

## **E-CONTENT – Evs (22)**

### **Nalanda Open University**

Course Name: M.A. / M.Sc. Environmental Science

Coordinator: Prof. (Dr.) Bihari Singh

Mobile No. : +91 9546452116, +91 9334331422

E-mail ID: [bihari\\_singh2001@yahoo.com](mailto:bihari_singh2001@yahoo.com)

M.A. / M.Sc. Environmental Science,  
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#### **Short description of the suggested Topics**

##### **Theory Paper**

##### **Paper-VIII**

#### **(ENVIRONMENTAL POLLUTION & CONTROL)**

##### **Remaining part of Paper VIII**

#### **4. Definition of Noise Pollution; Main sources of Noise pollution; Effects of Noise pollution; Control and Abatement measures to reduce the menace of Noise pollution.**

##### **Noise pollution: an introduction**

Any sound which is unwanted, disagreeable and unpleasant to our ears is termed as Noise. Noise pollution may be defined as any undesirable sound adversely affects the physical and mental health of its recipients.

It may, however, be noted that degree of annoyance due to loud sound may not necessarily be related to the intensity of sound alone, personal attitude and mode of the recipient are also the important influencing factors. A loudly played music may be liked by someone whereas very feeble sound may be taken as noise by an ailing person or by someone who likes loneliness and tranquility.

Noise may be natural (such as Thunder) or man-made. But the impact of natural noise is insignificant as compared to man-made noise because it has benefited us in many ways but simultaneously the reality of its occurrence.

Noise is essentially of feature of the technology based society of modern time. Scientific and technological advancement it has increased human miseries as well. Noise is one among them, which is found to have physiological and psychological effect of damaging nature on human beings. Sound is measured in a unit called decibel (dB). Source of noise pollution

Noise pollution may be broadly categorized into two types

- Outdoor Noise Pollution and
- Indoor Noise Pollution.

## **Source of Outdoor Noise Pollution:**

The main sources of outdoor noise pollution are the following

### **I. Industry and Machinery**

High intensity noise produced by heavy machines producing consumer goods (Cement, Steel, fabrics, metal work etc.), power plant generating electricity, saw and drilling machines and grinding and crushing machines upset the recipient mentally and physically to different degrees. Workers on duty near these machineries and industrial units in operation having exposure to high intensity noise (90 dB - 110 dB) for 8 to 10 hours a day are the worst sufferers. Blasting, drilling and crushing during mining of minerals and coal also produce sudden as well as constant noise of high decibel value.

### **II. Transportation**

In Modern times vehicular transport is the main noise menace affecting common people, especially in large and overcrowded town and cities. Traffic noise includes road - traffic noise as well as aircraft noise. With fast increasing number of traffic vehicles - cars, scooters, motorcycles, buses, trucks, especially diesel operated vehicles - levels of noise in most towns and cities (metropolitan cities in particular) have increased to a noise level between 70 and 90 decibels. Rail traffic noise and aircraft noise are increasingly becoming the cause of discomfort and audio problems in residents of nearby areas. Fast running trains and fast Jet aircrafts which has been introduced over the years and their increasing number have enhanced the discomforts and health of humans and animals.

### **III. Community Activities.**

Indians are people who celebrate every occasion – be it religious, social, marriage celebrations, birthday party or even winning of a cricket or football match - with fireworks, crackers and playing music through loudspeakers. During Durga puja and Ganesh puja playing of loudspeakers at high sound level (i.e. at high pitch) is an essential component of a week - long programme of festival celebration. Bursting fireworks on Deepawali is taken as the essential component of the celebration.

## **Sources of Indoor Noise Pollution:**

Sources of noise generated Indoor include domestic appliances like washing machine, mixers, vacuum cleaners, coders, fans, telephones, air conditioners, loudly played televisions, tape recorders, generator sets, radios, music systems and other electronic gadgets.

## **Effect of Noise Pollution**

Noise pollution has been found to have its adverse effects on humans and animals as well as on physical environment.

**Effect on human beings:**

High decibel noise is found to have physiological as well as psychological effects on human beings. Noise levels between 80 - 130 dB can cause temporary or permanent hearing loss to the recipient. The degree of hearing loss depends on the duration of exposure as well as the intensity of the sound. A noise level of 150 dB or above can permanently rupture the eardrum of the exposed person. Contact exposure to high decibel level noise may also cause hypertension, stomach disorders, including ulcer, heart diseases, hormone imbalance etc. Constant exposure to undesired levels of noise for longer duration may cause such psychological and emotional effects as anxiety, irritability, sleeplessness, tension, lack of concentration, mental tiredness, behavioral problems, lower working efficiency etc. Workers of noise producing industries and high noise commercial areas develop hard of hearing problem.

