

Noise pollution



Noise pollution

Definition - The term noise may be defined as an unwanted sound at a wrong time and wrong place. Although noise is undesirable, it could be meaningful or meaningless. A meaningful noise generally meant for inviting attention such as the cry of baby or screaming of a person for help. On the contrary an irresponsible or meaningless noise is disturbing and annoying.

Prolonged and loud sound is generally considered noise which is mostly caused by industries, vehicles, aero planes etc. industrial noise is very prominent and dangerous. Noise is found to cause some kind of physical, physiological or psychological harm or stress to human beings. This also called pollutant.

- ✿ Noise is the byproduct of human activity.
- ✿ Excessive noise can result is loss of hearing, increase in accidents and decrease of productivity. Noise is very prominent in urban and industrial area.

Noise pollution

- ✿ **‘Sound frequency’** is the rate at which compression waves arrive at or pass a fixed point. Sound intensity is the acoustical power (i.e. the energy delivered by sound) per unit area.
 - ✿ **‘Pitch’** is the human perception of sound frequency (and also intensity to some extent).
 - ✿ **‘Loudness’** is the human perception of sound intensity (and also frequency to some extent).
 - ✿ **‘Hertz’** (Hz) or cycles per second are a measure of sound frequency. Human beings can hear only ranging from 20 to 20,000 Hz. The range of frequencies of human speech is 200 to 3000 Hz, which is best heard by humans. Sounds too high it! Frequency above 20,000 Hz is called ultrasound and that which is too low frequency below 20 Hz is called infrasound.
- ✿ The response of ear to sound is proportional to the logarithm of its intensity or pressure. The loudness is expressed in terms of a unit called “decibel”(deci comes from the Latin word to ten, and a bel is the logarithm of a ratio of any two acoustical or electrical intensities). **In terms of sound, a decibel is ten times the logarithm of the ratio of two sound intensities, one being the intensity of any sound of interest and the other being a reference sound.**

$$\text{Decibel (dB)} = 10 \log \frac{\text{Sound intensity measured}}{\text{Reference sound intensity}}$$

A normal conversation is done at 60 db sound. A jet plane during its takeoff produces a 150 db sound.

Noise pollution

Causes of noise pollution:

The sources of noise are more in urban and industrial areas than in rural areas.

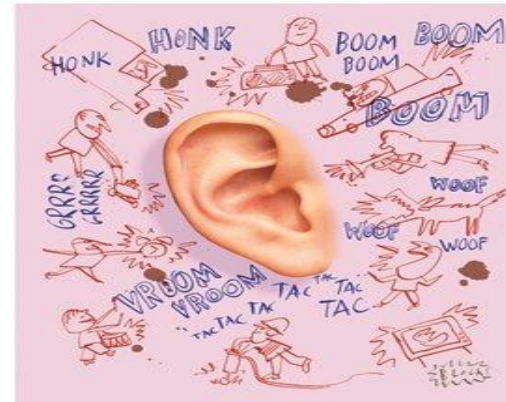
1. Stationary sources

Use of loudspeakers on various occasions like festivals, elections, worships in temples, mosques, and advertisements, mining operations, use of bulldozers, drillers and dynamites to break rocks, household gadgets like vacuum cleaner, TV, radio, stereo, grinder, mixer etc., common vegetable and fish markets.

2. Mobile sources

Road traffic, railway traffic, air traffic, navigation etc the sources of noise can be classified in following categories:

- a. Industrial noise
- b. Transportation\traffic noise
- c. Noise from construction work
- d. Neighborhood noise



Transportation \ traffic noise: The main threat of noise comes from transport. A survey in Delhi, Kolkata and Mumbai showed that daytime noise varied from 60 db in busy localities. In some heavy traffic areas, the average noise level reached up to 90 db even at night.

Causes of noise pollution:

A. Road traffic or highway noise:

The noise generated from highway traffic is one of the major sources of noise pollution. Highway noises are two types, viz., noise generated by individual vehicles and noises generated by a continuous flow of vehicles of all types.

The noise from individual vehicles includes noise from engine and transmission, exhaust, noise, noise due to slamming of car doors and use of horn. Traffic speed is one of the major causes of noise. The other factors on which traffic noise depends are traffic density and a number of operating factors\ conditions\ types of vehicle. Heavy diesel engine vehicles are the noisiest vehicles on roads. It can be observed that sports car and motor cycles are notorious noise producers.

B. Aircraft noise

Aircraft noise differs from road traffic noise in the sense it is not continuous but intermittent. Noise is at a maximum during take-off and landing. Major cities around the world have banned or reduced flights at night and also prescribed noise limits.

