ENVIRONMENTAL POLLUTION AND POLLUTANTS

ENVIRONMENTAL POLLUTION

- **Environmental Pollution can be defined as any undesirable change in physical, chemical, or biological characteristics of any component of the environment i.e. air, water, soil which can cause harmful effects on various forms of life or property.**

- **Pollution: introduction of contaminants / influence of any substance causing nuisance, harmful effects, and uneasiness to the organisms**

- **Pollutant:- Any substance causing Nuisance or harmful effects or uneasiness to the organisms, then that particular substance may be called as the pollutant.**

Types of Pollutants

- Pollutants may be classified by various criteria:

  1) By the origin: whether they are natural or man-made (synthetic).

  2) By the effect: on an organ, specie, or an entire ecosystem.

  3) By the properties: mobility, persistence, toxicity.

  4) By the controllability: ease or difficulty of removal.

- Three factors determine the severity of a pollutant: its chemical nature, the concentration and the persistence

- Pollutants are generally grouped under two types:
- Biodegradable pollutants – Biodegradable pollutants are broken down by the activity of micro-organisms and enter into the biogeochemical cycles. Examples of such pollutants are domestic waste products, urine and faecal matter, sewage, agricultural residue, paper, wood and cloth etc.
- Non- Biodegradable pollutants – Non-biodegradable pollutants are stronger chemical bondage, do not break down into simpler and harmless products. These include various insecticides and other pesticides, mercury, lead, arsenic, aluminium, plastics, radioactive waste etc.

- Stock pollutants -- Pollutants, towards which the environment has little or no absorptive capacity are called *stock pollutants* -e.g. persistent synthetic chemicals, non-biodegradable plastics, and heavy metals). Stock pollutants accumulate in the environment over time
- Fund pollutants -- Fund pollutants are those for which the environment has some absorptive capacity. Fund pollutants do not cause damage to the environment unless the emission rate exceeds the receiving environment's absorptive capacity (e.g. carbon dioxide, which is absorbed by plants and oceans)
- Another classification of pollutants is based on its harmful effects –
  - Common Elements
  - Toxic Elements
  - Radioactive Elements

Six Common Pollutants

TYPES OF POLLUTION

- **WATER POLLUTION**
- **AIR POLLUTION**
- **LAND POLLUTION**
- **NOISE POLLUTION**

WATER POLLUTION

- **Water Pollution** can be defined as alteration in **physical, chemical,** or **biological** characteristics of water through natural or human activities and making it unsuitable for its designated use.

SOURCES OF WATER POLLUTION

- **Most of Water Pollution is man made It may also occur naturally by addition of soil particles through erosion animal wastes and leaching of minerals from rocks**

- **The sources of water pollution can be classified as**
  - **Municipal Waste Water**
  - **Industrial Waste**
  - **Inorganic Pollutants**
  - **Organic Pollutants**
  - **Agricultural Wastes**
  - **Marine Pollution**
  - **Thermal pollution**

Water pollution affects the entire biosphere

MUNICIPAL WASTE WATER

INDUSTRIAL WASTE

The major source of water pollution is the waste water discharged from industries and commercial bodies, these industries are chemical, metallurgical, food processing industries, textile, paper industries. They discharge several organic and inorganic pollutants. That prove highly toxic to living beings.

INORGANIC POLLUTANTS

- They include fine particles of different metals, chlorides, sulphates, oxides of iron, cadmium, acids and alkalies.

ORGANIC POLLUTANTS

- **They Include oils, fats, phenols, organic acids grease and several other organic compounds**

AGRICULTURAL WASTES

- **Chemical fertilizers and pesticides have become essential for present day high yielding crops.**

- **Consequently , they have become a potential source of water pollution.**
  - These fertilizers contain major plants Nnutrients mainly nitrogen, phosphorous, and potassium.
  - Excess fertilizers may reach the ground water by leaching or may be mixed with surface water of rivers, lakes and ponds by runoff and drainage.

MARINE POLLUTION

Ocean are the final sink of all natural and manmade pollutants.

