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NOISE POLLUTION

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Abstract

Urbanization, ie., growth of urban population, has awfully accelerated during this century and has been faster in developing countries than in the advanced ones. The problems associated with the rapid change in human environment have intensified in the cities. It is here that physical environment is becoming increasingly polluted, the man-made environment of slums, restricted living space and noise are at their worst and the changes in the social environments have aggravated many problems

Not very far back, in the past, this very environment was pure, virgin and uncontaminated, and basically quite hospitable for mankind. It is all due to thoughtless over-exploitation of our various natural resources, by our own activities, perhaps due to our unending greed, in the garb of 'development', and the egoistic attitude towards "Nature"

*The pollutants reach us through the air we breath. the water we drink, the food we eat and the sound we hear. **Morris K.Uddal** rightly said "The more we exploit, the more our options are reduced, until we have only one to fight for survival. We are destroying the environment and the biosphere, where we live"*

This paper deals with sequence of various acoustical disturbances caused in the wake of noise pollution in the segments of industrial, commercial and traffic activities; how it would be harmful to the society at large explaining its insidious effects and the measures to be adopted to contain its adverse and ill-effects against deterioration of environment.

Noise is an important environmental pollutant like noxious gases that befoul our air, water and soil. It destroys bridges and produces cracks in buildings. The noise can cause skin and mental diseases.

According to Robert Koch a Nobel Prize Winner German bacteriologist.

<p>"A day will come man will have to fight merciless noise as the worst enemy of health"</p>

*According to him “ Noise Like Smog is a Slow Agent of Death.”
Broadly speaking, Intensity is the energy of sound waves and Frequency is the number of times per second the sound waves hit the ear of man. On the basis of the above definition, the loudness which is more commonly understood source of noise, is in fact Combination of Intensity and Frequency can be measured in DECIBELS.*

A decibel can be defined as an abstract unit. It is to be remembered that the threshold at the normal hearing is 20-25 decibels and of normal conversation is 60 decibels. It has also been noticed that speech interference occurs at 75 decibels and definite annoyance begins at 80 decibels. The motor- activities disturbed at 90 decibels and physiological disturbance occurs beyond 120 decibels Definite pain occurs at 140 decibels

It is awareness, reason and rational action that offer a visible alternative to the continued misuse of the environment. It is only an aware citizenry that can play a vital role in environmental preservation.

Introduction

Urbanisation and Environment

Urbanization, i.e., the growth of urban population, has awfully accelerated during this century and has been faster in developing countries than in the advanced ones. The problems associated with the rapid change in human environment have intensified in the cities. It is here that the physical environment is becoming increasingly polluted, the man-made environment of slums, restricted living space and noise are at their worst and the changes in the social environments have aggravated many problems. Mankind is constantly flowing from rural settlements and every proposal for stopping this flow is completely unrealistic. Scientific and technological developments have given momentum to the growth of industries and hence, the pace of urbanization. Man has been living on the Earth, for about 40,000 years. He is surrounded by various forms of 'Organisms' 'forces' and 'conditions' -both physical and biological, eg. sunlight, land, air water and living beings, which include all types of plants and Animals. The total of these is called **Environment**. For the first time in his entire cultural history man has been confronted with the most horrible, tragic and unprecedented problems of **“Environment Pollution”**. Not very far back, in the past, this very environment was pure, virgin and uncontaminated, and basically quite hospitable for mankind. It is all due to thoughtless over-exploitation of our various natural resources, by our own activities, perhaps due to our unending greed, in the garb of 'development', and the egoistic attitude towards "Nature" .The other three main reasons are (i) 'Population explosion' (ii) Rapid Urbanisation and (iii) The Throw-away concept of disposable items.

Pollution

The word **Pollution** has been derived from the Latin word **‘Pollutionem’** (meaning to defile or make dirty). Pollutant is a substance, the presence of which causes pollution. The pollutants reach us through the air we breath, the water we drink, the food

we eat and the sound we hear. **Morris K.Uddal** rightly said "The more we exploit, the more our options are reduced, until we have only one to fight for survival. We are destroying the environment and the biosphere, where we live" **Odum** (1971) described Pollution as "an undesirable change in the physical, chemical or biological characteristics of our air, land and water that will harmfully affect human life or that of desirable species, living conditions etc.". There are seven main types of Pollutions in the environment (i) Air Pollution (ii) Water pollution (iii) Land pollution (iv) Industrial Pollution (v) Sewage Pollution (vi) Noise Pollution (vii) Radiation Pollution.

