



Noise Pollution: The Effect on Human Being and Its Measures For Control

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Abstract

With growing population, our planet has been exposed to various kinds of pollutions viz. air, water, soil, noise etc. Out of all these, Noise pollution remains the most neglected one. Sound remains an important part of human life; however it becomes unwanted when it starts leading to disturbance & trauma. The deluge of noise could lead to a poor psychological & physical health. Children & old people are worst hit by its devastating consequences. In this paper, effort has been made to analyse various sources of noise pollution & their detrimental effects on human with eco-friendly measure to keep noise free society

Keywords: Vehicular noise, airport noise, occupational noise, eco-friendly measure

1. Introduction

Noise is generally defined as unwanted sound, or sound which produces unpleasant effects and discomfort to the ears. Sound is an intrinsic part of our daily lives, but noise is not. Sound becomes unwanted when it either interferes with normal activities such as sleeping, conversation, or disrupts/diminishes one's quality of life (Singh & Davar , 2004). Noise produces severe adverse effects on the quality of man's surrounding and is, therefore, considered to be polluting the environment. The usual reasons of noise pollution in our internal and external surroundings are transportation vehicles, industrial machinery, construction sites, loud speakers etc. Noise is considered as environmental pollution, even though it is thought to have less damage on humans than water, air or land pollution.

The major noise contributing sources are vehicular traffic, airport traffic, occupational traffic and other sources such as wind turbine, social event, and religious event. In this review paper information was collected under four sub head such as vehicular traffic, airport traffic, occupational noise and other sources. The effect of noise produced by above said sources on human being was analysed. Effort was also made to discuss the noise control measure like green roof, Eco-Friendly vibration controlling devices,

2. Sources of noise pollution

2.1 Vehicular traffic

In India noise pollution has been increasing rapidly due to urbanization & uncontrolled movements of vehicles. A study was conducted by Singh & Dewar, 2004 for Delhi

and Kolkata and Vishakhapatnam Cities, reveals that the noise level is 90-95 db as against the ambient limit of 45 db. Even at the “calm” places, it does not fall below 60db. As per one of the studies, 16% of people in Europe are exposed to 40 db or more of traffic noise in their bedrooms at night compared to 30 to 35 dB prescribed limit of World Health Organization standards for undisturbed sleep. Additionally Transport is the major contributor to noise in the town, especially from heavy vehicles like Trucks and Buses. A cross-sectional study was done in Nagaon district Assam indicates that due to the loaded trucks, sand carrying trucks, Public Buses and other heavy vehicles found noise level exceeds creating an environment with high level noise pollution (Nath & Borthakur, 2012). A similar survey of the population in Delhi State pointed that main sources of noise pollution are loudspeakers and automobiles which indicate that the worst environmental problems are traffic, which have been studied at a great deal as an infrastructure problem. A Test carried out in the Konaya city of noise pollution analysis came up with the result that people were found affected by about 38% continual, 23% frequently, 35% sometimes by city noise and 4% of people were not affected in this investigation. The roads width attracted the attention for noise level increment in this investigation. It was observed that wider road had lesser pollution. For example, when the noise level is 73.1 db, on the 20 m wide road including 4 vehicles in the traffic and noise level increased to 74.5 db by decreasing the road width down to 10 m. The vehicle type and kind are another factor affecting the traffic source noise level too. The vehicle horn, types of vehicles appeared to be the most important factors effecting traffic noise levels. While noise level was between 65-75 db in the normal traffic moving street, noise level was suddenly increased over 83 db with only one horn sound (Dursun et al. 2002).

2.2 Impacts of vehicular traffic

Above data shows that the traffic, and its associated problems of noise and air

pollution, has a diverse set of social impacts on health, stress, families and communities. Studies show that, the noise should be identified as the major environmental problem and should take necessary steps to minimize it (Nancy well, 2010). To do the same in the present scenario education appears to be the best method to tackle this problem of noise pollution. Government and Non-Governmental Organization can play a significant role in this process. Although noise mapping assist in developing a society noise free. The most important factor which affects the noise pollution is different political and social application of city plan on noise pollution. The vehicular traffic emerges as leading sources of noise pollution which affect the people educational quality of human being. The main driven force is the growing market value, increasing purchasing power of the customer, culture trends and lack of proper implementation of norms related to the noise pollution. As noise pollution, particularly the vehicular traffic is unavoidable because it is now becoming a part of daily life but this routine would lead to many chronic health impact of both physical and mental kind. However in spite of all these awareness, implementation of laws and personal self-regulation could play a major role to tackle the situation.