3 major sources of marine pollution:

- Rivers discharge their pollutants into the sea. The sewage and garbage of costal cities are also dumped into the sea.
- Oil spills- While being toxic to marine life, polycyclic aromatic hydrocarbons (PAHs), found in crude oil, are very difficult to clean up, and last for years in the sediment and marine environment
- Deep sea mining

Marine Pollution : Acidification

- The oceans are normally a natural carbon sink, absorbing carbon dioxide from the atmosphere
- Because the levels of atmospheric carbon dioxide are increasing, the oceans are becoming more acidic
- Oceans and coastal ecosystems play an important role in the global carbon cycle and have removed about 25% of the carbon dioxide emitted by human activities between 2000
- Rising ocean temperatures and ocean acidification means that the capacity of the ocean carbon sink will gradually get weaker

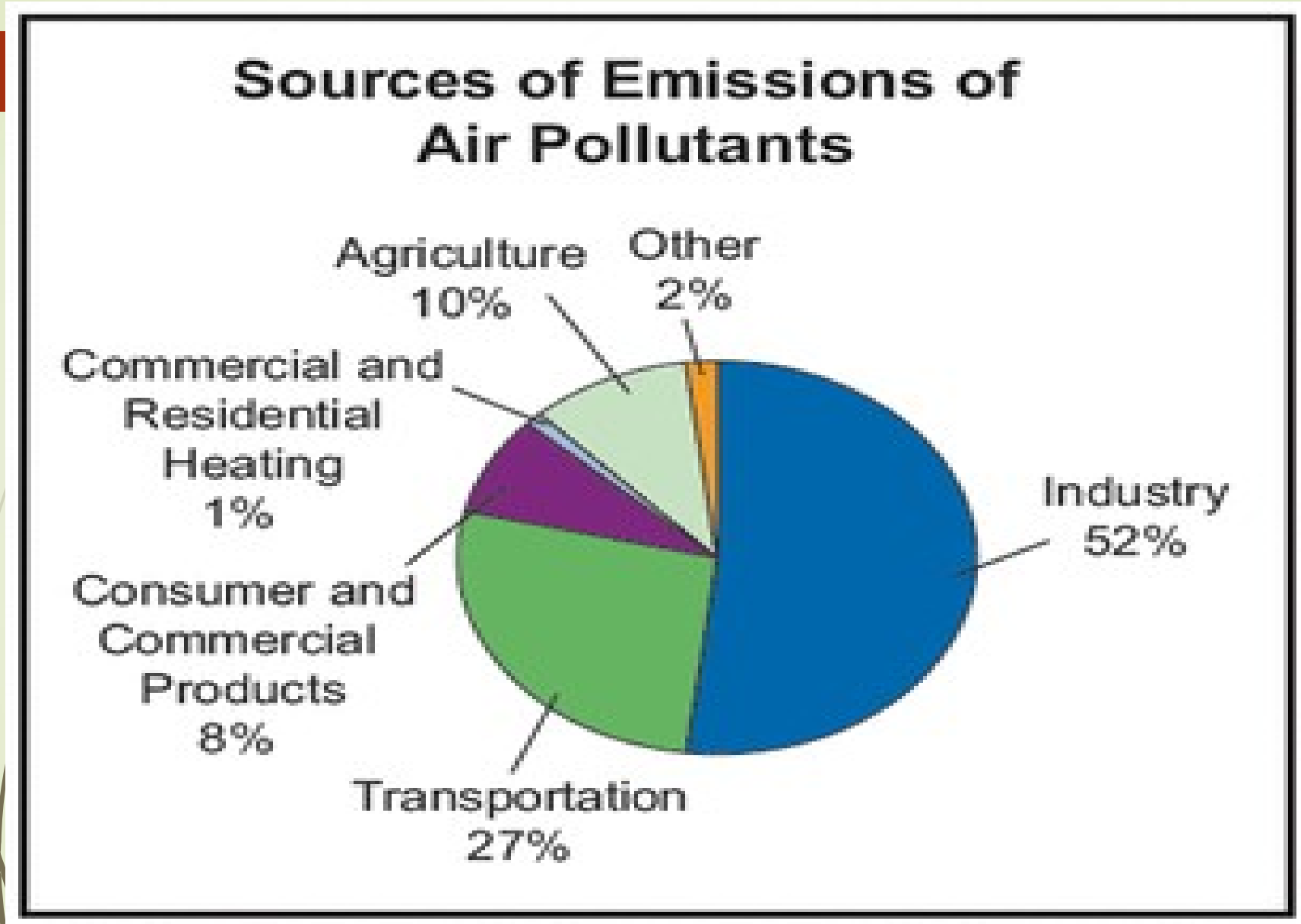
THERMAL POLLUTION

- **Thermal Pollution of water is caused by the rise in temperature of water. The main source of thermal pollution are the thermal and nuclear power plants. The power generating plants use water as coolants and release hot water into the original source. Sudden rise in temperature kills fish and other aquatic animals.**

AIR POLLUTION

- Air Pollution by far the most harmful form of pollution in our environment.

