



Sri
SAI RAM
ENGINEERING COLLEGE
INSTITUTE OF TECHNOLOGY
West Tambaram, Chennai - 44



SAIRAM
DIGITAL RESOURCES

YEAR
II

SEM
IV

GE8291

ENVIRONMENTAL SCIENCE AND ENGINEERING

UNIT NO 2

ENVIRONMENTAL POLLUTION

2.2 Definition, cause and effects of
(c) soil pollution (d) Marine pollution
(e) Noise Pollution

SCIENCE & HUMANITIES



NOISE POLLUTION

Noise pollution is excessive, displeasing human, animal, or machine-created environmental noise that disrupts the activity or balance of human or animal life

The noise originates from human activities, especially the urbanization and the development of transport and industry.

There are many sounds in the environment, from rustling leaves (20 to 30 decibels) to a thunderclap (120 decibels) to the wail of a siren (120 to 140 decibels). Sounds that reach 85 decibels or higher can harm a person's ears.

Sound sources that exceed this threshold include familiar things, such as power lawn mowers (90 decibels), subway trains (90 to 115 decibels), and loud rock concerts (110 to 120 decibels).

Sources of Noise Pollution:

Transport/Traffic: One of the main sources of noise are various modes of transportation (like air, road, rail-transportation). For example, noise caused by taking off and landing of airplanes exceed 110 db.

Industrial activity: Use of sirens, heavy machines, engines, turbines, cutting, grinding etc causes significant noise pollution.

Domestic activity: Use of grinders, food blenders, television, music system can produce unpleasant loud sound disturbing the neighborhood.

Celebrations: People celebrate festivals by exploding crackers. There is a great concern over the noise levels generated during Diwali which involves extensive use of firecrackers.

Effects of Noise pollution

Hearing damage: Noise can cause temporary or permanent hearing loss. It depends on intensity and duration of sound level. Auditory sensitivity is reduced with noise level of over 90 dB in the mid high frequency for more than a few minutes.

Physical and mental balance: Constant noise affects a man physically and mentally. Physical effects include blood vessels to contract, skin to become pale, muscles to constrict and rise in blood pressure leading to tension, insomnia (sleeplessness) and nervousness. Lack of concentration anxiety, stress and mental fatigue are significant health effects of noise.

Hypertension: It is a direct result of noise pollution which is caused due to elevated blood levels for a longer duration.

Cardiovascular issues: Heart-related problems such as blood pressure level, stress, and cardiovascular diseases might come up in a normal person and a person suffering from any of these diseases might feel the sudden shoot up in the level.

Interferes with man's communication: In a noisy area communication is severely affected. This may increase the rate of accidents especially in industries.

Affects efficiency and productivity: Noise pollution can also lead to lowered worker efficiency and productivity and higher accident rates on the job.

Health effects: Loud and sudden noise affects the brain. Intermittent noise leads to a higher incidence of psychiatric illness and also a danger to the health of pregnant mothers and small infants.

Effect on Animals:

Animals rely heavily on sounds to communicate, to find food, avoid predators etc. Pets react more aggressively due to exposure to constant noise. They become disoriented more easily and face many behavioral problems.

Overexposure to high intensity of noise affects the hearing ability of many animals. Man-made noise affects mating calls and echolocation. This leads to reduction in survival and reproduction rates.

At an ecosystem level, noise pollution could lead to migration of animals. Their migration can affect the crop production. Because many animals such as bats pollinate bananas, peaches, agave and other cash crops

Control of Noise pollution:

Noise pollution can be effectively controlled by taking the following measures:

- (1) **Control at receiver's end:** For people working in noisy installations, ear-protection aids like ear-plugs, ear-muffs, noise helmets, headphones etc. must be provided to reduce occupational exposure.
- (2) **Suppression of noise at source:** It can be achieved by following methods:
 - (a) Designing, fabricating and using quieter machines to replace the noisy ones.
 - (b) Proper lubrication and better maintenance of machines.
 - (c) Installing noisy machines in sound proof chambers.
 - (d) Covering noise-producing machine parts with sound-absorbing materials to check noise production.

(e) Reducing the noise produced from a vibrating machine by vibration damping i.e. making a layer of damping material (rubber, neoprene, cork or plastic) beneath the machine.

(f) Using silencers to control noise from automobiles, ducts, exhausts etc.

(3) **Acoustic Zoning:** There should be silence zones near the residential areas, educational institutions and above all, near hospitals.

Zoning of noisy industrial areas, bus terminals and railway stations, aerodromes etc. away from the residential areas i.e. increasing the distance between source and receiver.