C. Rail traffic noise;

Noise from rail traffic is not serious nuisance as compared to the road traffic and air port noise. The noise produced is generally of lower frequency than that of road vehicles and further, most railway tracks run through rural areas. The impact of noise pollution by trains is felt maximum in buildings located beside railway tracks. The normal ambient noise level near rail tracks went up by 10-20db during train movement.

Causes of noise pollution:

Industrial noise:

In industries, noise is the by-product of energy conversion. The compressors, generators, furnaces, looms, grinding mills, release valves and exhaust fans are the most offending noise sources.

The common noise level in most units is 80-120 db, which is really hazardous. Studies showed that 1.3% of industrial workers suffer tinnitus for noise exposure levels up to 80 db.

Noise from construction work:

Noise from construction sites is generally far worse than the noise originating from factories. There are two reasons for this – one is that construction (of roads, bridge, buildings, dams etc.) may become necessary anywhere and the other reason is that construction equipments are inherently noisy.

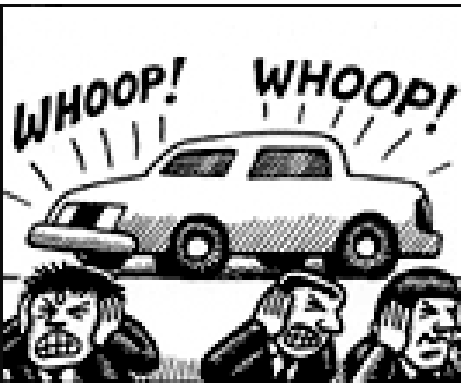
Neighborhood noise:

It includes a variety of noise sources which disturb and annoy general public. The most prominent is the indiscriminate use of loudspeakers in public functions, entertainments, festivals, elections etc. The other sources include vacuum cleaners, TV, radio sets and washing machines etc.

Sources of noise

Noise generation from **natural sources** like **lightening, blowing air, flowing water**, is a common phenomenon in our life. But the **two main anthropogenic (man-made) sources** which are mainly responsible for noise pollution are as follows:

- ❑ **Industrial sources** : noise is generated by various industrial processes like **grinding, welding, cutting, pressing, blasting** etc. similarly noise is also produced by machineries or equipments used for various industrial operations. The major noise producing equipments includes gas turbine, rotary compressor, centrifugal pump, fermentation tank etc.
- ❑ **Non-industrial sources**: it consists of noise generated from **domestic activities, loudspeakers, construction and traffic**. Use of loudspeaker during various religious or non-religious, public or private functions is a common practice. It considerably increases level of noise. During construction activity use of various machineries, equipments also increase noise levels in the surrounding environment.



Effects of noise pollutions

A. Physiological effects: the acute effects caused by noise depend upon the pressure and frequency.

- At high level of about **150 db immediate permanent hearing impairment** may be caused. At sound levels in the range of **120-150 db, effects on respiratory system, dizziness, disorientation, loss of physical control, other physiological changes resulting from stress, nausea and vomiting may be caused.**
- Nerve fibers leaving the inner ear carry impulses elicited by sirens, trumpets, etc. to the medulla of the brain stem, where they meet other fibers going to other parts of the brain. **Nerve pathways permit both ears to communicate with numerous parts of both sides of the brain, including the centers of consciousness and the control centers that regulate breathing, blood pressure and other bodily functions below the level of consciousness.**
- Loud sounds can cause an increased secretion of many hormones of the pituitary gland e.g., adrenocorticotrophic hormone (ACTH). ACTH in turn stimulates the adrenal gland, which secretes several other hormones.

Effects of noise pollutions

A. Physiological effects:

Through a variety of influences, these hormones in turn trigger various effects such as

1. **Enhancement of the sensitivity of the body to adrenalin**
2. **Increase of blood sugar levels**
3. **Suppression of immune system and**
4. **Decreasing efficiency of liver to detoxify blood**

- **The major chronic effect of noise is the so-called noise includes hearing loss. A person exposed to high noise level goes deaf more quickly than the one who is exposed to a relatively noise-free environment during his day to day activities. This effect depends upon and increases with the pressure frequency, and the time of exposure.**
- **Studies on a group of youngsters listening to rock music generated at over 90 db throughout the 500 to 8000 Hz range and sustained over about an hour showed a threshold shift of 40 db in about 10% of the listeners and 20 to 30% threshold elevation in the others. Most of this threshold shift is usually temporary but repeated exposure can make it permanent.**