- The pollutants for air pollution are divided into two categories
- The first type of pollutants known as **primary pollutants** are those which are produced from a certain process like the smoke emitted from the vehicles
- The second type of pollutants are termed as the **secondary pollutants** and these are the ones which are generated due to the reaction of primary pollutants with natural air eg. smog


Sources of Emissions of Air Pollutants
Agriculture 10%
Other 2%
Commercial and Residential Heating 1%
Industry 52%
Consumer and Commercial Products 8%
Transportation 27%

MAJOR AIR POLLUTANTS

- **Carbon monoxide and dioxide**-this happens because of Deforestation and fossil fuel burning.
- **Sulfur dioxide and nitrogen dioxide** –Due to the burning of sulfur containing compounds of fossil fuels.
- **Sulfur oxides**- very dangerous to humans at a high concentration. Sulfur in the atmosphere is responsible for acid rain.
- **Particulate matter**- PM 2.5, PM 10
- **Ozone** –

CONSEQUENCES OF AIR POLLUTION

- **CO_2 is a good transmitter of sunlight, but it also partially restricts infrared radiation going back from the earth into space, which produces the so-called greenhouse effect that prevents a drastic cooling of the Earth during the night.**

- **CO2 in atmosphere --> GLOBAL WARMING**

Pollutant Standard Index (PSI)

- The **Pollutant Standards Index**, or **PSI**, is a type of air quality index, which is a number used to indicate the level of pollutants in air.
- The **PSI** considers six air **pollutants** - sulphur dioxide , particulate matter , fine particulate matter , nitrogen dioxide , carbon monoxide and ozone
- PSI range: 0-50 is good; in Delhi in November 2016 PSI crossed 200 which is very unhealthy; above 300 is hazardous

LAND POLLUTION

- **Land pollution is the demolition of Earth's land surfaces often caused by human activities and their misuse of land resources. It occurs when waste is not disposed properly.**

- **Urbanization and industrialization are major causes of land pollution.**
- **Natural factors**:
  - volcanic eruptions
  - changes in rainfall pattern
  - Earthquakes
  - topographic changes
  - wind and glacier movements

CAUSES OF LAND POLLUTION

- **Six Main causes of land pollution:**
  - **Construction**
  - **Agriculture**
  - **Domestic waste**
  - **Industrial Waste**
  - **Radioactive waste**
  - **Toxic waste**

CONSTRUCTION

- **Buildings take up resources and land, the trees are chopped down and used to make buildings.**
- **Takes away the places for animals and other organisms to live.**

AGRICULTURE

- **As there are more and more people inhabiting the earth, food is in higher demand and so forests are chopped down and turned into farmland**

- **In addition, herbicides, pesticides, artificial fertilizers, animal manure are washed into the soil and pollute it.**

DOMESTIC WASTE

- **Tons of domestic waste is dumped every day. Some waste from homes, offices and industries can be recycled or burnt in incinerators .**

- **There is still a lot of garbage, such as refrigerators and washing machines that are dumped in landfills simply because they cannot be reused in anyway, nor recycled .**