2.3 Airport traffic

Projected growth demand for the commercial aviation increased aircraft noise and emission. Aircraft noise metrics are classified as either single even to cumulative metrics. Single-event metrics measure the direct effects of a single aircraft movement and include metrics such as the Maximum weighted Sound Exposure Level (SEL) and the effective perceived noise level (EPNL). The Equivalent Sound Level which indicates the average single-event noise level of all the single events experienced during a given time period. The day-night-level (DNL) derived from the Equivalent Sound Level average noise over a 24-hrs period and applies a 10dB penalty for night time events. The A-weighted

DNL is used widely for noise impact assessments the sound exposure (Anuja et al., 2011). The Noise pollution associated with the Airport is prominent in causing noise pollution resulting in unbearable high levels of noises and vibrations. These might have severe negative effects to both workers and surrounding residents. A long term exposure to noise levels of about 90 db<more may lead to permanent hearing loss and considered painful. Prolonged exposure to noise of 100 db may cause irreparable damage to the auditory organs. The noise levels in the surrounding settlements of airports were higher than the World Health Organization recommended limits and causing annoyance to worker in airport. Mato & Mufuruki conducted a study on Dares Salaam International airport indicates that the highest noise levels of LA max 115 and 99.5 db Leq (Equivalent Continuous Noise Level). 60 db were recorded on the apron, while the lowest noise levels of LA max 60 and 45 db Leq. 60 were recorded in the VIPs 'lounge. The overall results indicate that various groups of workers, security workers who work at the apron are exposed to high noise levels. Noise pollution has entered in the every way of life from the daily routine to fast going life .It is also prominent among the military .A research shows hearing loss and hearing loss disability among US soldiers .Hearing loss is a common chronic condition among middle-aged ,elderly US adults and also in some young age males(Gubata & Packnet, 2013).A model was developed by the scientist by which we can predicted the noise generated by the aircraft .The model incorporated population distribution considerations around an airport and the annoyance caused by aircraft noise. The objective was to minimize noise of aircraft operations in a 24-hour period (Frair, 1984).

2.4 Impacts of Airport traffic

Noise pollution not only impacts the young & adults but also preschool going children. Research showed that the environmental noise exposure particularly aircraft noise shows negative association with

children cognition, reduced concentrations, reading comprehension and health (Clark et al., 2013). Aviation industries are available to us as the fast and reliable transport system which also gives us enormous amount of noise pollution which could be experienced by the people residing nearby the airport and the people working on the airport. The noise generated by the airplanes is generally higher than the safer limits (70 db) prescribed by the WHO which had deter mental effect on the health of the people, in some cases hearing capacity also lowers down. The solutions lies in nature like planting trees which act as a noise absorbent, installation of Green roof, proper scheduling of the flights, proper locations of the airports and military headquarters sites.

2.5 Occupational noise

Industrial noise is related to environmental health and safety. Long-term and repeated exposure to noise has a gloomy impact on the sense of hearing. It affects auditory organs, central and autonomic nervous system. In addition a study conducted by Samuel and Goldhaber in USA indicates that more than 30 million workers in the manufacturing and electrical utility industries experienced high noise levels on a regular or intermittent basis. A Swedish study focused on blood pressure analyses shows that, both systolic and diastolic blood pressure levels were significantly higher in 44 male industrial workers with noise.