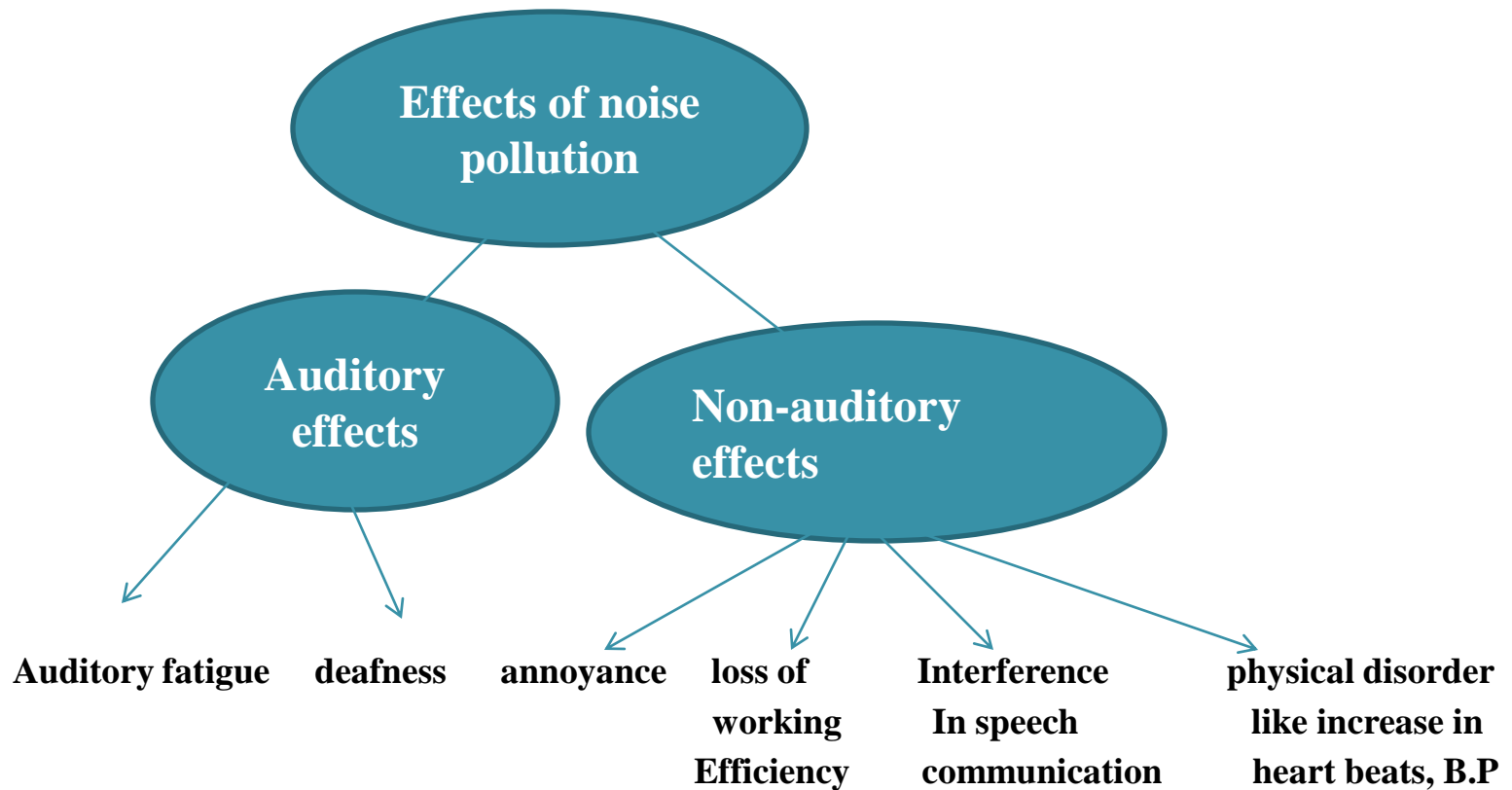
Effects of noise pollutions

B. Psychological and other effects:

- **Temporary effects such as deterioration in concentration and even mental disorientation at high noise levels.**
- **Loud continuous noise reduces the working efficiency, interferes with communication** and increases the frequency of errors which may at times cause accidents.
- **Noise reduces the mental capability.** Noise has psychological effects on human ranging from mild distress to complete unhinging.
- **Noise interferes with deep sleep and interrupts sleep.** Because sleep is important to emotional stability, noise may contribute to distress and emotional disturbance.
- **Noise also aggravates any existing psychological conditions and mental illness.**



Effects of noise pollution



Noise has become a very important stress factor in the environment of man. It has many effects on exposed population. It can have a number of undesirable effects depending upon its intensity, frequency, duration, and time of day when it occurs. The various effects of noise pollution on human beings are classified auditory (direct affecting ear & hearing ability) and non-auditory effects (affecting other physiological process). Similarly noise can show various detrimental effects on other living organisms like plant & animal

Auditory effects

The most acute and immediate effect of noise pollution is impairing of hearing which may causes auditory fatigue and may finally lead to deafness.