**Effect on animals:**

Sudden yet high decibel noise from aeroplanes (supersonic jet in particular) is known to cause disturbance to birds and animals around aerodromes. Migratory birds in particular are more sensitive to sudden loud burst of sound. Prolonged exposure to noise has been found to cause heart, liver and brain disorders and reduced hormonal secretions in animals as well.

**Effect on Physical Environment:**

Sudden and loud noise can damage and cause collapse of fragile parts of buildings, including glass panels.

**Control and Amendments measures:**

Noise is not just a nuisance. It affects our physical as well as mental health and harms the environment. Control and Abatement measures can help reduce menaces of loud noise in the following ways:

- ❖ Reduce the noise level at the source itself.
- ❖ Reduce the intensity of noise through interruption in the path.
- ❖ Protect the recipient from ill effects of noise.

**The control and Abatement measures may include the following:**

- i. Siting noise producing industrial units away from human settlements. Proper construction planning can also help in source reduction.
- ii. Putting rigid sealed enclosures around vehicle engines and machines in factories.
- iii. Regular tuning and proper maintenance of machines.
- iv. Planting trees around the source of sound or around dwelling area, hospitals and educational institutions. Dense plantation provides a very effective sound barrier.
- v. Effective traffic management and wide roads reduce the intensity of noise by allowing vehicles to run at lower levels.

- vi. Strict enforcement of laws that regulate the playing of music systems and loudspeakers. The enforcement of such laws can protect people from disturbing noise at odd hours of the night.
- vii. The use of ear plugs and ear mufflers can effectively protect individuals from excessive noise. People can simply plug their ears with fingers or with bits of cotton.
- viii. Public awareness about the effects of loud noise and the participation of common people in noise prevention and control programmes can bear fruitful results.
- ix. Laws and regulations including the Noise standards for different categories of area (zones) as per the Environment (Protection) Second amendment Rules, 1999 of Government of India need to be effectively implemented.

**Note:** The description is meant for full length question and answer. The study material may be shortened/modified in view of the question asked to answer.

## **5. Definition and elaboration of water pollution; Point and Non-point sources of water pollution; Effect of water pollution on human health and environment.**

### **Definition and Elaboration of water pollution:**

Water is an amazing solvent capable of dissolving or suspending various kinds of substances both natural as well as man-made. Because of this property water gets easily contaminated.

Water pollution may be defined as the presence of undesirable substances (organic, inorganic, biological or radioactive) in water or alteration in such physical factors as heat and pH (acidity/alkalinity) which make it unfit and harmful for use by man, animal and aquatic life.

Due to various human activities in the present age of technology and industrialization most water bodies are heavily polluted. Consumption of contaminated water is the cause of various diseases of humans and animals throughout the world. In fact, pollution of freshwater resources is one of the most serious environmental problems of the entire world.

### **Point source and Non-point sources of water pollution:**

Sources of water pollution are natural as well as anthropogenic. Soil particles entering into water bodies due to soil erosion, wind storm etc. minerals from rocks and soil which reach water bodies with rainwater decaying of plant, their leaves and other organic matter in water bodies (lakes, ponds, wells and rivers) are examples of natural sources causing water pollution.

However, the main sources of water pollution are anthropogenic. Industrial effluents, agricultural wastes, sewage and domestic wastes are the main

sources of water pollution. Radioactive wastes from nuclear plants are another source of water pollution.

### **Point and Non-point sources:**

The sources of man-generated water pollutants can be broadly put under two categories. They are:

#### **Point sources and Non-point sources**

##### **Point sources:**

Point sources include those fixed sources from which water pollutants are discharged into water bodies. Thus, effluent outlet of a factory or production unit and sewage outlet of a municipal area are the examples of point sources.

##### **Non-point sources:**

They include numerous sources spread over a large area from where pollutants reach at water body. Agricultural run-off, city storm, water flow and soil particles in rainwater due to soil erosion are examples of nonpoint sources. It may be understood that whereas point source of water pollution can be effectively checked by adopting appropriate technologies and measures, it is more difficult to check or prevent non-point source water pollution and needs preventive and control measures to be applied on a larger scale.