This paper deals with the sequence of various acoustical disturbances caused in the wake of noise pollution in the segments of industrial, commercial and traffic activities; how it would be harmful to the society at large, explaining its insidious effects and the measures to be adopted to contain its adverse and ill-effects against deterioration of the environment.

Noise Pollution- A Silent Killer

Noise pollution did not create much public concern due to ignorance about the treacherous effect of noise on both workers in industry in particular and the public in the community in general. It is, therefore, imperative to assess the environment in which the noise is being heard by using suitable bases of judgement and awareness to determine whether or not a definite nuisance exists.

Noise is an important environmental pollutant like noxious gases that befoul our air, water and soil. It destroys bridges and produces cracks in buildings. The noise can cause skin and mental diseases.

It has been revealed that noise is a technology generated problem and that the overall noise doubles every ten years keeping pace with our social and industrial progress. This geometric progression-wise growth of noise could be mind-boggling in view of the ever increasing pace of technological growth. According to **Robert Koch** a Nobel Prize Winner German bacteriologist.

“A day will come man will have to fight merciless noise as the worst enemy of health”

According to him **“ Noise Like Smog is a Slow Agent of Death.”**

Source of Noise Pollution

Noise is a major factor of environmental pollution; on the one hand, industrialization, scientific and technological developments have contributed a great deal to the progress of society, on the other, these are main causes of environmental pollution, including noise pollution. As the day rises, the noise level in the different parts of the city increase in and around work places and homes. The peak noise levels are reached in the twilight hours as traffic reaches a peak. In India, the problem caused by noise pollution is more aggravated in view of the fact that there is hardly any celebration, festival,

marriage or religious function, where there is no use of loud speakers at a very high pitch continuously for a long time. In offices also there is noise pollution due to clicking of typewriters, bells, ringing telephones, clattering office machines and conversations. On the road, noise pollution exists due to growing automobiles, screeching tyres, squealing brakes, screaming sirens, blaring televisions and radios, and blasting horns. Another major factor contributing to the noise pollution in India is that in many of the cities, the industrial and commercial units are either not very far from the residential areas, or they are sometimes set up in the residential areas.

Noise & Its Measurement

In layman's terminology, noise is just unpleasant sound. Broadly speaking, **Intensity** is the energy of sound waves and **Frequency** is the number of times per second the sound waves hit the ear of man. On the basis of the above definition, the loudness which is the more commonly understood source of noise, is in fact a **Combination of Intensity and Frequency which can be measured in DECIBELS**. If we view through an oscilloscope, noise makes an uneven and jagged track on the screen in sharp contrast to the following track by a harmonious sound. Decibel is a unit of sound, name after **Alexander Graham Bell**.

Intensity – The level of sound is usually expressed in terms of the Sound Pressure Level (SPL) in decibels, which is defined as

$$\text{SPL} = 20 \log_{10} P/P_0 \text{ dB}$$

where P is the pressure variation measured in N/m^2 and P_0 is the standard reference pressure taken as $2 \times 10^{-5} \text{ N/m}^2$

Frequency – Frequency of a sound wave is the number of times it repeats itself in each second (i.e. the repidity, with which the pressure fluctuations occur) Human beings generally have the ability to hear sounds in the frequency range 20 to 20,000 Hz (1 Hz = 1 cycle per second) The point at which the limit of the hearing threshold i.e., 0 dB, the sound pressure is equal to the standard reference pressure of $2 \times 10^{-5} \text{ N/m}^2$. Human hearing is most sensitive to frequencies in the range 500 to 6000 Hz and less sensitive both at lower and higher frequencies.

Fundamentals of Sound – Characteristics of Sound Vs Noise

A vibrating source produces vibration into the medium in which it is placed. These vibrations are propagated as waves in the form of pressure variations and are termed as acoustic waves. If they fall within the range capable of exciting the sense of hearing, they are called as **sound waves**. An acoustic wave travels in a given medium at a constant velocity. When the level of the sound becomes objectionable, it is called **noise**. Thus in general, the sound can be referred as a physical or mechanical disturbance capable of being detected by the human ear. The human ear can detect sounds from 20 Hz to 20,000 Hz. The frequencies most important for understanding normal speech lie between 300 Hz. to 5,000 Hz.

Effects of Noise on Human Beings

(a) **Auditory Effect:** The human ear is a very sensitive instrument. If the hearing mechanisms are damaged in any way either by excessive noise levels or by diseases which affect the brain, the auditory nerve or the auditory ossicles, then hearing will be impaired. Intense noise levels, for example, are encountered in many industries and they can cause temporary or progressively permanent loss of hearing.