(4) **Sound Insulation at Construction Stages:** It reduces the chances of noise nuisance in future. Some of these measures could be:

a) The space/cracks that get left between the door and the wall should be packed with sound absorbing material.

(b) Sound insulation can be done by constructing windows with double or triple panes of glass and filling the gaps with sound absorbing materials.

(c) Acoustical tiles, perforated plywood etc. can be fixed on walls, ceilings, floors etc. to reduce noise (especially for sound proof recording rooms etc.)

(5) **Planting of Trees:** Green muffler scheme involves planting green trees and shrubs along roads, hospitals, educational institutions etc. to reduce noise to a considerable extent. Trees like Ashoka, Neem, Tamarind are good for this

(6) White noise:- It is a special type of sound signal which is used to mask background sounds. White noise helps to mask out sounds which might otherwise prevent one from either falling asleep or waking up whilst asleep.

(7) Legislative Measures: Strict legislative measures need to be enforced to curb the menace of noise pollution. Noise standards should be strictly followed. Minimum use of loudspeakers and amplifiers especially near silence zones.

Banning pressure horns in automobiles. Albeit, noise has been considered as pollutant under Air act and The noise pollution (regulation and control) rules(2000) have been framed under Environment protection act.

But still people need to be educated about harmful effects of noise.

MARINE POLLUTION

It is defined as the discharge of waste substances into the sea, posing threat to living sources, hazard to human health, hindrance to fishery and impairment of quality of sea water.

Coral Reefs

Coral reefs are underwater structures made from calcium carbonate secreted by corals.

Corals are colonies of tiny living animals found in marine waters containing few nutrients. Most of the coral reefs are built from stony corals.

Importance of coral reef:

The coral reefs which are the most productive eco-systems offer many benefits to people.

1. Reefs support more than one million species
2. They provide feeding, breeding and nursery areas to fish and shell fish
3. They offer medicine
4. They act as buffer to ocean waves and protect coastal lines from storms and so on.

The coral reefs have been valued at 47 thousand US dollars per square meter of shoreline for their protection function alone.

The coastal wetlands provide habitats for over 2000 species of fish and plants.

Sea grass beds which are under water ocean grasslands support a wide variety of commercially valuable species of fish.

Factors affecting Coral reefs:

The coral reefs are threatened by

- 1.The sediment from deforestation carried by the runoffs.
- 2.the agricultural and industrial chemicals reaching through river discharges.
2. the boat anchors and the careless drivers
- 4.Rising ocean temperatures, ocean acidification.

Sources of Marine pollution

Sewage: Pollution can enter the ocean directly. Sewage or polluting substances flow through sewage, rivers, or drainages directly into the ocean.

The release of other chemical nutrients into the ocean's ecosystem leads to reductions in oxygen levels, the decay of plant life, and a severe decline in the quality of the seawater itself.

As a result, all levels of oceanic life, plants and animals, are highly affected.

Toxic chemicals from Industries:

Industrial and agricultural waste is another most common form of wastes that is directly discharged into the oceans, resulting in marine pollution.

The dumping of toxic liquid in the ocean directly affects marine life as they are considered hazardous, and secondly, they raise the temperature of the ocean, a phenomenon known as Thermal pollution, as the temperature of these liquids is quite high.

Animals and plants that cannot survive at higher temperatures eventually perish.

Land runoff:

Land runoff is another source of pollution in the ocean. This occurs when water infiltrates the soil to its maximum extent, and the excess water from rain, flooding or melting flows over the land and into the ocean.

Often, this water picks up man-made, harmful contaminants that pollute the ocean, including fertilizers, petroleum, pesticides and other forms of soil contaminants.

Fertilizers and waste from land and humans can be hugely detrimental to the ocean by creating dead zones.

Large scale oil spills:

Ship is a huge source of marine pollution, the most devastating effect of which is oil spills. Crude oil lasts for years in the sea and is extremely toxic to marine life, often suffocating marine animals to death once it entraps them. Crude oil is also extremely difficult to clean up.

Ocean mining: Ocean mining in the deep sea is yet another source of ocean pollution. Ocean mining sites drilling for silver, gold, copper, cobalt, and zinc create sulfide deposits up to three and a half thousand meters down into the ocean. deep-sea mining causes damage to the lowest levels of the ocean and increases the toxicity of the region. This permanent damage dealt also causes leaking, corrosion and oil spills that only drastically further hinder the ecosystem of the region.

