



Soil Pollution

- **Causes and Sources of Soil Pollution**

- **Plastic bags**

- They accumulate in soil and prevents germination of seeds. They stay in the soil for centuries without decomposing (non-biodegradable).
- Burning of plastic in garbage dumps release highly toxic and poisonous gases like **carbon monoxide, carbon dioxide, phosgene, dioxins** and other poisonous **chlorinated compounds**.
- Toxic solid residue left after burning remains in the soil. The harmful gases enter soils through chemical cycles.

- **Industrial sources**

- They include **fly ash, metallic residues, mercury, lead, copper, zinc, cadmium, cyanides, chromates, acids, alkalies, organic substances, nuclear wastes**
- A large number of industrial chemicals, dyes, acids, etc. find their way into the soil.

- **Pesticides and fertilisers**

- **Chlorohydrocarbons (CHCs)** like **DDT, endosulfan, heptachlor** accumulate in soil and cause biomagnification. Some of these pesticides like DDT and endosulfan are banned by most of the countries.
- Excessive use of chemical fertilisers **reduces the population of soil-borne organisms** and the crumb structure of the soil, productivity of the soil and increases salt content of the soil.

- **Other pollutants**

- Many air pollutants (acid rain) and water pollutants ultimately become part of the soil, and the soil also receives some toxic chemicals during weathering of certain rocks.
- Radioactive elements from mining and nuclear power plants, find their way into the water and then into the soil.

- Sources of soil pollution:

1. Seepage of polluted water.

2. Dumping of Solid waste into the soil or improper solid waste management.

3. Fly ash, iron and steel slag, medical and industrial wastes disposed on land.

4. Fertilizers, pesticides and other chemicals from farmlands.

5. Land filling by municipal waste and leachates from mismanaged landfills.

6. Acid rain and dry deposition of pollutants on land surface.

7. Pharmaceuticals from use of antibiotics in livestock

8. Unsafe storage of hazardous chemicals and nuclear waste.

- The primary pollutants of concern in land and soil include heavy metals such as lead, mercury, arsenic, cadmium and chromium, persistent organic pollutants and other pesticides, and pharmaceuticals, such as antibiotics used for livestock management.
- These degrade soil biodiversity and functioning, and can reduce agricultural productivity, thus negatively impacting livelihoods, disease control and food security.
- They can also cause a variety of non-communicable diseases, and even death in humans and wildlife.

- Sources of heavy metal pollution include a variety of industrial, household and agricultural activities, such as
 - mining and smelting operations
 - preparation of nuclear fuels and electroplating (chromium, cadmium)
 - coal and other fuel burning
 - chemical production
 - leather tanning
 - informal recycling of lead-acid batteries and electronic waste
 - poor incineration of hospital waste
 - mismanagement of household and industrial waste

Effects of Soil pollution

1. Reduction in soil nutrients, nitrogen fixation and consequent drop in crop yield
2. Salinization and soil erosion
3. Groundwater contamination and biomagnification
4. Loss of vegetation and biodiversity
5. Health problems as pollutants enter food chain- developmental impairment and noncommunicable diseases, antimicrobial resistance.

Way forward

- Adopt agroecological practices and integrated pest management and establish guidelines for the reduction and efficient use of fertilizers and environmentally friendly pesticides in agriculture.
- Reduce point-source pollutants, such as heavy metals from industry, and diffuse pollutants including pesticides and inefficiently used fertilizers in agriculture.
- Reduce the use of antimicrobials, including antibiotics in the livestock sector, to avoid unintended releases into the environment and food chain, and increase public awareness and international collaboration on research and product development.

- Invest in building the knowledge
- Remediate contaminated sites.
- Invest in long-term environmental monitoring following industrial closures.
- Avoid indiscriminate disposal of solid waste.
- Ban plastic bags and promote bags of degradable materials like paper and cloth.

- Treat sewage properly before using as fertilizers and as landfills.
- Segregate domestic, agricultural and other waste before vermicomposting.
- Treat industrial wastes prior to disposal.
- Collect biomedical waste separately and incinerate in proper incinerators.
- Follow the Four R's

Refuse, Reuse, Recycle and Reduce

1. Noise Pollution

- Noise by definition is “sound without value” or “any noise that is unwanted by the recipient”.
- Noise level is measured in terms of decibels (dB). An increase of about 10 dB is approximately double the increase in loudness.
- H.O. (World Health Organization) has prescribed optimum noise level as 45 dB by day and 35 dB by night. Anything above 80 dB is hazardous.
- Noise pollution leads to irritation, increased blood pressure, loss of temper, mental depression and annoyance, a decrease in work efficiency, loss of hearing which may be first temporary but can become permanent in the noise stress continues.
- A **green belt of trees** is an efficient noise absorber.