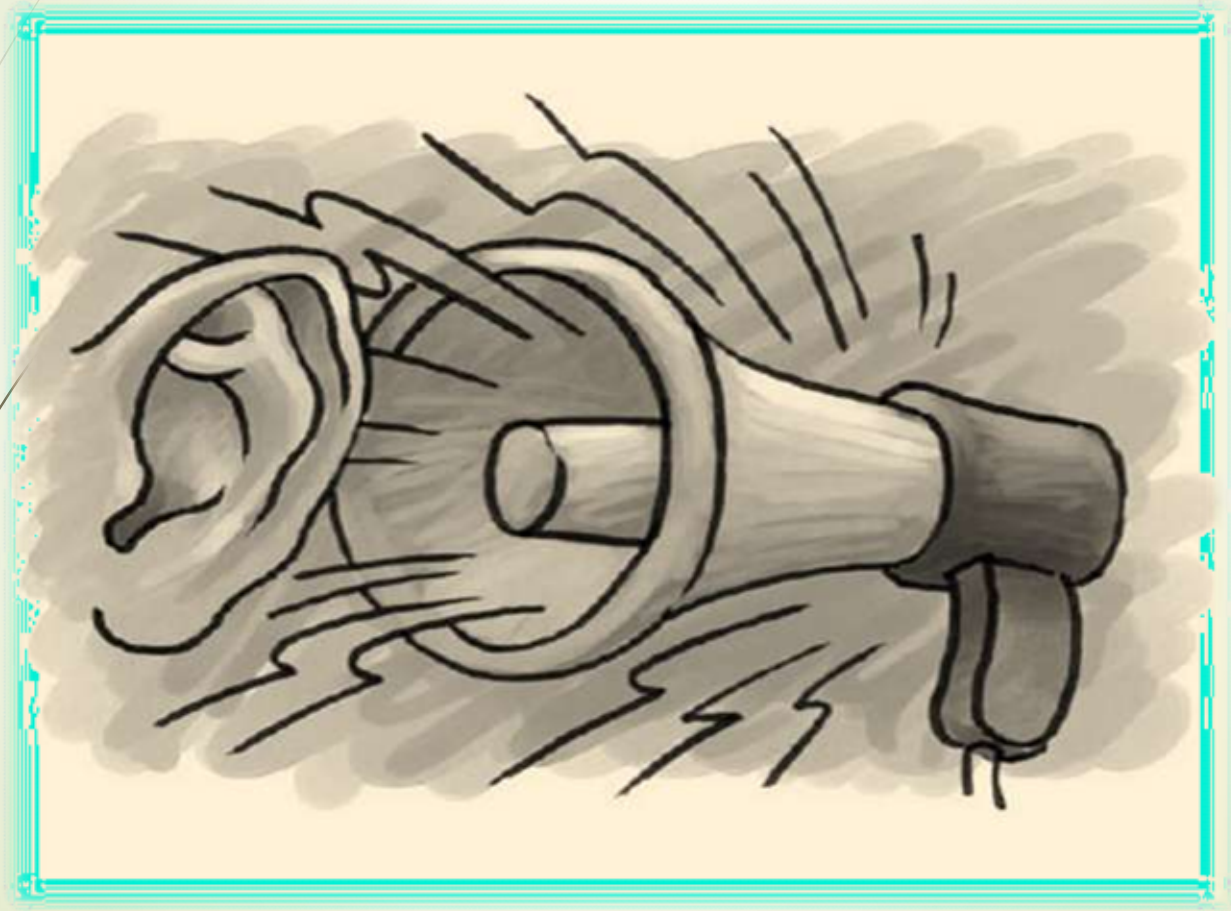
INDUSTRIAL WASTE

- **Plastics factories, chemical plants, oil refineries, nuclear waste disposal activity, large animal farms, coal-fired power plants, metals production factories and other heavy industry all contribute to land pollution.**

Effects of Land Pollution

- Soil Erosion
- Low yields
- Desertification
- Less land for cultivation

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.