Littering of plastics: Plastic debris cannot decompose and remains suspended in the ocean's current for years. Animals can become snagged on the plastic or mistake it for food, slowly killing them over a long period of time. Animals who are most often the victims of plastic debris include turtles, dolphins, fish, sharks, crabs, sea birds, and crocodiles.

Other Sources:

- Greenhouse gases emitted from fossil fuel are majorly responsible for marine pollution, causing acidification of water.
- Atmospheric pollution also contributes to marine pollution. For example- atmospheric carbon dioxide increases the acidity of oceanic water.
- The nuclear wastes from various industries pollute the marine ecology affecting the food chain of the marine ecosystem.

- Thermal pollutants from power plants, manufacturing industries, etc. enter into oceans, increasing the temperature of the water.
- Acid rain is also responsible for marine pollution.
- During acid rains, the sulphuric acid and nitric acid mix with marine water, increasing the acidity of the water.

Effects of marine pollution

Reduction of oxygen level in water:

Most of the debris in the ocean does not decompose and remain in the ocean for years. It uses oxygen as it degrades. As a result of this, oxygen levels go down. When oxygen levels go down, the chances of survival of marine animals like whales, turtles, sharks, dolphins, penguins for a long time also goes down.

Disruption to the cycle of coral reefs: Oil spill floats on the surface of the water and prevents sunlight from reaching to marine plants and affects the process of photosynthesis. Skin irritation, eye irritation, lung and liver problems can impact marine life over a long period of time.

Effect of oil spill on marine animals : The oil spill is dangerous to marine life in several ways. The oil spilled in the ocean could get on to the gills and feathers of marine animals, which makes it difficult for them to move or fly properly or feed their children. The long term effect on marine life can include cancer, failure in the reproductive system, behavioral changes, and even death.

Failure in the reproductive system of marine animals: The waste from industries and agriculture are composed of harmful chemicals that affect marine life badly. These chemicals are so dangerous that it can damage the organs of water animals such as the reproductive system. The failure of the reproductive system affects the breeding process of the species of water animals.

Effect on food chain: Chemicals used in industries and agriculture get washed into the rivers and from there are carried into the oceans. These chemicals do not get dissolved and sink at the bottom of the ocean. Small animals ingest these chemicals and are later eaten by large animals, which then affects the whole food chain.

Effect on human health: Animals from impacted food chain are then eaten by humans, which affects their health as toxins from these contaminated animals get deposited in the tissues of people and can lead to cancer, birth defects or long term health problems.

Control measures of marine pollution:

Reduce the usage of plastic materials: Plastic wastes form the largest portion of ocean pollutants. Out of the 260 million tons of plastic produced each year globally, approximately 10% ends up in the oceans.

These plastics then take thousands of years to decompose, during which time it poses a terrible threat to life in the oceans. Thus, reduction in the use of plastic products could help in significantly reducing the rates of ocean pollution.

Methods to removal of oil

Mechanical method: The best method of cleaning oil spillage is by mechanical method. This is because the mechanical method completely removes the oil from the marine environment. However this method can only be applied when the sea is calm.

The mechanical method cannot be applied under the following conditions. (1) rough sea waves (2) high wind velocity (3) high water waves.

The method requires the use of oil booms and skimmers. In this method the oil is captured and stored until it can be disposed of properly

Skimmers:

Skimmers are machines specially designed to suck up the oil from the water surface like a vacuum cleaner.

They are used to physically separate the oil from the water so that it can be collected and processed for re-use. Skimmers can be used to effectively recover most of the spilt oil, so it is economically viable.

The presence of debris poses a major roadblock to this technique, as skimmers can get clogged easily.

Biodegradation:

Biodegradation is the process whereby most of the components of the spilled oil is broken down by bacteria and other microorganisms into harmless substances such as fatty acids and carbon dioxide.

The rate at which spilled oil undergoes biodegradation depends on the type of oil, its concentration and the type of hydrocarbons it contains.

We can speed up the natural process of biodegradation by adding nutrients like nitrogen and phosphorus.

These nutrients stimulate growth of the microorganisms concerned.

Chemical dispersants:

This method of cleaning oil spillage is best applicable when the sea is rough, the surrounding wind having a high velocity and marine life under threat.

Dispersants help the surface oil slicks mix into the water, reducing the immediate risk to seabirds and shorelines.

Dispersants are most effective when used within an hour or two of the initial spill. Chemical dispersants reduce the surface tension that stops oil and water from mixing.

Small droplets of oil are then formed, which helps promote rapid dilution of the oil by water movements.

The formation of droplets also increases the oil surface area, thus increasing the exposure to natural evaporation and bacterial action.

Successful dispersion of oil through the water column can affect marine organisms like deep-water corals and sea grass.