- **What is noise level?**
- Any unwanted sound that causes annoyance, irritation and pain to the human ear is termed noise. It is measured in A-weighted decibels (dB (A)) that indicate the loudness of the sound.
- Noise level refers to the decibel levels of noise produced by any appliance or machine. In general, the human ear can tolerate noise levels up to 85 dB. Anything beyond that can affect their productivity and quality of life.

- **Ambient Noise Level Monitoring**

- Noise Pollution (Control and Regulation) Rules, 2000 define ambient noise levels for various areas.
- The Government of India on Mar 2011 launched a Real-time Ambient Noise Monitoring Network.
- **Silence Zone** is an area comprising not less than 100 metres around hospitals, educational institutions, courts, religious places or any other area declared as such by a competent authority.

Control of Noise pollution

- Better designing and proper maintenance of vehicles.
- Noise reduction using noise attenuation walls, well maintained roads and smooth surfacing of roads.
- Air traffic noise can be reduced by enforcing noise regulations for take off and landing of aircrafts at the airport.
- Industrial noises can be reduced by sound proofing equipment like generators and areas producing lot of noise.
- Ban on use of Power tools, very loud music and land movers, public functions using loudspeakers etc at night.

- Use of firecrackers, horns, alarms, refrigeration units etc is to be restricted.
- A green belt of trees is an efficient noise absorber.

- **Permissible noise level in India**

- The CPCB has laid down the permissible noise levels in India for different areas. Noise pollution rules have defined the acceptable level of noise in different zones for both daytime and night time.
- In industrial areas, the permissible limit is 75 dB for daytime and 70 dB at night.
- In commercial areas, it is 65 dB and 55 dB, while in residential areas it is 55 dB and 45 dB during daytime and night respectively.
- Additionally, state governments have declared 'silent zones' which includes areas that lie within 100 meters of the premises of schools, colleges, hospitals and courts. The permissible noise limit in this zone is 50 dB during the day and 40 dB during the night.

- **Laws**

- Earlier, noise pollution and its sources were addressed under the Air (Prevention and Control of Pollution) Act, 1981.
- They are now, however, regulated separately under the Noise Pollution (Regulation and Control) Rules, 2000.
- Additionally, noise standards for motor vehicles, air-conditioners, refrigerators, diesel generators and certain types of construction equipment are prescribed under the Environment (Protection) Rules, 1986.
- Noise emanating from industry is regulated by State Pollution Control Boards / Pollution Control Committees (SPCBs / PCCs) for states / Union territories under the Air (Prevention and Control of Pollution) Act, 1981.