### **Effect of water pollution on human health and Environment:**

The major freshwater pollutants are:

- ❖ Domestic wastes and Sewage
- ❖ Industrial effluents, and
- ❖ Agricultural discharge

#### **i. Effect of domestic waste and sewage:**

Water pollution due to sewage and domestic waste is of major concern because infectious diseases like typhoid, cholera, jaundice, dysentery and diarrhoea and amoebiasis spread chiefly through contaminated water. Domestic wastes and sewage contain plenty of organic matter in the form of food and food residues, human excreta, soaps and detergents and a large number of pathogens - the disease causing bacteria, virus, protozoa and parasites. According to one estimate, nearly two-thirds of all illness in our country is due to the pathogenic bacteria present in polluted water.

#### **ii. Effect of industrial effluents:**

Industrial effluents are the most hazardous of all water pollutants. Toxic metals such as lead, mercury, zinc, copper, cadmium and chromium, non-metal like arsenic, petrochemicals like benzene and gamma-xene, acids, alkalies, cellulose fibres and colouring and bleaching materials enter water bodies and soil mainly through industrial effluents. Most of the industrial

effluents are toxic to living organisms even in minute quantities and many of them are non-biodegradable.

**These pollutants lead to various types of diseases.**

**Lead** - Lead accumulates in human body and leads to anemic and vomiting. It damages the nervous system, kidney, liver and brain. Children and pregnant women are especially susceptible to lead poisoning.

**Mercury** - Mercury and its compounds cause abdominal disorders, headache, diarrhea, chest pain and headache. Minamata disease of Japan is an example of the serious impact of mercury poisoning.

**Zinc** - It causes vomiting and renal damage.

**Chromium** - Diseases of Central Nervous System, cancer and nephritis are caused when chromium accumulates in human body beyond permissible limits.

**Arsenic** - Arsenic poisoning occurs through drinking water and can cause severe health problems such as liver, cirrhosis, lung cancer, gastrointestinal disorder, kidney damage and skin problems.

**Petrochemicals** – Benzene, Polyvinyl chloride (PVC) and other petrochemicals are severe health hazard. Most of these organic chemicals are carcinogen even when their concentrations in the human body are low.

**iii. Effect of Agricultural discharge**

Soluble nitrates coming into drinking water bodies due to excessive use of nitrogenous fertilizers cause a disease in infants, known as blue baby syndrome because babies are born blue in colour and die soon.

Pesticides penetrate lethal epidermis of the skin and produce lethal effects. The pesticides DDT, malathion and parathion are nerve poisons. Some pesticides cause precipitation of protein in the body resulting in liver damage, and in the long run death. Some pesticides react with the respiratory system where they cause acute suffocation and block the respiratory tract.

**Note** : As per the demand of the question asked to answer, so also the availability of time answer may be shortened/modified accordingly.

**8. Definition and elaboration of Radiation including Radioactive pollution; Radioactive pollution is different from other types of pollution; Protective and precautionary measures against radioactive pollution.**

Radiation is the emission of rays and particles from a source - natural or man made. The term radiation is invariably associated with energy and most of the scientists define radiation as the release of energy from atoms of some elements.

Radiation pollution refers to the presence of high energy radiation from various sources degrading the quality of the environment and endangering animal and plant.

The energy sources natural as well as man-made. Natural sources include high-energy cosmic rays, ultraviolet, visible and infrared radiation reaching the earth from the sun and other stars. Natural radiation also includes invisible radiation (radioactive alpha, beta and gamma rays) from unstable atoms of elements such as Uranium, Thorium and Radium. Man has been exposed to such radiations since the beginning of his evolution. But these natural radiations have rarely posed a health hazard as they were in extremely low doses.

However, things took a serious turn for the worse when scientists mastered x-ray production and nuclear fission and fusion processes. High energy ionizing radiations include x-rays and gamma rays and/or alpha and beta particles, which carry energy levels so high that they can knockout one or more electrons from neutral atoms of elements and produce ions. High energy ionizing radiation can be both beneficial and harmful. It depends on how we use it. The discovery of x-rays was welcomed as a miracle of science because of their application in disease diagnosis. But it is now known that x-rays account for over 50 percent of harmful artificial radiation exposure to humans. The mastery over nuclear fission and fusion processes has ushered in a dangerous age of nuclear weapon. Though nuclear nations of the world says that their nuclear programme aims to peaceful applications of nuclear energy, the nuclear accident of Chernobyl in the erstwhile USSR and of the three miles Island in the USA did occur, inflicting untold misery on people for a long time. In the first ever use of nuclear power in war, the United States dropped two atom bombs over the Japanese towns of Hiroshima and Nagasaki in August 1945.

These atom bombs killed thousands of people and left many more thousands injured and crippled.

