Chapter -I

Introduction

The Environment has a profound effect on our behaviour. It can affect our social life, interpersonal behaviour, mental and physical output, our emotions and also our health. People can affect and alter aspects of their environment but the environment can also affect people. The aim of the environmental psychology is to examine the relationship between physical environment and human behaviour.

In recent years, growing awareness has led to a great deal of effort being put in to study how our environment affects people. Environmental psychology -- a recently developed branch of psychology is coming forth with a great force. It examines the effect that environment has upon the day to day life of people.

One of the Environmental Psychology’s main concern has been the psychological effect of living in noisy and crowded urban environments. Much attention has been paid to the stress effects of noise both in field and laboratory (Glass, Singer and Friedman, 1969; Goodman and Clay, 1976; Bronzaft and McCarthy, 1975) studies.

Noise is one of the major factors which creates environmental pollution. Many pathological effects of noise too have been recognised.

Unfortunately, no such published data are available for
Delhi or any other Indian metropolitan city. The noise research of this country has barely begun. However, Electro Technical Division Council and the Engineering Division of I.S.I and Industrial Toxicology Research Centre (IRTC) at Lucknow are making some efforts to initiate work on this problem. Nevertheless, some doctors do report many cases of central nervous system disorders, neurosis, headaches, high blood pressure and short memory among the residents of crowded and noisy metropolitan cities due to increasing nauseous sounds. Various hospitals and ENT clinics have registered an alarming increase of over 90% in the incidence of deafness.

The above explanation makes it clear that there is no escape from noise in the urban environment. A big city is never still and rarely quiet. Even at 3 a.m. there is usually a traffic rumble in the background. For some people this hum of activity is stimulating, seeming to give life to the city organism. Not everybody sees it that way. But, for many, noise is not a stimulant but an irritant.

However, the annoyance generated by noise is not something that pertains to our times only. That it is a very old complaint is testified by Walker (1970): 'the Old Testament refers to the nuisances in Israel caused by Industrial Noise from the clatter of stone handmills.'

Nowadays, the most common source of noise annoyance in the cities is road traffic, but aircrafts, factories,
construction or demolition sites, children and domestic appliances are very often mentioned.

Sound coming from outside the dwelling unit may be classified as to source e.g. transportation (truck, motorcycle or aircraft); recreation (music, radio, model cars etc.); domestic (quarrels, crying or playing of children); official (police or air raid sirens); natural (wind, thunder); or commercial (foundry, construction). Among sounds produced inside a building an individual can be expected to react differently to sounds from one's own apartment, sounds from a neighbour's apartment, with the sound coming from the latter's apartment, being qualified as the one that is the most disturbing!

Despite the widely felt ill-effects of noise, defining noise is still very difficult. The subjective assessment can be that noise is sound which does not contain information of interest to the recipient. 'Noise is in the ear of the beholder' as it were. Clearly the interest of the listener can change with circumstances. Speech can be either noise or communication, depending on one's part in a conversation, but mechanical noises also can contain useful information. The muted rattle of a worn big end is very important to the motorist. To a large extent the information content of a sound depends on who or what is making it; the sound of a car horn is communication to the man with his hand on the button, but mere noise to the person whom it wakens at 2 a.m. Then, of course, there is the
person who delights in the throaty growl produced by his tuned car or motor cycle; the attention of irritated and surprised looks is satisfaction indeed. Most city sound is a by-product of the process of getting on with life and carries little information to the citizen-at-large.

The trouble is that sound has the characteristic of distributing itself fairly widely, so that it permeates the life of everyone in the city. The machine generated monologue continues whether one likes it or not.

A parliamentary committee on the problem of noise described noise annoyance in very appropriate terms, "essentially as the resentment we feel at an intrusion into the physical privacy which we have for the moment marked out as our own, or into our thoughts and emotions."

Our everyday experience of noise leads us to regard it not just as a potent source of irritation and annoyance but also as an agent which impairs our efficiency. Whether this effect on efficiency is general—extending beyond those tasks where speech is the primary component—is a matter of contention. Our recollection that noise may have on some occasions led to a wavering of attention, to some lapse in concentration, may, of course, be quite misleading. A lapse or failure may have been attributed to noise, but study under controlled experimental conditions may indicate that such lapses are just as frequent in noise as in quiet.