The effects due to low-frequency noise in a low demanding work situation which focused on noise sources with a dominating content of low frequencies (20–200Hz) are found in many occupational environments. The effects of moderate levels of low-frequency noise leads to low attention, tiredness and motivation in a low demanding work situation. The study indicates that low-frequency noise negatively impact on performance mainly on two tasks such as sensitive to reduced attention and a proof-reading (Bengtssona & Wayne, 2004). It is



explored that the theoretical framework of the physical workplace environment effects on the job performance. There may be five factors (sound, temperature, air, light and color, and space of the workplace environment), which may affect job performances (keshavarza & Mohammadib, 2011). Modern thinking in occupational safety and health identifies noise as hazardous to worker safety and health. Although Hearing is one of our key senses and plays an important part in allowing us to understand our environment (Juraj et al, 2012). Noise pollution also finds its way in hospitals. Anesthesiologists also experiences higher level of noise in operating room which degrade the quality of communications. Noise can be avoided by isolating the sources of noise, placing noise barriers, increasing absorption of walls and ceilings, or decreasing the exposure time.

2.6 Impacts of Occupational noise

Study conducted by Rahman & Badayai, 2012 reveals that the exposure to high levels of sound may lead to cardiovascular disease, endocrine and digestive reactions especially in complex jobs. Professionals involved (Oliveira et al., 2012). Noise in the industries also plays major role in causing health effect to the worker working in the industries on different process. The industrial noise come under occupational health hazards, continuous long term exposure of noise leads to the increase systolic blood pressure, stress and hearing impairment. Detailed study of the effects of noise unveils that in vertebrates, sound detection depends on the mechanic sensory receptors in the inner ear called hair cells. Sound waves stimulate the hair bundle to increase and decrease the probability of listening to the sound frequency. Loud sounds can be harmful to the delicate stereo cilia and may even produce hair cell death. Hearing loss as a resulting of hair cell damage is irreversible in humans (Brian, 2004). An assessment carried out on the mean auditory hazard incurred by occupational exposure to impulse noise with an objective to assess the collective hearing hazard. But the

usage of personal protective equipment like ear plug in the area of high exposure to noise or running awareness program may help to overcome for this type of problems. The exponential model thus integrated the fact that daily exposure to impulse noise may be more harmful for hearing than 8 hour exposure (Forget, 2011).

2.7 Other sources

Other sources of noise pollution may include wind turbine, social event, religious event etc. Wind turbine noise makes it far more annoying and stressful than other sources of noise. Several other factors are responsible for causing noise from the wind turbine, which includes the amplitude modulation, the turbulence of the air, the dominance of low frequencies and the association between the acoustic and visual impacts. Experts established a more extensive list of commonly mentioned symptoms, namely sleep disturbance, headache, tinnitus, ear pressure, dizziness, vertigo, nausea, visual blurring, tachycardia, irritability, problems with concentration and memory, and panic episodes associated with sensations of internal pulsation or quivering when awake or asleep (Kinanya , 2012). Noise passes its ways in the rainy seasons with generation of noise on un-insulated metal deck roofs can cause serious acoustic problems in buildings. Study made by Chraif, 2012 reveals that even sound created by rain fall on un-insulated metal deck roofs effect the people's activities. The study also indicate that during heavy rains, 43% people lose focus to what they do, 30 % found that the rain noise is very annoying and only 2 percent thought that rains may cause stress. It shows that, increased noise exposure leads to communication failure, loses concentration. Additionally the influence of radio noise (75 db or more) leads to sleep deprivation, short term memory and attention to details tasks. A study of Himalayan tourist Destinations revealed that high tourist influx and concomitant increase in the numbers of automobiles resulted in higher noise pollution. A similar study carried out at Sabarimala,

Perambur and Madurantakam in which a constant noise level is between 65 db and 70db was recorded. Uninterrupted circulation of vehicles and loudspeakers were the major causes for high levels noise (Marale, 2011). A survey conducted during the Diwali festival in India indicates that noise levels were exceeding the permissible limits. Noise generated by some of the crackers such as Satali Bomb 120-125 db, Middle Size Crackers 85-90 db, Rocket at the time of Launching 90-95 db, Chakra 80-85db, Sparkles 70-75db. The noise levels were observed to be high especially during the night and evening causing chronic respiratory problem to the elderly people & pet (Biarkar and Gaikwad, 2011). Noise of dhol, dhapli, bigul and shankh has been in the roots of our Indian Culture. A new problem of noise pollution emerged in recent years in India is an outcome of the indiscriminate use of loudspeakers. Which carries its adverse effects on human health, animals and birds by way of causing various health hazards (Kumar et. al, 2004)

