



NOISE POLLUTION : A HEALTH HAZARD

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ABSTRACT

Unwanted and excessive sound is referred to as noise pollution which has a damaging effect on human health, animal and wildlife as well as environmental quality. Environmental noise consists of all the unwanted sounds in our communities except those originating in the workplace. Because of urbanization, industrialization and population growth, noise pollution has become severe and widespread. Highway, rail and air traffic are big contributors to noise pollution. Vehicular and loud music are the two most faced noise pollutions in today's life. Noise pollution is a big threat to health and well-being. The potential health effects of noise pollution are numerous, pervasive, persistent as well as medically and socially significant. Noise is really a public health problem which may lead to hearing impairment, deafness, sleep disorders, cardiovascular diseases, reduced productivity, negative social behavior, social handicaps, annoyance, irritation and aggression, absenteeism, accidents and the like. The ability to enjoy leisure time may decrease and antisocial behaviour may increase due to noise pollution. Unwanted and consistent noise adversely effects the general health and well-being of

individuals. It may produce effects similar to those of chronic stress. Noise pollution adversely affects future generations by degrading residential, social and learning environments with corresponding economic losses. Noise has an interfering effect on the cognitive processing system of humans, as well as, a detrimental effect on their physical and mental health. Thus, noise pollution, today, is increasingly becoming an omnipresent, yet an unnoticed form of pollution in developed as well as developing countries. Noise pollution continue to grow in extent, frequency and severity. Due to exposure to noise, people are suffering from different kinds of physical and mental health problems. The adverse effect of noise pollution, need to be controlled in order to protect human beings from adverse health impacts so that they could select and live peacefully in their natural environment.

Key word : noise, pollution, annoyance, wildlife, cardiovascular, impairment, deafness.

Sound is a form of energy. This sound can sometime be soothing to listen, and at times, loud to hear. Sound is produced by the vibration of objects and it needs medium to travel, as air, water etc. Regular exposure to a higher sound level that affects humans and other living organisms, denotes sound pollution or noise pollution. Thus, noise is an unpleasant and undesirable sound that leads to discomfort. Noise pollution is the propagation of sound with ranging impacts on the activities of humans and animals both, most of which are harmful to a certain degree. Whether there impacts are acute in the form of impulse noise or chronic in the form of prolonged exposure, the challenge of noise confronts many, who must accomplish vital performance duties in its presence. Although noise has diffuse effects, which are shared in common with many other chronic forms of stress, it also exerts its own specific influence on various form of cognitive and motor responses. Thus, noise is a pervasive and influential source of stress. Nowadays, noise exposure has increased both in duration and intensity due to the universal presence of handheld devices that provide auditory stimulation in the form of speech and music. Noise takes the form of environmental stressor when unwanted sounds enter the environment. The sources of noise pollution are the construction sites, motorized, vehicles, musical concerts, wedding events, heavy machinery usage, crowding, aircrafts, unnecessary usage of horns on road traffic, using loudspeakers, unnecessary fireworks and transportation noise. Noise pollution has a detrimental

effect on health and wellness of all living-beings.

Noise, A physical stimulus

Noise is an environmental stressor, produced by the vibration of sound within any physical medium. Oscillations of the particles in the medium, cause a change in the pressure of that transmitting medium that constitute the ambient sound waves. Like other forms of energy, they vary in amplitude and frequency (Jones, 1983) Sound waves also vary in duration and precise wave form. The temporal characteristics of the wave itself may be continuous or intermittent. Continuous noise is constant, with no breaks or changes in intensity (Speaks, 1999). Intermittent noise, changes in intensity over a given period of time, having gaps of relatively quiet intervals between repeated louder phase of the signal. Speech is a practically distractive noise to which human are especially attuned. Most common method to assess the sound magnitude in decibel scale (dB). This scale is based on the intensity of the stimulus. It has been observed that an increase of 3dB approximates a doubling of the sound pressure level. Since the human ear does not have equal sensitivity to stimuli over the entire frequency and the sound pressure ranges (Fletcher & Munson 1933), the dB scale does not entirely equate to what an observer perceives. The apparent subjective loudness of a stimulus is therefore, a function of not just the intensity but also of the duration, variation of intensity and frequency of the sound waves (Engel, et. al., 2006).

