MODULE 32 - EFFECTS OF NOISE POLLUTION

OBJECTIVES

By the end of this session students will be able to:

1. Know more about the effects of Noise Pollution
2. Understand how noise pollution impacts human beings, wildlife, non-living matter
3. Understand how to protect themselves from Noise Pollution

SUMMARY

Sound is a natural phenomenon which we encounter every day, in all our activities. Natural and manmade activities all involve sound. However, sound can be tolerated only up to an extent. If sound increases manifold, it becomes unbearable noise. Noise Pollution generally refers to unwanted sound produced by human activities—unwanted in that it interferes with communication, work, rest, recreation, or sleep. Unlike other forms of pollution, such as air, water, and hazardous materials, noise does not remain long in the environment. However, while its effects are immediate in terms of annoyance, they are cumulative in terms of temporary or permanent hearing loss & in some cases even mental disorders. In this program we will learn about the various effects of sound pollution and some solutions for decreasing noise pollution.

TRANSCRIPTION

1. Introduction:

Noise Pollution is unwanted sound which interferes with communication, work, rest, recreation, or sleep. It is usually produced by human activities like industries, transportation, construction work, use of electrical and electronic devices and gadgets, etc. Unlike other forms of pollution, such as air, water, and hazardous materials, noise does not remain long in the environment. However, while its effects are immediate in terms of annoyance, they are cumulative in terms of impact on health.

In this program we will discuss about the effects of noise pollution on health and the possible solutions that can be taken to decrease noise pollution.

2. Acceptable Sound Levels:-

Only some levels of sound in the atmosphere are acceptable to the human ear. Sounds that go beyond these levels become noise. According to Keonigsberger et. al. (1973) acceptable sound levels for various places are:

Acceptable Sound Levels (Source: Keonigsberger et. al. (1973)			
S.No.	**Category**	**Place**	**Level of Sound (dB)**
1	Residential Areas	• Bed Room • Living Room	25 40
2	Commercial Areas	• Office • Conference • Restaurant	30-45 40-45 40-60
3	Industrial Areas	• Workshop • Laboratory	40-60 40-50
4	Educational Areas	• Class Room • Library	30-40 35-45

But according to the Environment Protection Third Amendment Rules 1989, the standard limits of sound of various places are:

Standard Sound Limits (Source: Environment Protection Third Amendment Rules 1989, Government of India)			
S. No.	**Area**	**Day Time**	**Night Time**
1	Industrial Area	75	70
2	Commercial Area	65	55
3	Residential Area	55	45
4	Silent Zone	50	40

3. Noise Exposure Duration & Intensity

Continuous exposure to sound is always harmful to the hearing system. There is a level beyond which it creates pollution. The degree of hearing loss depends on the duration and intensity of sound. The maximum exposure limit for various sound levels is:

Sound Levels & Duration of Exposure **(Source – Khopker – SS. M. 2004)**	
Level of Sound (in dB)	**Exposure limit**
80	12 hrs.

90	08 hrs.
93	04 hrs.
96	02 hrs.
99	01 hrs.
100	30 minutes
105	15 minutes.
108	Seven minutes
111	Three and a half minutes.
114	2 minutes
115	1 minute
118	30 seconds
124	15 seconds
127	4.2 seconds
130	2.0 seconds
133	1.0 seconds
135	0.6 seconds

The effect of various intensities of sound on human hearing is:

EFFECT OF SOUND INTENSITY ON HEARING	
< 25 dB	No problem in hearing
25-40 dB	Problem in hearing of soft speech
40-50 dB	Problem in hearing of normal speech
55-70 dB	Problem in hearing
70-90 dB	Only shouted speech can be understood
> 90 dB	Unable to hear

Noise intensity impacts human health in various ways.

EFFECT OF NOISE INTENSITY ON HUMAN HEALTH	
80 dB	Annoying
90 dB	Hearing damage for 8 hrs
95 dB	Very Annoying

100 dB	Simulation of reception in skin
120 dB	Pain Threshold
130-135 dB	Nausea, vomiting, dizziness, interference with touch
140 dB	Pain in ear; insanity in case of prolonged exposure
150 dB	Burning of skin; changes in pulse rate
160 dB	Other minor permanent damage
180 dB	Eardrum rupture; other permanent damage
190 dB	Lung damage

4. Effect of Noise Pollution on Human Being:

Effect of Noise Pollution on Human Body:

Noise pollution impacts human body in various ways.