It can also cause oil to be temporarily accumulated by sub-tidal seafood.

- Plans for conserving marine biodiversity must be taken into account of human needs.
- People should be educated about marine ecosystems and the benefits offered by them.
- Local communities must be involved in protecting and managing their coastal resources.

- Social and economic incentives must be offered for conserving and sustainable use of marine resources.
- The fact that all the oceans in the world are connected must be reflected in the policies.
- Government must manage their own waters while extending cooperation to the neighbouring states.

Other control measures.

- The industrial units on the coastal lines should be equipped with pollution control instruments and efficient treatment facilities.
- The urban growth near the coasts should be regulated.
- The needs of fisherman, who live on the coasts and depend on marine resources should be accommodated.

Protective measures

- Municipal and industrial wastes should be treated before being allowed to join in the sea.
- Coastal waste should be periodically analyzed for detecting pollution levels.
- Soil erosion in the coastal land should be arrested by suitable control techniques.
- Recreational beaches should be maintained to meet hygienic and aesthetic standards.

SOIL POLLUTION

Definition: soil pollution is defined as the contamination of soil by human and natural activities which may cause harmful effects on living beings.

Sources:

Industrial Wastes: Many factories like sugar, cement, fertilizer, leather etc produces large amount of toxic solid wastes which causes severe soil pollution. Thermal power plants generate a large quantity of “Fly ash”. Industrial sludge may contain various salts, toxic substances, metals like mercury, lead, cadmium, arsenic etc.

Urban Wastes: Wastes like plastics, glasses, garbage and rubbish materials, rubber etc from houses can pollute soil. Many of these are non biodegradable and quite toxic.



Agricultural practices: Fertilizers, Insecticides, fungicides, pesticides etc can accumulate in the soil. This can reduce the useful microorganisms in the soil and finally enter the nearby water bodies.

Radioactive pollutants: Radioactive fallout from nuclear dust, laboratories may contain highly radioactive materials. Isotopes of radium, uranium, thorium, strontium, iodine, caesium etc reach the soil and persist there for a long time and keep on emitting radiations

Biological wastes: Human and animal wastes (excreta) can contaminate soil. The sewage sludge contains many pathogenic organisms, bacteria, viruses and intestinal worms which cause soil pollution..

Effects of soil pollution

i) Decrease in agricultural productivity: Many waste materials like plastics, glass etc are non-biodegradable. Dumping them on land can change the pH of the soil, severely affect the fertility and hence productivity. Many of these substances are toxic for the useful micro organisms present in soil.

ii) Groundwater pollution: Percolation of toxic wastes causes ground water pollution. Chemicals, pesticides, fertilizers from soil may percolate and contaminate ground-water resources.

iii) Spread of diseases: Pathogens present in the wastes and excreta contaminate the soil and vegetable crops causing diseases in man and domesticated animals.

iv) Radiation sickness: Radioactive fallout on vegetation is the source of radio-isotopes which enter the food chain in the grazing animals.

Some of these radioisotopes replace essential elements in the body and cause abnormalities.e.g. strontium-90 instead of calcium gets deposited in the bones and tissues. The bones become brittle and prone to fracture.

(v) Salination of soil: Increase in the concentration of soluble salts in soil is called salination. This adversely affects the quality and productivity of soil. Excessive irrigation led soil salinity, vegetation loss and turns into barren land

Control measure of soil pollution

- i) **Recycling of soild wastes:** Materials like paper, glass and plastics can be recycled and reused. Metals should be recovered from scrap and disposed materials.
- ii) **Use of eco-friendly agricultural methods:** Use of chemical fertilizers should be reduced by the use of bio fertilizers and manures. Use of pesticides can be reduced by adopting biological control of pests.
- iii) **Proper disposal of solid wastes:** Solid wastes should be properly collected and disposed off by appropriate method.
- iv) **Production of bio-manure/bio-gas from soild wastes:** Biodegradable organic waste should be used for generation of biogas. Cattle dung should be used for methane generation. Waste can be used for making compost manure.

v) Ban of toxic chemicals: Ban should be imposed on chemicals and pesticides like DDT, BHC etc., which are fatal to plants and animals. Nuclear explosions and the improper disposal of radioactive wastes should be banned.

vi) Public awareness: informal and formal public awareness programme should be imparted to educate people on health hazards by environmental pollution.

video links

<https://www.youtube.com/watch?v=keeQK1EzNEo>

<https://www.youtube.com/watch?v=LjHjduhwl3k>

<https://www.youtube.com/watch?v=DdImG-jphkM>

Sairam