The first possibility about the effect of noise could be
that noise acts as a distractor, acting to draw attention away from the task at hand. A second possibility proposes that because of the special association between hearing and alertness, noise may in some way change the level of activity within the nervous system with consequent changes in the level of efficiency.

Performance by several accounts (e.g. Broadbent, 1971) is thought to deteriorate whenever the level of activation or level of arousal within the nervous system is either too high or too low.

Scott (1960) has explained "At low activation levels, performance is handicapped by a lack of alertness, a decrease in sensory activity, and lack of muscular coordination (all of which are due to insufficient cortical stimulation from the Brain Stem Reticular Formation). At intermediate level of activation, performance is optimal, and at high levels, performance is again handicapped by hypertensiveness, loss of muscular control, 'impulse to action'; and in the extreme, total disorganization of responses."

However, it must be kept in mind that all people do not react to noise in the same manner. McLean and Tarnopolsky (1977) hold that annoyance encompasses three different types of reactions to noise:

1. feelings of being bothered, angered or having one's privacy invaded, which can be called
'subjective annoyance' (e.g. 'that noise upsets me');

2. reports of interferences with everyday activities (such as 'I cannot read in a noise', 'we have to stop talking');

3. symptoms recognised in medical terminology as due to stress or tension or as psychosomatic ('the noise makes my head ache').

People exposed to noise may exhibit one or several of these categories. At lower levels of sound, between 90 and 100 dBA, the physical reactions tend to be restricted to headaches and a general feeling of malaise. There may be other effects as well. High noise levels tend to reduce one's awareness of the surroundings, leading to a concentration on the job in hand to the exclusion of other happenings. In most cases even this concentration is impaired.

It appears that in the human central nervous system, noise produces changes indicating arousal (Anticaglia and Cohen, 1970). Excessive noise seems to spill over from the auditory system into disorders of other special senses. People become more prone to heart disorders and similar maladies when they have to live more often in noisy surroundings.

Moreover sounds of high frequency are more annoying than those of low frequency. Sounds which appear randomly in time
and also vary in level are more annoying than those sounds which are unchanging. Sounds which are high in intensity are more annoying than those at low levels. All noise tends to be more noticeable when it is intermittent. Most of us rapidly become used to a continuous noise like a rumble of a ship's engines and air-conditioners or even the noise of the car one is driving. This is due mainly to the fact that the ear/brain system adapts itself to the ambient noise level and tends to pick out only those noises which are louder than or different from the background level. Perhaps the best example of this is the 'cocktail party effect', it is easily possible to listen to what one particular person is saying even when one is surrounded by a babble of loud conversation. In this case it seems that the innate pattern recognition ability of the brain enables us to identify the noise of our partner while filtering out the unwanted jumble of sounds separating the communication from the noise.

In an effort to assess the possible effects of noise, the investigators exposed the subjects to a loud or soft noise that was either predictable or unpredictable (Glass et al, 1977). Then the subjects were asked to perform tasks in a quiet room. This procedure brought to light the effects of noise on performance. The 'effects' of noise are really after effects; after the subjects had been exposed to noise, especially unpredictable noise, their performance suffered. The investigators suggested that people can adjust in noisy conditions over a short period of time. However, this
adaptation requires the use of a great deal of energy, which makes them less able to cope with later environmental or task demands.

Whereas the children are concerned, noise may present an even bigger problem. Cohen, Glass and Singer (1973) worked on this and examined the reading abilities of children living in a high-rise apartment building built directly over a New York City freeway. It was seen that children living on the lower floors were exposed to a great deal more highway noise than on the upper floors. The children on the upper floors had a higher reading ability than those students who lived on the lower floors.

In another important study, children whose school was in the flight path of Los Angeles International Airport were observed and examined (Cohen et al., 1981). Compared to children in quiet schools these pupils had higher blood pressure, were more likely to fail in a puzzle-solving task, and were more inclined to give up when faced with a difficult task. The longer the child had been in the noisy school, the more distractible he or she was. One of the more disturbing factors was that these problems tended to remain even after the children's school had been insulated and the noise level reduced. This suggests that the effects of noise are long-term.

At this stage, before discussing about the hearing damage done by noise, it would be desirable to know about the physical characteristics of noise (sound).
Sound is measured in decibels. Zero decibel is the threshold of sound, it being the weakest sound we can hear. On the other hand sound level of 140 decibels may produce insanity.