Radioactivity related diseases are increasing especially among children and pregnant women. Therefore, radiation pollution demands serious attention in view of the permanent and grave damage that it inflicts on present as well as future generations.

### **How is Radiation pollution different from other types of Pollution?**

Radioactive pollution differs from conventional pollutions in that it cannot be detoxified or broken down into harmless substances. The radioactive wastes cannot be destroyed and hence they remain in our environment for a longer period of time. Even disposal of radioactive wastes may cause pollution and damage the environment. Moreover, when a person is exposed to radiation, his or her offspring may also be affected and may be transmitted to future generations. This is known as **Genetic Variation**.

### **Productive and Precautionary measures against Radioactive Pollution:**

With the expanding nuclear energy resources nuclear fission reactors and nuclear explosion tests, the global radiation level is increasing continuously. This is a matter of serious concern. We cannot control natural sources of radiation but definitely the

levels of radiation pollution from anthropogenic sources can be lowered to safe limits through sincere efforts and effective measures. It may be noted that radioisotopes once produced cannot be rendered harmless by any means except their natural duration of decay. Hence prevention and protection are the only measures that can contain severity of radiation pollution.

Following preventive and protective measures are more important and effective among several measures that can be adopted to abate the ill effects of radiation pollution.

**i. Reprocessing of spent fuel**

The disposal of the spent fuel from the large number of nuclear power plants installed in different nuclear countries of the world has been a big problem from safety point of view. In recent years, technologies have been developed to dispose of spent fuel (nuclear fuel rods) only after reprocessing these wastes to separate out the non – usable wastes from usable nuclear fuel and to process these wastes for use elsewhere.

**ii. Safe disposal of nuclear waste:**

Method (s) adopted for safe disposal of nuclear waste depends on the category of the waste to be disposal of

**a. Method to dispose low level nuclear waste:**

Low level nuclear wastes come from hospitals using radiations for diagnostic and radio-therapeutic purposes. The method usually adopted for their disposal includes extreme dilution of the waste before their discharge into nearby water bodies. Care is taken so that after treatment of the waste the concentration of the waste is much below the Maximum Permissible Concentration (MPC) as recommended by the International Commission on Radiological Protection (ICRP), Vienna, Italy.

**b. Method of dispose Intermediate Level Nuclear Waste:**

Intermediate Level Nuclear Wastes are generated as sludge from decontamination process in nuclear fuel processing from research laboratories, from nuclear reactor processes etc. Such wastes are safely disposed of by packing them in concrete lined tanks or thick walled concrete boxes covered by metal casting that is not likely to be corroded by chemicals. The concrete boxes with steel castings are then buried safely to deeper depth in remote/abandoned areas.

**c. Method to dispose high level nuclear waste:**

High level nuclear wastes are generated from nuclear power plants (as spent nuclear fuel), from nuclear explosions and nuclear bombs. Such wastes must be treated properly and with much caution, lest they would contaminate the environment and continue to harm organisms including human generation after generation.



The common practices to dispose of radioactive wastes either by underground burial or dumping them in sea in special shielded tank.

An effective yet simple method to dispose high level nuclear waste is through immobilization techniques. In this technique, the waste is converted into a rock – like substance (called as Synrock)

### **Safety measures for Radiation Protection**

Some of the major activities undertaken in recent years on global level scale for protection against radiation hazards include the following:

- ❖ Global banning of nuclear explosions.
- ❖ Extreme and foolproof safety measures to be adopted for safe disposal for safe disposal of nuclear plant wastes.
- ❖ Proper dumping of radioactive materials from hospitals where radioactive materials are used in diagnostic and therapeutic purposes.

In addition for workers handling radioactive materials and for the general Public International Atomic Energy Commission (IAEC) has set up strict guidelines to be followed:

- ❖ No practices, which produce increased radiation, shall be adopted unless their introducing produces a positive benefit.
- ❖ All exposures should be As Low As Reasonably Achievable (ALARA), economic and social factors being taken into account.
- ❖ The dose to which an individual is exposed shall not exceed the limit recommended for the appropriate circumstances by the commission.
- ❖ Nuclear plants should be located, designed, constructed and operated so as to conform to very stringent safety standards.

Some other measures of general nature which ought to be followed include the following:

- ❖ Radiation therapy and nuclear medicines should be advised to patients only when absolutely required and that too in minimum possible doses.
- ❖ X-ray examination for diagnosing diseases should be advised by the doctors only when it is considered essential. Repetition of frequent X-ray examination should be avoided to protect patients from dangers of X-ray exposure.