Noise and Performance

Effects of noise on non-auditory aspects of performance, an information processing attention, memory is a widely studied area but has been the source of much debate also. Noise may affect performance by impairing information processing or, alternatively by inducing shifts in strategic response. Specifically, noise increases levels of general alertness or activation and attention selectivity. It does not influence performance speed but it reduces performance accuracy and short term or working memory performance. Jones (1993) argued that it is in the context of working memory tasks that the strongest noise effects are likely to occur. Noise has been found to increase the mental workload imposed by a given task environment, thereby reducing the

cognitive resources available for allocation to task performance (Becker, et. al., 1995). This shows that noise cause annoyance (De Coensel et.al., 2009; Smith, 2003) and stressors distract attention to task-irrelevant thoughts. One such thought may be worry. Hence one has to invest more effort into task performance in the presence of noise.

Impacts on Humans-beings

Historically, Florence Nightingale recognized noise as a health hazard in 1859, when she wrote ‘Unnecessary noise is the most cruel abuse of care which can be inflicted on either the sick or the well.’ (Nightingale, 1859). Noise pollution is an annoyance to human-beings and it disrupts activity or balance of human’s way of life. Epidemiological evidence suggests that noise pollution can cause both, annoyance, and increase the risk of stroke and heart disease. Whilst the increased risk to an individual may be low, the exposure of millions of people results in a significant health burden. WHO estimates that noise pollution from traffic results in 1 million healthy life years lost in Western Europe every year. Research from the UK Health Security Agency suggests that in 2018, 1,30,000 healthy life years were lost in UK and that 40% of the British Population are exposed to harmful noise levels from road traffic. WHO observed that the thresholds for negative health impacts of noise were lower than had previously been thought (2019). Studies reveal that high levels of noise contribute significantly to cardiovascular effects in humans and an increased evidence of coronary artery disease (Munzel,et.al, 2018; Hoffman, et.al.2006). Moreover, high stress levels, tinnitus, hearing loss, sleep disturbances and some other harmful and disturbing effects are seen due to noise pollution. A review of existing literature shows noise pollution to be associated with faster cognitive decline (Paul, et. al., 2019). According to an estimate, across Europe, 113 million people are affected by road traffic noise level above 55 decibels, the threshold at which noise becomes harmful to human health as indicated by WHO. It has been observed that when sound interferes with normal activities, as, sleep or conversation or disrupts or diminishes one’s quality of life, it is taken as unwanted noise which indicates noise pollution. A comparative study of Maaban tribesmen, who were insignificantly exposed to transportation or industrial noise and a typical US population, showed that a chronic exposure to moderately high levels of environmental noise, contributes to hearing

loss (Rosen & Olin, 1965). Noise exposure in the workplace can also lead to noise-induced hearing loss and other health issues. Occupational hearing loss is one of the most common work-related illnesses in the US and World wide. Noise is more than a mere nuisance. At certain levels and duration of exposure, it can cause physical damage to the eardrum and the sensitive hair cells of the inner ear and result in temporary or permanent hearing loss, which is known as noise-induced hearing loss. Moreover, excessive noise exposure can raise blood pressure and pulse rates, cause irritability, anxiety and mental fatigue, interfere with sleep, recreation and personal communication. Children, who face high levels of noise pollution, may suffer from stress and other problems, such as, impaired memory and attention span.