The decibel scale is logarithmic. So, a noise level of 90 db. has ten times the sound energy of 80 db. and a tenth of 100 db. Apparently, the small changes in numbers around the recommended limit of 90 decibels mean big changes in sound levels.

These various attributes of noise such as frequency, intensity and intermittency and various qualitative attributes such as information content, familiarity and abruptness lead to great changes in the effect they have on the individual.

Sudden damage to hearing may result from the noise of a blast or an explosion. Gradual damage may result from continued exposure to noise over a period of years. Other factors being equal, a steady sound (such as that of a textile mill) will be less likely to damage hearing than one that is impulsive (as that of a pneumatic hammer or a drop forge).

Many companies periodically test the hearing of workers in noisy areas and transfer those who show signs of deafness. Those who work around jet aircraft, in boiler shops, in drop forge shops or those who use metal-cutting,
dripping and shaping tools are most likely to suffer gradual loss of hearing.

The precise relationship between expected hearing loss and time of exposure to a given sound-pressure level has been elegantly worked out for industrial populations (Burns and Robinson, 1970; Hickish et al., 1971) and translated into legislation both preventive and aimed towards compensation (HMSO, 1973).

For safety purposes, exposure to continuous noise at 90 dBA for 8 hours per day is the upper limit permitted. However, in the third world countries like India, the working population which is generally very poor, illiterate and also does not have a clear idea of the risk involved in working for long durations in loud noise, is usually exploited. Sometimes even if the workers have an idea of the amount of risk involved, they would still have to work under extremely adverse environmental conditions in order to supplement the family’s income.

Besides the risk to the industrial workers, certain other groups at risk are less well known. Young people regularly attending discotheques and pop concerts show deafness which is dose dependent upon the frequency of attendance. (Fearn, 1972, 1973, 1974). Deafness from this cause is at its maximum between 2000 and 3000 Hz—a range which includes some of the frequencies most important for understanding speech.

In this case, Fearn (1973) estimates the extent of the
risk as follows: "From data received from local authorities we estimate about 3 or 4 million young people being exposed to amplified music in Youth clubs. In addition there is an unknown number of people going to commercial establishments. Even if not everyone goes as often as once a week, clearly 10% means several hundred thousand throughout the country at some fair risk."

If this estimate is even approximately correct, it looks as if we shall have, when these children reach their mid-fifties, a major epidemic of deafness arising from the summation of music-induced deafness with the age-related deafness which is not unusual in our society.

People exposed to noise may exhibit one or several of these categories. McKennell (1963) showed, in a population where almost everybody was exposed to noise, that some 65% felt bothered, some 35% registered that their conversation was interrupted; and only 5% said that noise gave them headaches. (OPCS, 1971).

Anastasi 1964 collected introspective reports from various subjects about the effect of working in noise. She found that the reactions of the people varied almost as much as their personalities with some subjects finding it extremely difficult to work in noise while others did not report any feeling of disturbance at all.

The studies quoted above clearly demonstrate that striking individual differences exist in reaction to noise.
Not only do people differ in their initial responses to a problem, but they also appear to differ greatly in their ability to adjust to aversive surroundings over a longer period of time. Surveys conducted around airports, for example, find many people in the areas of highest noise exposure who seem practically oblivious to noise, while even in the most distant zones polled, there are individuals who find the aircraft sounds extremely annoying (McKennell, 1970).

So, noise sensitivity level of an individual plays a vital role in determining that person's reaction to noise. Sensitivity seems to be a relatively stable characteristic or a personality trait and perhaps it is rooted in the person.

Further, several studies claim to show that the distribution to annoyance is bi-modal and this has usually been taken as evidence for the notion that individuals fall into a 'sensitive' or 'insensitive' group.

Individual differences in noise 'sensitivity' have been investigated in a setting in a college dormitory (Weinstein, 1978). Before arriving on campus, incoming freshmen (all of whom were going to live in a dormitory) were asked about their noise sensitivity. They were divided into noise sensitive and noise insensitive groups based upon their self-reports and subsequently asked how they felt about dormitory living near the beginning and again near the end of the freshman year. The noise-sensitive students were
significantly more dissatisfied than the insensitive ones with the noise level in the dormitory at the beginning of the year and their dissatisfaction was even more pronounced near the end of the year. Interestingly, the noise sensitive students were found to differ from the insensitive ones also in other ways: their measured academic ability was lower and they were less sociable.

