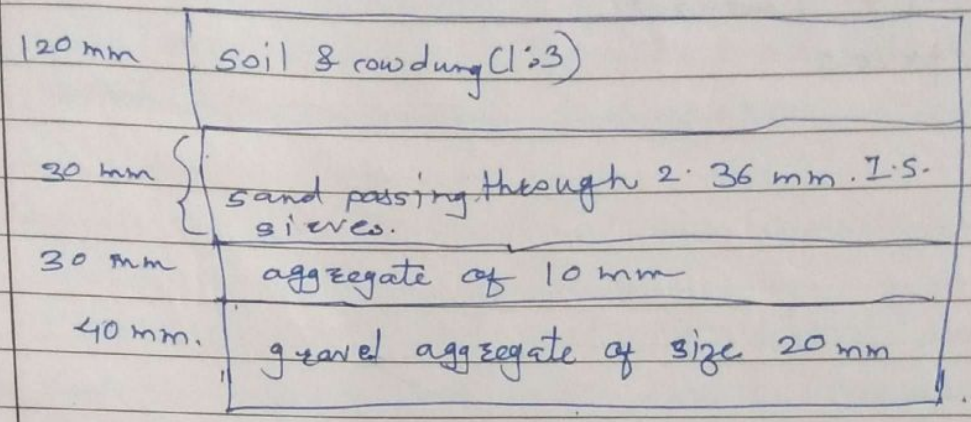
① Global effect — climat change, ozone layer depletion, green House effect & global warming.

② Effect on Human Health :- due to oxides of N_2, SO_2, CO, HC etc.

- NO_2 — irritation of eye, lung cancer, Pneumonia, bronchitis & respiratory problem.
- Nitrous oxide combines with Hb & reduces O_2 carrying capacity of blood.
- SPM can can cause damage to lung tissue & cause disease like asthama, bronchitis & cancer.

HNO_3
N_2O

4 layers.



Earthworm – Eisenia Fetida (Tiger worm)
5 lit. influent / day.

N_2O – Nitrous oxide / dinitrogen monoxide.
Laughing gas.

SO_2 – 3-5 days remain in atm.
corneal Hazc, Breathing difficulty,
Airways inflammation, eye irritation.
Psychic alteration, pulmonary oedema
Heart failure, circulatory collapse
althama, chronic bronchitis, morbidity &
mortality increases in old people & infants -
human health 0.3 μg/m³ - implies a
potential risk to human health.
for trees 0.2 μg/m³ - extremely dangerous.

NO_2 Dyspnea. - shortness of breath.
Diaphoresis – sweating
– eye, nose, throat irritation, headche, chest tightness,
choking, chest pain.

- SO_2 causes watery nasal discharge, sneezing, coughing, irritation of eye lung cancer, asthama, allergic inflammation etc
- CO_2 & CO causes headache, dizziness, nausea, difficulty in breathing.
other - Asbestos, Arsenic, mercury, radioactive substances cause lung disease & affect other vital organ like kidney, liver, spleen, brain & may cause cancer.
Asbestos - Fiber goes to lungs & causes asbestosis.
lead (Pb) emmited from the vehicles causes lead poisoning.

3 Effect on plant - Air pollutant affects plants by entering through stomata. Stomata are leaf pores through which gases diffuse. Pollutant destroys chlorophyll & affect process of photosynthesis.
- Damage to the leaf structure & causes necrosis (dead areas of leaf), chlorosis (reduction of chlorophyll causing yellowing of leaf), epinasty (downward curling of leaf) & abscission (dropping of leaves).
- SO_2 causes bleaching of leaves, chlorosis, injury & necrosis of leaves.
- PAN - (Peroxyl acetyl Nitrate) - causes silvering of lower surface of leaves, damage young leaves & suppresses growth.
Fluoride causes necrosis of leaf tip while ethylene results in epinasty, leaf abscission & dropping of flowers.

4 Effect on aquatic life - Air pollutants mixing up with rain can cause high acidity in fresh water lakes affecting aquatic life.

Air pollution.

5. Effects on Materials - Presence of SO_2 & moisture accelerates corrosion of metallic surface due to form^n of sulphuric acid.
- Sulphuric acid also damages buildings, statues made up of marbel & limestone. eg - Taj Mahal.

Control Measures for Air pollution:

1. Proper use of fossil fuel for different purposes.
2. Siting of Industries after proper Environmental Impact Assessment (EIA) study.
3. Use of various devices in industries to control air pollutants such as Gravity settling chambers, cyclon seperator, wet scrubbers, electrostatic precipitator for particulate pollutants.
4. The gases pollutants are controlled by process like adsorption, absorption, condensation, combustion etc.
5. Stalk height should be increased so that the dispersion of pollutant will be carried out at higher level
6. Industrial areas, mining activity, nuclear testing should be away from residential areas & forests.
7. Use of alternative energy technologies such as solar energy, wind energy, biofuel energy etc. which are renewable, clean & pollution free should be used.
8. Timely checking of vehicles for exhaust emmissions is also a viable method to reduce air pollution.
9. The govt. has established the Air (Prevention & Control) Act in 1981 for the control of air pollution. And one central & state govt. has established.

pollution control Boards i.e. CPCB & MPCB for the periodic monitoring, testing & control for all types of pollution.

10. Lastly the public awareness & people's participation is essential for controlling all types of man-made pollutions.

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