It is less clear how humans adapt to noise subjectively. It has been observed that tolerance for noise is frequently independent of decibel levels. Humans relate to noise on a subjective level and such subjectivity is conditioned by culture (Schafer, 1977) Schafer noted that sound is an expression of power, and as such, material culture tend to have louder sound equipments, not only for safety reasons, but for expression of power by dominating a soundscape for a particular sound. (Schafer, 1977) Based on this observation, Fong made a comparative analysis of different soundscapes from Bangkok, Thailand and Los Angles, and, found that soundscapes differ, based on the urban development in the area. Fong observed that cities in periphery have different soundscapes than inner city areas. Fond's finding tie not only soundscape appreciation to subjective view of sound, but also demonstrates, how different sounds of the soundscapes are indicative of class difference in urban environments (Fong, 2014) Researches indicate that elders and children with Autism Spertrum Disorder can express hyperacusis due to noise pollution. Hyperacusis is an abnormal sensitivity to sound. People who experience hyperacusis may have unpleasant emotions, as, fear and anxiety as well as uncomfortable physical sensations in noisy environments. As a result they may avoid noisy environments which lead them to isolation and their quality of life becomes poor. Explosive noises, as, high-performance car exhausts and car alarms, put an adverse effect on the physical and mental health of such people. WHO indicates that children are vulnerable to noise, with noise pollution having a permanent effect on their health. Noise poses a serious threat to a child's physical and mental health and may also negatively interfere with a child's learning and behaviour. Exposure to persistent noise pollution

raises the need to maintain environment health so that people could lead a healthy life.

The source of outdoor noise worldwide is mainly caused by machines, transport and propagation systems. (Hogan & Latshaw, 1973; Marx, 1964). Noise pollution associated with household electricity generators is an emerging environmental degradation in many developing nations (Menkiti & Agunwamba, 2015). Noise has acoustic properties including pitch and volume. Volume is usually measured in decibels (dB), on a logarithmic scale. When a sound is perceived to double in loudness, it corresponds to an increase of roughly 10dB, a tenfold increase in power. The decibel scale for common sounds are presented in Table I.

Table-I : The Decibel Scale

Decibel measure (dB)	Common Sound
30	Leaves rustling/ whisper
40-50	Average room noise
60	Background music
70	Average office noise
80	Inside an aeroplane or underground carriage
90	Hairdryer
110	Nightclub or rock concert
135	Jet engines

Source: Common sounds and their relative volume in decibels Hearing Health Foundation, “Decible Levels” (2023)

Since sounds can be continuous or intermittent therefore the timing and duration of a sound are also relevant to its potential effects on human health.

With continued exposure to noise pollution, a person’s sensitivity to stress increases. Feeling

irritable, on edge, frustrated or angry is observed, and, if noise is uncontrollable, its impact on mental health intensifies. Noise reduce the depth and quality of sleep, altering rapid eye movement sleep which has an adverse effect on person's mood and ability to concentrate. Physically, a person may develop abnormal perception of loudness. Preeclampsia, in pregnant women can develop due to unwanted noise which can cause high blood pressure, Children if exposed to noise for 8 hrs a day, may develop inability to hear certain sound frequencies. Noise pollution can affect a child's hearing at any stage of development from foetal to adolescence. Unwanted noise at school or home may make it challenging for children to learn, concentrate, communicate, speech development and cognitive performance. This may adversely affect a child's behaviour, ability to form relationships and their confidence. Chronic exposure may lead them to develop high blood pressure also.

Impact on Animals and Wildlife

Noise generated by traffic, ships, vehicles and aircraft can affect the survivability of wildlife species and can reach undisturbed habitats. Although sounds are commonly present in the environment, anthropogenic noises are distinguishable due to differences in frequency and amplitude. Many animals use sounds to communicate with others of their species, whether that is for reproduction purposes, navigation, or to notify others of prey or predators. However, anthropogenic noises inhibit species from detecting these sounds, affecting overall communication within the population. Species such as birds, amphibians, reptiles, fishes, mammal and invertebrates are examples of biological groups that are impacted by noise pollution. If animals can not communicate with one another, this would result in decline of reproduction and higher mortality rate. Thus, noise pollution can interfere with an animals ability to attract a mate, communicate, navigate, find food or avoid predators and likewise can be an existential threat to vulnerable organisms. Noise pollution is especially a serious problem for marine animals, particularly those that rely on echolocation, such as, certain whales and dolphins, and much of the world's oceans are polluted with chaotic sounds from ships, seismic tests, and oil drills. Some of the loudest and most detrimental sounds in the sea are from naval sonar devices, whose noise can travel hundreds of miles through the water and is associated with

mass strandings of whales and dolphins.