Due above innumerable sources of noise pollution its disastrous impact was seen on the human psychology. Studies indicate that physical environment like usable space, noise, air conditions, color and lighting having deep impact on psychology (Ata, 2012). Raising awareness of auditory health among primary school was also a key to solve the problem of noise (Tejada & Hodar, 2004).

Noise pollution is also increased by the event like marriage, festivals and many other sources like radio noise, the un-insulated metal deck noise during raining is be measured and evaluated. It had been found that noise level has increased above 70 db which may lead to noise related problem such as like psychological problems & pro environmental problems. In fact, preventive activity could also helpful in reducing the noise level to a persistent level.

3. Eco friendly controlling measure

3.1. Green roof

Green roof is the technology which involve the maintenance of vegetation cover mostly sedum (A type of stone crops) on the roof. It Act as a means of ecological barrier between the outdoor environment and indoor environment. Green roofs also reduce the noise pollution up to certain extent. In general conventional roofs have hard surfaces, which do not allow, absorbing sound. Vegetation in combination with the growing substrate helps to absorb sound waves to a greater degree than a hard surface. Green roof can provide mitigations of unacceptable noise levels that affect the human health (Connelly et al., 2008). It consist of several layers (Figure 1), such as roof construction and waterproofing layer (roofing felt), root penetration protection, drainage layer, filtration layer, growing substrate, and sedum and moss plants. The growing substrate and drainage layers contain air that can be assumed to reduce noise, but the air also decreases the density of the layers which lowers its noise reducing capacity. Studied made by Rowe, 2011 indicate that Green roof reduces the noise level up to 10 db. Studies carried by Jens lagstrom shows that the noise reduction is possible between 5 and 20 dB (figure 4.2 b). To conclude this result he has used speaker for generating different frequencies of noise. It was also observed that at a frequency of 750 Hz the noise reduction was highest (20 dB), however at higher frequency (1400 Hz) noise reduction was very poor (5 dB) (IGRI, 2004). It has been well recognized that green roof systems have numerous positive effects on ecological and environmental aspects (Yang et al. 2010) now days for sustainable urban environment green roof systems are widely used.

4. Eco Friendly controlling device

4.1 Vibration control based Eco Friendly noise reduction device

Shrivastava, 2011 has developed Eco-friendly vibration control device, thereby controlling the noise. Device consist of

wooden (tamarind wood) along with the grip align by the rubber middle layer is composite materials from natural fiber which has light weight, high strength to weight ratio and corrosion resistance. It was reported that developed device could control vibrations up to 40% and effectively optimizes noise. Author also claimed that developed device have very less construction cost, operation & maintenance and repair.

Apart from controlling measures suggested by researches, legal norms are also meant to control noise pollution such as Environment Protection Rules, 1986 and Rules of the Factories Act, 1948 (Anurag, 2013).

5. Conclusion

The study unveils noise pollution is becoming one of the major factor effecting the human being. A fundamental reason for noise generation is vehicular traffic, aviation, occupational noise, firecrackers, orchestrated

music systems, professional celebrations and many other sources. Although legal norms are there to check the noise pollutions, still due to carelessness of peoples huge noise is generated and introduced to the atmosphere. Noise pollution leads to increase cardiovascular diseases, cognitive performance in children, mental illness, hearing impairment, stress, depression; permanent hearing losses with continuous long term exposure of noise. It could be controlled by eco-friendly measures like green roof, Vibration control based Eco Friendly noise reduction device .In spite of all above detrimental effects, the amount of non-systematic studies and popular literature on this topic is overwhelming. On the contrary, well-developed systematic studies are not present in large numbers and all have their own limitations. In order to address public concerns and assess the effects of noise on human, systematic studies needs to be done.

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