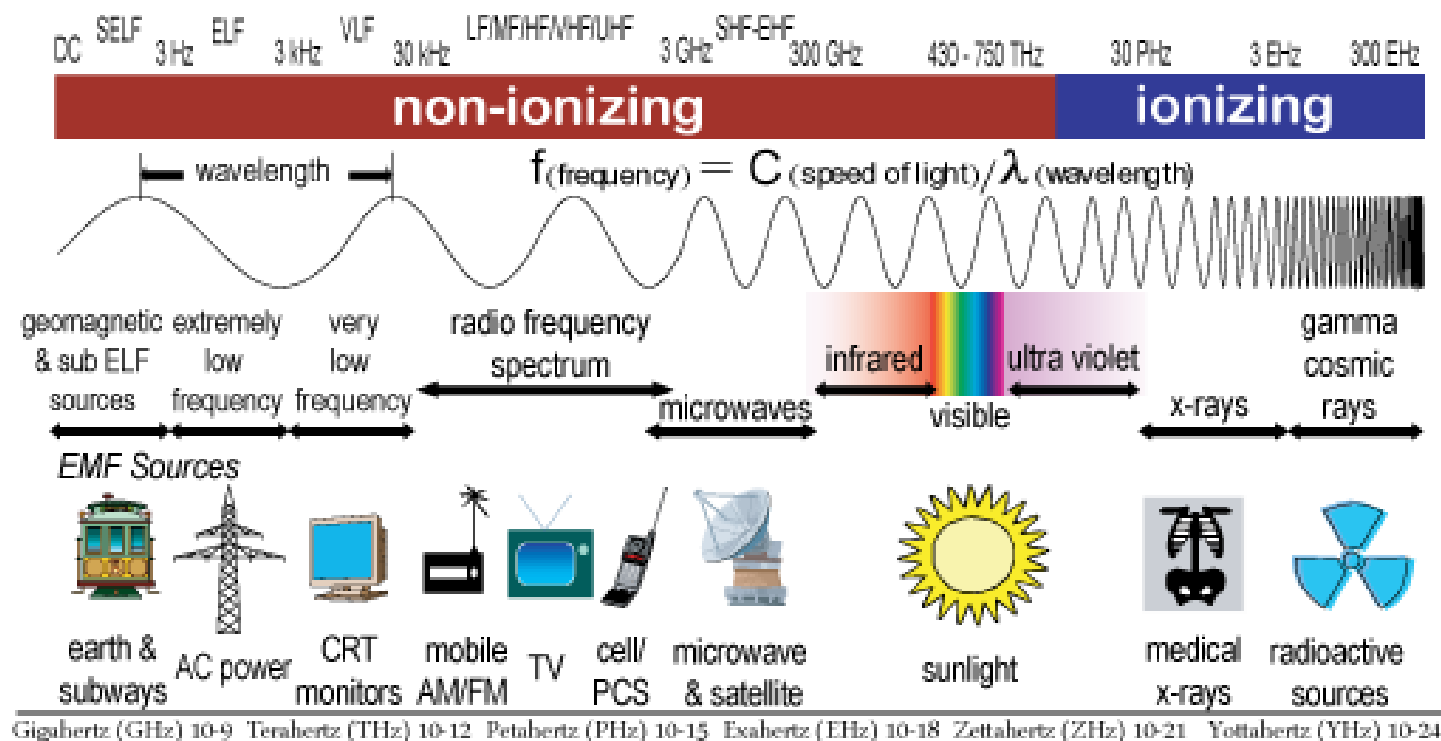
- A Real time Ambient Noise Monitoring Network has been launched in 2011.

Radioactive Pollution

- Radioactive Pollution is defined as the increase in the natural radiation levels in the environment that pose a serious threat to humans and other life forms.

They include cosmic rays from space and terrestrial radiations from radio-nuclides present in earth's crust such as **radium-224, uranium-238, thorium-232, potassium-40, carbon-14**

THE ELECTROMAGNETIC SPECTRUM



- Radioactivity is a phenomenon of spontaneous emission of proton (alpha-particles), electrons (beta-particles) and gamma rays (short wave electromagnetic waves) due to the **disintegration of atomic nuclei** of some elements. These cause radioactive pollution.

- ⇒ *Non-ionizing radiations affect only those components which absorb them and have low penetrability.*
- *Ionising radiations have high penetration power and cause breakage of macromolecules*

- **Biological Damage Due to Ionizing Radiations**

- Radiation damage can be divided into two types: (a) **somatic damage** (also called **radiation sickness**) and (b) **genetic damage**.
- Somatic damage refers to damage to cells that are **not associated with reproduction**.
- Effects of somatic radiation damage include loss of hair, **fibrosis of the lungs**, a **reduction of white blood cells**, and the induction of **cataract in the eyes**. This damage can also result in cancer and death.
- Genetic damage refers to damage to cells associated with **reproduction**.
- This damage can subsequently cause genetic damage from **gene mutation** resulting in abnormalities.
- Genetic damages are passed on to the next generation.

- Inspire of these safety measures three disasters in the nuclear power plants are noteworthy – **Three Mile Island' in Middletown (U.S.A.) in 1979, Chernobyl (U.S.S.R.) in 1986 and Fukushima Daiichi nuclear disaster in 2011.**

- **Impact on birds**

- The **surface area of a bird is relatively larger** than their body weight in comparison to the human body, **so they absorb more radiation**.
- Also, the **fluid contained in the body of the bird is less** due to small body weight, so it gets heated up very fast.
- The magnetic field from the towers disturbs birds' navigation skills; hence when birds are exposed to EMR they disorient and begin to fly in all directions.

Prevention and control of radiation pollution

- Proper site selection, design, construction, commissioning, and operation of nuclear reactors ensuring full safety should be made.
- X-rays for diagnostic purposes and radiotherapy should be done with appropriate protection measures.
- Radioactive wastes contain highly hazardous radioactive elements like radium, thorium and plutonium, therefore they should be stored and disposed off safely.
- Appropriate preventive steps should be taken to protect from occupational exposure.