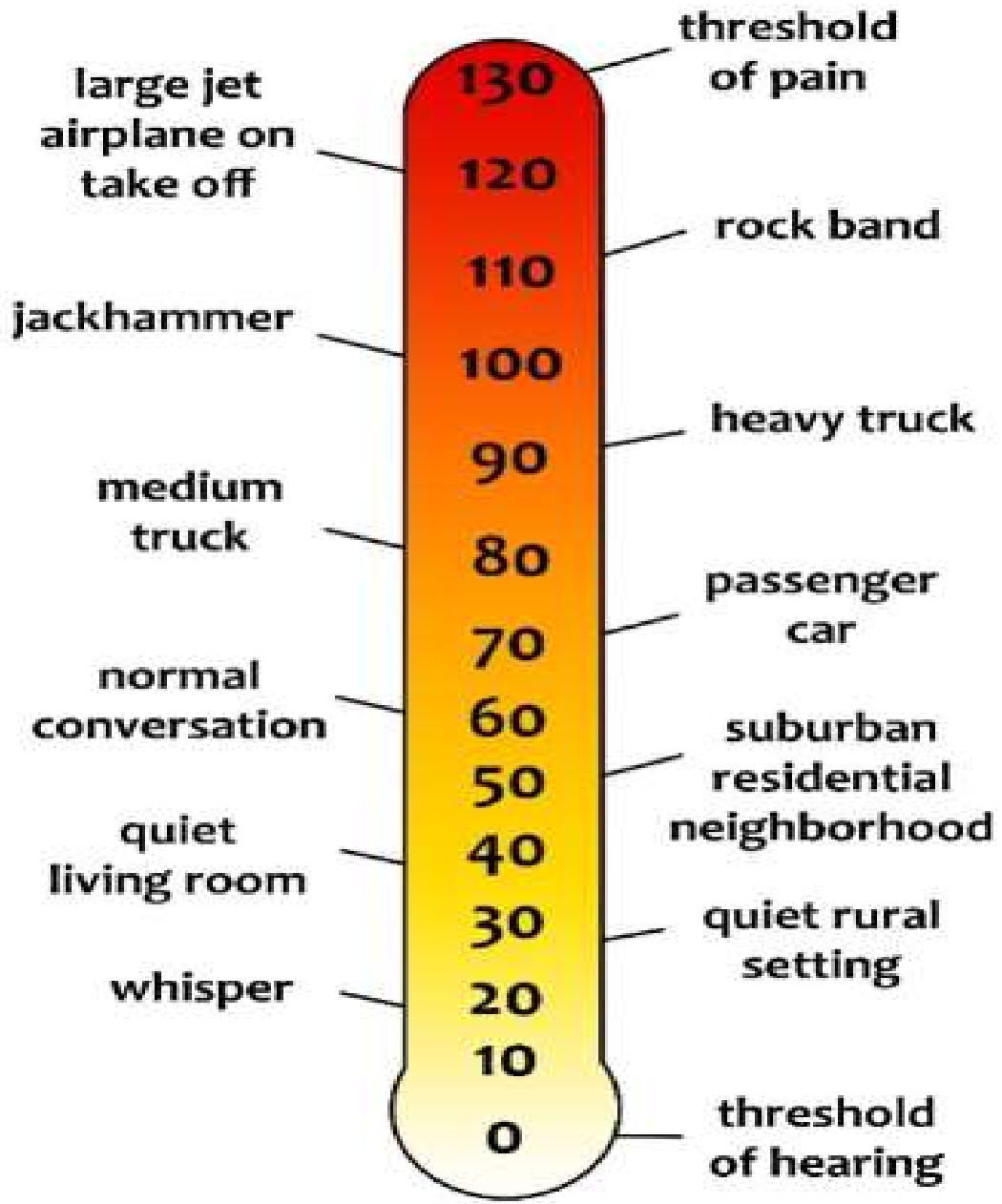
- Sound becomes undesirable when it disturbs the normal activities such as working, sleeping, and during conversations.

- It is measured in the units of decibels and is denoted by the **dB**.

SOURCES OF NOISE POLLUTION

- **Transportation systems are the main source of noise pollution in urban areas.**
- **Construction of buildings, highways, and streets cause a lot of noise, due to the usage of air compressors, bulldozers, loaders, dump trucks, and pavement breakers.**
- **Industrial noise also adds to the already unfavorable state of noise pollution.**
- **Loud speakers, plumbing, boilers, generators, air conditioners, fans, and vacuum cleaners add to the existing noise pollution.**

Decibel Scale (dBA)



Permissible noise level in India

- 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
- In residential areas it is 55 dB and 45 dB during daytime and night.
- 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

EFFECTS OF NOISE POLLUTION

- **According to the USEPA, there are direct links between noise and health. Also, noise pollution adversely affects the lives of millions of people.**
- **Noise pollution can damage physiological and psychological health.**
- **High blood pressure, stress related illness, sleep disruption, hearing loss, and productivity loss are the problems related to noise pollution.**
- **It can also cause memory loss, severe depression, and panic attacks.**

SOLUTIONS FOR NOISE POLLUTION

- **Planting bushes and trees in and around sound generating sources is an effective solution for noise pollution.**
- **Regular servicing and tuning of automobiles can effectively reduce the noise pollution**
- **Social awareness programs should be taken up to educate the public about the causes and effects of noise pollution.**
- **Workers should be provided with equipments such as ear plugs and earmuffs for hearing protection.**

- Similar to automobiles, lubrication of the machinery and servicing should be done to minimize noise generation.
- Soundproof doors and windows can be installed to block unwanted noise from outside.
- Regulations should be imposed to restrict the usage of play loudspeakers in crowded areas and public places.
- Factories and industries should be located far from the residential areas.

Central Pollution Control Board

- The **Central Pollution Control Board** (CPCB) of India is a statutory organisation under the Ministry of Environment, Forest and Climate Change;
- Established in 1974
- CPCB conducts environmental assessments and research. It is responsible for maintaining national standards under a variety of environmental laws, in consultation with zonal offices, tribal, and local governments
- It has responsibilities to conduct monitoring of water and air quality, and maintains monitoring data

Ecological crisis

- An ecological crisis occurs when changes to the environment of a species or population destabilizes its continued survival.
- Crisis caused by
- Abiotic factors
  - Climate change
  - Global worming
  - Acid rain
  - Ozone depletion …….
- Biotic factors
  - biodiversity extinction)
  - Overpopulation ……

THANK YOU