- It creates excretory disorders, influencing the quantity of urine excreted due to the presence of ketosteroid.
- It leads to respiratory disorders, making it difficult for a person to breathe.
- The Integumentary system is also affected, decreasing the power of resistance of the skin, causing dryness of the skin and creating cracks.
- The nervous system is affected with brain fatigue, sleep interference, abnormal conscious states and decreased sensation.
- It causes auditory disorders like deafness and auditory fatigue.
- Optical disorders include dilation of the pupil and muscular tension.
- Digestive disorders leading to gastrointestinal problems may also occur.
- The cardiovascular system is affected with disturbed blood flow, disturbed pulse rate, disturbed heart beat and disturbed BP.

Effect of Noise Pollution on Human Behaviour:

Noise pollution affects human behaviour by:

- Disturbing peace
- Creating Annoyance
- Creating Anxiety
- Aggression
- Depression
- Mental disorientation
- Lack of concentration
- Reducing work efficiency
- Interference in enjoyment

- Errors in judgment

5. Effect of Noise Pollution on Wildlife:

The results of noise pollution on wildlife are:

- Migration of birds from the noise habitat.
- Zoo animals like deer, lions, and rabbits become dull and inactive and their health deteriorates.
- Affects food habits.
- Affects mating behavior.
- Stress reaction due to dysfunction of endocrine glands like thymus, and adrenal.

6. Impact of Noise Pollution on Non Living Matter

Vibration originating from high intensity noise causes:

- Shattering of Windowpanes.
- Loosening of plaster of house walls.
- Cracks in walls.
- Cracks in household crockery.
- Breaking down the hanging in the rooms.
- Depreciation of residential property located airports, highways, industrial areas.

7. Control of Noise Pollution

Noise pollution can be reduced or controlled by various methods:-

(a) Control of noise at source – Noise can be controlled at source by:

- Using silencing devices in noise producing equipment.
- Keeping the noise producing equipments at a distance.
- Choosing machine/equipments that produce less noise.
- Conducting noise operations in open or away from residential areas.
- Keeping industrial area away from residential area.
- Using electric or battery operated devices in place of petrol or diesel operated devices.

(b) Control of Noise at transmission level: - Various kinds of barriers are available which absorb noise, which can be used to reduce sound pollution. These barriers include:

SOUND ABSORBING ABILITY OF VARIOUS BARRIERS (Source:)			
S. No.	**Noise Absorbing Material**	**Thickness (in MM)**	**Sound level (in dB)**
1	Asbestos	0.6 mm	26 dB
2	Brickworks	11.6 mm	40 dB
3	Fire board	1.2 mm	18 dB
4	Plywood	0.6 mm	21 dB
5	Cement stab	7.6 mm	35 dB
6	Lead sheet	0.5 mm	15 dB
7	Plastic board	1.3 mm	12 dB
8	Compressed wood	5 mm	28 dB
9	Chipboard	1.8 mm	26 dB
10	Glass Firewood	50 mm	70 dB
11	Clinker Blocks	7.5 mm	23 dB
12	Curtains	0.25 mm	22 dB

8. Protection from Sound Pollution:

a) Ear plugs/ear muffs: Persons who are bound to be exposed to sounds of pollution levels can use ear plugs and ear muffs as protection devices.

b) Plantation: Trees and bushes have the quality to absorb noise and reduce the intensity of sound. Thus, plantation around the house and industries can reduce the level of noise pollution.

c) Control of noise pollution through education and awareness:

Awareness can be created in people through education, awareness comps and programs about the adverse effect of noise pollution.

d) Use of legislation:

- Use of pollution free devices can be made mandatory.
- Legislation can be brought in for the creation of silent zones
- Laws can be created for completely banning devices and activities which produce noise of pollution levels.
- Laws like IPC 1060, Sections 268, 278, 290, which define noise of resistance level and punishment for the same, can be strictly implemented.
- Regional laws can be enforced, like M.P. Control of Music & Noise Act 1951, The Rajasthan Noise Control Act 1963, The Bihar Control of the Use of Loudspeakers Act 1955, Railway Act 1948, The Motor Vehicle Act 1939 & Delhi Motor Vehicle Act 1940, The Environment Protection Act 1972, etc.