(b) **Physiological Effect :** Noise is likely to harm the physiological and psychological well-being of people. Physiological changes include:

Effect	Main Observations
- Cardiovascular response	Changes in heart beat rate and blood-pressure.
- Metabolism	Increased metabolic rate, Increased pulse rate.
- Respiration	Increased respiratory rate pulse frequency
- Eye pupil dilation	There is significant increase in pupil size above 55 dB.

(c) **Non – Auditory Effects:** In addition to its auditory effects (temporary and permanent threshold shifts, noise induced deafness etc.), noise can also produce many non-auditory effects. The exposure to noise .

- ◆ May interfere with verbal communication
- ◆ Cause annoyance and distraction
- ◆ Reduce working efficiency and work output
- ◆ Cause fatigue.

Sleep Interference : The WHO- World Health Organization Task Group on Environmental Health Criteria for Noise has recommended a noise level of 35 (A) to preserve the restorative process of sleep.

Speech Interference : Speech reception is the most important and also the most complex use of the auditory system. Noise can either mask the speech to make it inaudible or by making only some frequencies leaving it audible but of reduced intelligibility

A decibel can be defined as an abstract unit. It is to be remembered that the threshold at the **normal hearing is 20-25 decibels** and of **normal conversation is 60 decibels**. It has also been noticed that **speech interference occurs at 75 decibels** and **definite annoyance begins at 80 decibels**. The **motor- activities disturbed at 90 decibels** and **physiological disturbance occurs beyond 120 decibels**. **Definite pain occurs at 140 decibels** and though no human being has reportedly died of noise, experimental results have shown that mice died at 175 decibels of noise. According to environmentalist **Thomas G. Aylesworth**, “Constant noise may cause our blood-vessels to contract, our skin to become a pale, our muscles to contract and adrenaline to be short into our blood-stream”. This is the reason why factory workers develop abnormal heartbeat rates and suffering from insomnia, nervousness and impaired motor coordination.

Noise Control

A Industrial Noise:

Control of noise (i.e. its prevention and reduction) is a system related problem. This system is composed of the following components

- The source of noise
 - The path of sound propagation; and
 - The receiver of noise.
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- The source is part of the system that produces the acoustic energy. The source should be considered as a group of noise generators which present different physical characteristics randomly distributed in space and time.
 - The acoustic energy produced by the source is transmitted to the environment in which it is propagated, and which may be a solid structure or air.
 - The third component of the system (i.e the receiver of sound) may be a worker operating his machines

Noise prevention and reduction measures should be aimed at the following goals:

- a. Controlling source of noise
- b. Precluding the propagation, amplification and reverberation of noise
- c. Isolating the workers.

Evidently, reduction of noise at the source is the most rational method of noise control. If all machines and all prime movers were sufficiently silent, there would not be many problems of excessive noise left for solution.

B. Community Noise:

- The traffic volume should be reduced by diversion of traffic, and use of horn should be banned.
- Residences should not be allowed to grow nearby industrial areas.
- There should be plenty of trees and bushes in open spaces, houses and lanes.
- At the time of festive occasions, as practiced in some western countries, community fireworks could be displayed in lieu of individual celebrations, which will be a good way of enjoying the spirit of the occasion while keeping it safe and pollution free, thus lowering the noise, which mars the celebrations. Also, as a measure of awareness drive, slums, schools, and residential colonies covering all zones should be visited to address both youngsters and elders on the need of adhering to the relevant decibels and smoke emission levels in a bid to make festivals noise and pollution free, besides monitoring noise levels and ambient air quality.

Noise Pollution Standards :

The Noise Pollution (Regulations & Control) Rules 2000 prescribe the ambient air quality standards in respect to noise in industrial, commercial, residential and silence zone areas as below-

Sl. No	Area	Noise Level (Leq in dBA)	
		Day	Night
1.	Industrial	75	70
2.	Commercial	65	55
3.	Residential	55	45
4.	Silence Zone	50	40

Day time - 0600 hrs to 2200 hrs
Night time – 2200 to 0600 hrs

Conclusion

As mentioned earlier, noise is the sound that is unwanted by the listener. The “Damage-Rick Criterion” is the one of the most important criteria for setting noise standards. It specifies the maximum sound pressure level of a noise, usually as a function of the frequency to which persons may be exposed if the risk of significant hearing loss is to be avoided.

It is awareness, reason and rational action that offer a visible alternative to the continued misuse of the environment. It is only an aware citizenry that can play a vital role in environmental preservation. As **Meining** demands -

We need a much larger body of citizens whose eyes have been opened to see their surroundings with far greater appreciation and who thereby are not only enriched by what is good but appalled by that which is bad, and refuse to countenance the continued despoliation of their surroundings. The media have an important role to play in environment education, conservation and sustainable developments.

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