MCN-201:
SUSTAINABLE ENGINEERING

MODULE 2

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MODULE 2

- Environmental Pollution: Air Pollution and its effects
- Water pollution and its sources
- Zero waste concept and 3 R concepts in solid waste management
- Greenhouse effect
- Global warming
- Climate change
- Ozone layer depletion
- Carbon credits
- carbon trading and carbon footprint
- legal provisions for environmental protection.

POLLUTION

- "Pollution is the introduction of substances (or energy) that harm the environment and living things."
- The word pollution is derived from the Latin word “Polluere” which means to defile or make dirty.
- Undesirable changes in the environment/surroundings which not only adversely affect humans and other living things, but also our developmental activities and socio-cultural life.
- Materials in any form that causes pollution are called pollutants.

1. Air Pollution and its effects

Air pollution refers to the release of harmful contaminants (chemicals, toxic gases, particulates, biological molecules, etc.) into the earth's atmosphere. These contaminants are quite detrimental and in some cases, pose serious health issues. Some causes that contribute to air pollution are:

- Burning fossil fuels
- Mining operations
- Exhaust gases from industries and factories

SOURCES OF AIR POLLUTION

The sources of air pollution may be broadly classified as **natural** & **anthropogenic**

- **Natural sources of air pollution include:**

Volcanoes: Volcanic activity produces smoke, ash, co2,so2 etc

Dust: Wind blown dust from areas with little or no vegetation such as desert.

Forest fires: Forest fires created by natural causes , result in the formation and release of smoke, ash, dust, co2

- **Anthropogenic (Man-made) sources of air pollution:**

Stationary point sources: It is a source of air pollutant emission can be controlled at the origin. factories & power plants)

Mobile source**s:** It includes the exhaust emissions from vehicles

Evaporative sources: Volatile liquids that, when not completely enclosed in a tank or other container, evaporate and release vapour over time.(paints, solvents, pesticides , perfumes etc.)

EFFECTS OF AIR POLLUTION

- **Effects of air pollution on human health :**
- Generally occur as a result of contact between pollutants and the body.
- Eye irritation , Nose and throat irritation , Increase in mortality rate , Chronic pulmonary diseases , Carbon monoxide readily combines with haemoglobin in blood replacing oxygen from blood , Causes cancer.
- **Effects of air pollution on plants :**
- Suppressed growth and premature ageing in plants
- Causes leaf bleaching which results in Chlorosis (photosynthesis is affected due to loss of Chlorophyll) , Premature falling of leaves(abscission) , Causes necrosis (dead spots on leaves) .

- **Effects of air pollution on animals & birds**
- Affects the mucous lining of respiratory tract , Causes bronchitis and asthma
- Lack of appetite in pet animals , Acid deposition cause aquatic life damage
- Migration of seasonal birds are hampered due to severe air pollution
- **Effects of air pollution on material and property**
- Acid deposition can corrode metals, eat away stone on statues and monuments
- Discolour buildings, cloth fabrics
- **Effects of air pollution on environment**
- Reduce visibility , Pollutants can travel long distance – results in global (transboundary) pollution
- Climate change , acid rain, global warming etc

2. Water pollution and its sources

- Water pollution can be defined as the contamination of water bodies.
- Water pollution is caused when water bodies such as rivers, lakes, oceans, groundwater and aquifers get contaminated with industrial and agricultural effluents.
- Water contained in water bodies like lakes, rivers and oceans are called surface water.
- Water stored in aquifers (underground rock structures) is called underground water (subsurface water). Both these sources are prone to pollution.

SOURCES OF WATER POLLUTION

Water pollution occurs mainly due to presence of domestic as well as industrial wastes in fresh water.

1. Point Source: Sources which can be readily identified at a single location. This type of discharges can be controlled easily.

Examples: Waste water discharge from industries, domestic sector etc..

2 Non-point sources: Source of origin cannot be traced to a single discharge point. Examples: runoff from agricultural land, mining areas etc...

3. Natural sources of water pollution

Rain water, atmosphere, Underground rocks and volcanoes

4. Anthropogenic (man made) sources of water pollution

These sources include oil spills, industrial waste water discharges runoff from agricultural fields, waste water from automobile garages etc.

Generally water gets polluted from the following sources.

a) Domestic Waste water:

· Waste water generated from residential areas, commercial places, institution and other public places. Generally domestic sewage consists of 99.9% water and 0.1% solids.

b) Agricultural waste water:

· This is the runoff from the agricultural fields and animal farms and this waste water is rich in Nitrogen, Phosphate, Organic matter and Pesticides.

· This induces rapid growth of microscopic plants in surface waters thereby reducing oxygen content in aquatic environment, known as Eutrophication.

c) Industrial waste water:

· They are the one which results from industrial operations.

▪ It may have pollutants of almost all kinds ranging from simple nutrients and organic matter to complex toxic substances.

d) Groundwater pollution:

· Various kinds of harmful materials like fertilizers, pesticides, metals etc present in the solid waste gets dissolved into water.

▪ During rain these pollutants drain down into the soil & contaminate the groundwater.

Control Measures of Water Pollution

- Water pollution, to a larger extent, can be controlled by a variety of methods.
- Rather than releasing sewage waste into water bodies, it is better to treat them before discharge.
- Practising this can reduce the initial toxicity and the remaining substances can be degraded and rendered harmless by the water body itself.
- If the secondary treatment of water has been carried out, then this can be reused in sanitary systems and agricultural fields.