Conclusion:

Noise is a silent killer of all forms of life. Only self discipline and social awareness can save the people from noise pollution. We also need a special international declaration on noise pollution, since the Stockholm Declaration of 1972, which deals with environmental pollution, does not consider noise as a polluter. Noise pollution needs to be recognized as a source of environmental pollution, so that effective steps can be taken for protecting the environment and the health of all life forms.

GLOSSARY

1. **Sound:** Physical phenomenon that stimulates the sense of hearing.
2. **Noise:** In Physics, noise is an acoustic, electrical or electronic signal consisting of a random mixture of wave lengths. Presence of unwanted unpleasant sound is the result of pressure changes in a medium, caused by vibration or turbulence.
3. **Noise Pollution:** The sound which makes animals and human beings uncomfortable or creates adverse effects is called 'noise pollution'. >180dB is considered as noise pollution.
4. **Decibel:** Unit of intensity of sound (equal to 1/10th of 'Bell', named after Alfred Graham Bell).
5. **Intensity of sound:** The intensity is the product of the sound pressure and the particle velocity. The intensity of sound, at a given distance, depends upon the amplitude of the waves. Thus, a tuning fork gives out more energy in the form of sound when struck hard than when struck gently.
6. **Hearing loss:** Hearing loss causes partial or total inability to hear the sound in one or both ears.
7. **Degree of hearing loss:** Degree of hearing loss refers to the severity of loss of hearing ability.
8. **Ketosteroid:** A steroid containing a ketone group.
9. **Integumentary system:** The integumentary system is the organ system that protects the body from damage, comprising the skin and its appendages, including hair, scales, feathers, and nails.
10. **Respiratory disorder:** a disease affecting the respiratory system
11. **Nervous system:** The nervous system is a system of cells, tissues, and organs that regulates the body's responses to internal and external stimuli. In vertebrates it consists of the brain, spinal cord, nerves, ganglia, and parts of the receptor and effector organs.
12. **Cardiovascular system:** The heart and circulatory system (also called the cardiovascular system) make up the network that delivers blood to the body's tissues. The circulatory system is composed of the heart and blood vessels, including arteries, veins, and capillaries.

13. **Human behavior:** Human behavior is the potential and expressed capacity for physical, mental, and social activity during the phases of human life.
14. **Wildlife:** includes all non-domesticated plants, animals and other organisms. Domesticating wild plant and animal species for human benefit has occurred many times all over the planet, and has a major impact on the environment, both positive and negative.
15. **Non-living matter:** Most of the matter in the known universe is non-living. It is the matter that does not grow, reproduce or move itself about.
16. **Legislation:** Legislation (or "statutory law") is law which has been promulgated (or "enacted") by a legislature or other governing body, or the process of making it.

FAQs

Q1. What is the unit of measurement of sound?
Ans: Hertz.

Q2. What is 'Infrasound'?
Ans: Sound less than 20Hz is called 'infra sound'.

Q3. What is 'Ultrasound'?
Ans: Sound more than 20Hz is called 'ultra sound'.

Q4. What is the frequency band for audible sound?
Ans: 20Hz to 12,000Hz, where lowest audible frequency is 20Hz & loudest frequency of 12,000Hz.

Q5. What is dB?
Ans: The decibel (dB) is the scale which is used to describe the sound pressure level.

Q6. What is the sensitivity range of human ear?
Ans: 0-180 dB.

Q7. Which intensity sound is considered as a pollutant?
Ans: 80dB

Q8. What is the difference between noise and sound?
Ans: Noise is an acoustic, electrical or electronic signal consisting of a random mixture of wavelength, whereas sound is the result of pressure changes in medium, caused by vibration, which stimulates the sense of hearing.