Module 4: Environmental Pollution - Detailed Notes

These notes cover all important topics of Module 4: Environmental Pollution for Energy & Environmental Engineering (EEES/ES-301).

1. Environmental Pollution

Environmental pollution is the undesirable change in the physical, chemical or biological characteristics of the environment.

Main types of pollution:
- Air Pollution
- Water Pollution
- Soil Pollution
- Marine Pollution
- Noise Pollution
- Thermal Pollution
- Nuclear Pollution

2. Air Pollution

Air pollution is the contamination of air by harmful gases and particles.

Causes:
- Vehicle emissions
- Industrial smoke
- Burning of fossil fuels

Effects:
- Respiratory diseases
- Global warming
- Acid rain

Control Measures:
- Use clean fuels
- Afforestation
- Pollution control devices

3. Water Pollution

Water pollution occurs when harmful substances contaminate water bodies.

Causes:
- Industrial waste
- Sewage disposal
- Agricultural chemicals

Effects:
• Waterborne diseases
• Death of aquatic life
• Reduction in water quality

Control Measures:
• Wastewater treatment
• Proper sewage disposal
• Reducing chemical use

4. Soil Pollution

Soil pollution is contamination of soil due to chemicals and wastes.

Causes:
• Pesticides
• Industrial waste
• Plastic waste

Effects:
• Reduced soil fertility
• Harm to plants and animals

Control Measures:
• Organic farming
• Proper waste disposal
• Recycling

5. Marine Pollution

Marine pollution is contamination of oceans and seas.

Causes:
• Oil spills
• Plastic waste
• Industrial discharge

Effects:
• Harm to marine organisms
• Disturbance in aquatic ecosystem

Control Measures:
• Waste treatment
• Prevent oil spills
• Reduce plastic usage

6. Noise Pollution

Noise pollution refers to unwanted or harmful sound.

Causes:
- Traffic
- Industrial machinery
- Loudspeakers

Effects:
- Hearing loss
- Stress and hypertension

Control Measures:
- Use silencers
- Soundproofing
- Restrict loudspeakers

7. Thermal Pollution

Thermal pollution is rise in temperature of water bodies due to industrial discharge.

Causes:
- Power plants
- Industrial cooling water

Effects:
- Reduced oxygen in water
- Harm to aquatic life

Control Measures:
- Cooling towers
- Recycling hot water

8. Nuclear Hazards

Nuclear pollution is caused by radioactive substances.

Sources:
- Nuclear power plants
- Nuclear weapons
- Radioactive waste

Effects:
- Cancer
- Genetic mutations

• Radiation sickness

Control Measures:
• Safe disposal of radioactive waste
• Radiation shielding
• Strict safety measures

9. Solid Waste Management

Solid waste management involves collection, treatment and disposal of solid waste.

Types of Solid Waste:
• Municipal waste
• Industrial waste
• Biomedical waste

Methods:
• Recycling
• Composting
• Incineration
• Landfills

10. Urban and Industrial Waste

Urban waste includes household garbage and sewage.

Industrial waste includes chemicals and hazardous materials.

Effects:
• Pollution
• Health hazards
• Environmental degradation

Control Measures:
• Waste segregation
• Recycling
• Waste treatment plants

11. Role of Individual in Prevention of Pollution

Individuals can help reduce pollution by:
• Using public transport
• Saving electricity and water
• Avoiding plastic use
• Planting trees
• Following 3R principle (Reduce, Reuse, Recycle)

12. Pollution Case Studies

1. Bhopal Gas Tragedy:
Leakage of methyl isocyanate gas causing thousands of deaths.

2. Minamata Disease:
Mercury poisoning in Japan due to industrial discharge.

3. Chernobyl Disaster:
Nuclear reactor explosion causing radiation spread.

13. Disaster Management

Disaster management involves planning and response to natural disasters.

Objectives:
- Reduce damage
- Protect lives
- Provide relief

14. Floods

Floods occur due to excessive rainfall and overflow of water bodies.

Effects:
- Property damage
- Loss of life
- Waterborne diseases

Control Measures:
- Dams
- Drainage systems
- Afforestation

15. Earthquake

Earthquakes are sudden shaking of Earth's surface.

Effects:
- Building collapse
- Loss of life

Safety Measures:
- Earthquake-resistant buildings
- Emergency preparedness

16. Cyclone

Cyclones are strong storms with heavy rainfall and winds.

Effects:
- Coastal destruction
- Flooding

Control Measures:
- Early warning systems
- Evacuation plans

17. Landslides

Landslides involve movement of rocks and soil down slopes.

Causes:
- Heavy rainfall
- Deforestation

Control Measures:
- Afforestation
- Retaining walls
- Proper drainage

Conclusion

Environmental pollution and disasters affect human life and ecosystems. Awareness, conservation measures and proper management are essential for sustainable development.