Bregman and Pearson (1972) also recognised that the group of people in registering high annoyance includes some who, because of high sensitivity, are registering high annoyance at low or moderate stimulation, and some who are simply registering the average response to intense stimulation. This led them to the following definition of sensitivity: "given two persons rating the same sound, if one person rates the sound higher on any annoyance scale, it is assumed that the person is more sensitive to noise."

Noise also seems to affect our interactions with other people. Appleyard and Lintele (1972) compared the everyday life of people living on a busy, noisy street with that of residents of a quiet block. People who lived on the noisy street rarely interacted with neighbours outside their apartments, and they reported that their street was a lonely place to live. On the other hand, those who lived on the quiet street often sat on their door steps chatting with neighbours, and they reported a good deal of contact with other residents of the area. In another study, it was found that people are less likely to stop and offer help in a
noisy environment than in a quiet area (Mathews & Cannon, 1975).

Although, logically the problem of high noise pollution is one that should afflict the developed countries, since noise level is directly related to the level of industrialization, yet it is in the third world countries that the worst effects of noise are to be observed. Because of the wide-spread illiteracy and lack of awareness in people of its ill-effects, these countries are fast coming in the grip of this great problem.

A recent investigation carried out by Soleiman (1988) reveals that about 5% of Egyptians suffer from hearing loss, which is 3% above the world average. He measured noise levels of 88 dbs. in Cairo's residential neighbourhood and recorded 92 dbs. in downtown Cairo.

In the Indian metropolitan cities, the noise level to be found is one of the highest in the world. It is usually 95 dbs. or even higher against the permitted level of 45 dbs. as given by World Health Organisation. This high level of noise is enough to cause serious physiological and psycho-social problems to the inhabitants of these cities.

One reason for the high level of noise in such big cities is due to the congregation of people of different races and communities who celebrate their festivals and ceremonies at different times of the year. And one or the other community is always celebrating something the year round. Not only
that, but otherwise too, one might come across temples and gurudwaras belting out religious music at top volume, vying with each other to be the one to occupy top place in causing noise pollution. But since ours is a secular state, nobody can say anything to such people who claim that they have a right to practice their religion in any way they want. Yet, the public does not have a right to live in quiet.

The practice of holding night 'Jagratas' has become a common phenomenon. It not only disturbs the sleep, but also affects the studies and other daily activities of neighbours. The indiscriminate use of loud speakers has made life hell for people.

Not only outside, but in residences also, the sound of radios and TVs sometimes becomes irksome to the neighbours. Similarly, videos playing throughout the nights are, too, disturbing factors of today. In Britain there are special laws for it, as after specific hours one cannot disturb the neighbours. In case one indulges in such practices, he is heavily fined.

In election days, it is observed that in slum areas, the loud-speakers operate all the 24 hours. This is one of the serious evils which effects the daily life of the residents.

Since noise has been described as 'unwanted sound' which has very serious consequences, it follows that people may wish to be protected from its undesirable effects.
By the common law of England, freedom from noise is essential to the full enjoyment of a dwelling house and noises that affect that enjoyment may be actionable as nuisances. But it has been laid down that a nuisance by noise, keeping malice to be out of the question, is emphatically a question of degree. The noise must be exceptional and unreasonable. Ringing of bells, building operations, vibration of machinery, fireworks, bands, a circus, merry-go-rounds, disorderly crowds, dancing, singing, etc. have been held under certain circumstances to constitute nuisances since they interfere with quiet and comfort. So, they have been restrained by injunction. The concept of legalised nuisance such as the nuisance arising from noise produced by public transportation, has found some favour in U.S. courts.

In the United states, many cities have passed ordinances containing noise abatement provisions, conformity with which can be determined by readings from sound level meters and a frequency analyzer with frequency bands approximately one octave in width. Individual states have passed laws establishing means for measuring damage to hearing and schedules of compensation that are related to the percentage of hearing damage.

Immediate and strict measures must be taken to bring down the noise level in these cities with the law being given a free hand to control this problem.

Strict laws may be enforced that no one would use loud-
speakers beyond fixed certain hours of the day. Even the intensity of the sound of televisions and radios may be fixed so that neighbours may not be disturbed. The holding of religious functions in residential premises may also be banned. Public participation is an essential requisite for solving this problem. Through mass medias like TV and radios the public may be trained as to live decently in the context of noise pollution.

So, only through education and strict enforcement of laws will it be possible to save the future generations from the epidemic of noise induced illnesses.