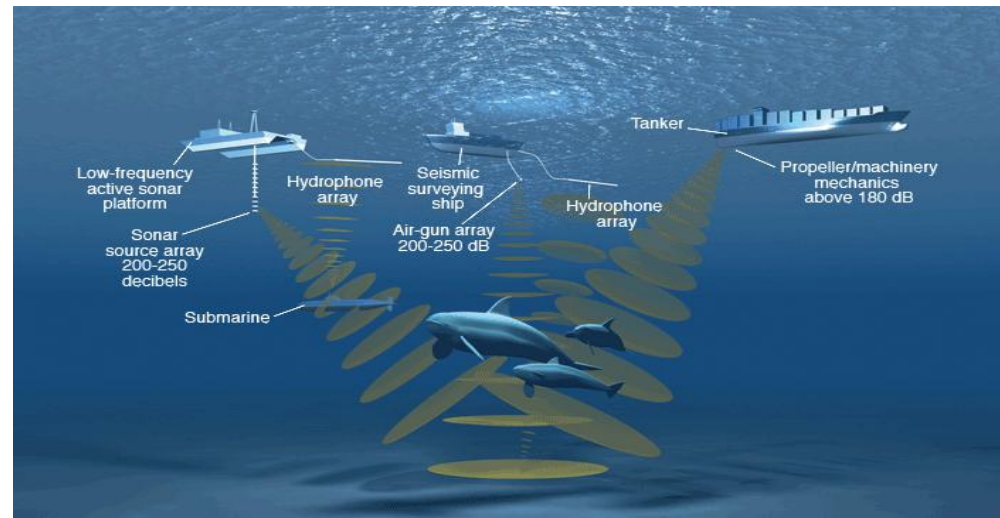
- ❖ Auditory fatigue occurs when exposed to noise levels of 90 db or above. In metro cities most of the shopkeepers, cobblers fruit sellers complain tinnitus in ear.
- ❖ Deafness occurs when exposed to loud noise. The workers working in noisy workplace environment may suffer from Noise Induced Hearing Loss (NIHL). Hearing loss may be temporary or permanent. Prolonged exposure to high noise levels leads to permanent deafness.

Non- auditory effects

Non-auditory effects are also alarming, because of the fact that they also cause severe diseases. It includes interference with **speech communication, annoyance leading to ill-temper, mental disturbance and violent behavior.** It also causes **loss of working efficiency due to physiological disorder.** Physiological disorders associated with noise include increase heart rate, increases blood pressure, change in skin temperature and blood circulation, Cardio-vascular diseases and change in levels of hormones. In females, the chances of miscarriage and congenital birth defects are more in noisy environment.

Other effects of noise

- ❖ Birds that rely on hearing to locate prey are seriously disadvantaged by anthropogenic noise. Birds in a city need to call longer and louder than their country counterparts.
- ❖ Noise disturbs feeding and breeding patterns of some animals and has been identified as a contributing factor of the extinction of some species.
- ❖ Aircraft noise and sonic booms have been implicated as a cause of lowered reproduction in a variety of animals.
- ❖ In dairy cows, excessive noise reduces feed consumption, milk yield, and rate of milk release.
- ❖ Intense noise can affect growth of chickens and egg production. Noise has also been shown to have a detrimental effect on the growth of some plants too.
- ❖ Military sonar, mass stranding of giant squids in coastal areas of Spain between 2001 and 2003 showed how grave the implications of noise pollution in marine life. The death of animals can occur merely hours after exposure to extreme underwater noise for example whales and dolphins can die soon enough due to strandings.





Noise pollution control program in industries

The modern technology for achieving greater productivity necessary deals with greater speeds, higher fluid pressures and velocities and more powerful machinery. This creates the undesirable noise pollution.

There are four basic principles of noise control:

- **Sound insulation:** prevent the transmission of noise by the introduction of a mass barrier. Common materials have high-density properties such as brick, thick glass, concrete, metal etc.
- **Sound absorption:** a porous material which act as a 'noise sponge' by converting the sound energy into heat within the material. Common sound absorption material include decoupled lead-based tiles, open cell foams and fiberglass
- **Vibration damping:** applicable for large vibration surfaces. The damping mechanism works by extracting the vibration energy from the thin sheet and dissipating it as a heat. A common material is sound deadened steel.
- **Vibration isolation:** prevents transmission of vibration energy from a source to a receiver by introducing a flexible element or a physical break. Common vibration isolators are springs, rubber mounts, cork etc.



Thank You