Impact on Communication and Ecosystem

Anthropogenic noise affects the acoustic communication in grasshoppers while producing sound to attract a mate. Research has found that the species of grasshopper changes its mating call in response to loud traffic noise. Sometimes, the higher frequencies are produced by grasshoppers to prevent background noise from drowning out their signals. This shows that anthropogenic noise disturbs the acoustic signals produced by insects for communication. Similar processes of behaviour perturbation, behavioral plasticity and population level shifts, in response to noise, likely occurs in sound-producing marine invertebrates, but more research is needed in this direction.

Anthropogenic noise can have negative effects on invertebrates, that aid in controlling environmental process that are crucial to the ecosystem. There are a variety of natural underwater sounds produced by waves in coastal and shelf habitats, biotic communication signals, that do not negatively impact the ecosystem. The changes in behaviour of invertebrates vary, depending on the anthropogenic noise and is similar to natural noisescapes. (Solan, et.al., 2016). Invertebrates play an important role in transporting substance for benthic nutrient cycling. As a result, ecosystems are negatively impacted when species cannot perform natural behaviors in their environment. Anthropogenic noise produced by human activity, negatively affect oysters. Studies several that oysten do not open their valves frequently in response to environmental noise, which is unhealthy. Anthropogenic noises have a similar effect on bird population as seen in marine ecosystems, where noises are seen to reduce reproductive success, undetected predators, minimization of nest areas, increase in stress response and declining of abundance and richness of species. Some highly-sensitive birds to noise, migrate to less disturbed habitats. Noise pollution can alter the distribution and abundance of prey species, which can then impact predator populations.

Noise Regulation and Mitigation

Noise-control ordinances and laws enacted at the local, regional and national levels can be



effective in mitigating the adverse effects of noise pollution. Generally, a small white noise source such as static or rushing air, placed in the room, can mask the sounds of conversation from adjacent rooms. Using hearing protectors which are held over the ears in the same manner as an earmuff, are useful in noise mitigation. Outdoor noise limits are also important for human comfort. Standard house construction may provide some shielding from external sounds, if the house meets minimum standards of construction and if the outside noise level falls within acceptable limits. Noise from roadway and other urban factors can be mitigated by urban planning and better road designing. Roadway noise can be reduced by the use of noise barriers, limitation of speed of vehicles, alteration of road surface texture, limitation of heavy vehicles, use of traffic controls that smooth vehicles flow to reduce braking and acceleration and tyre designing. An important factor in applying these strategies is a computer model for roadway noise that is capable of addressing local topography, meteorology, traffic operations and hypothetical mitigation. Costs of building-in mitigation can be modest, provided these solutions are sought in the planning stage of a roadway project. Aircraft noise can be reduced by using quieter jet engines. Altering flight paths and time of day runway can benefit residents near airports. Some noise pollution preventive measures may be like- banned honking in public areas, installing of adequate soundproof systems in commercial and industrial buildings, controlling music sound to desirable limits making a dense tree cover, explosive should be banned in forests, mountains and mining areas.

Until the 1970s, governments, all over the world tended to view noise as a 'nuisance' rather than an environmental stressor. Many conflicts over noise pollution are handled by negotiation between the emitter and the receiver. Escalation procedures vary by country, and may include action in conjunction with local authorities, in particular the police. Noise pollution is a major problem in India. The government of India has rules and regulation against fire crackers and land speakers, but enforcement is extremely lax. Awaaz foundation, a non-governmental organization in India is working to control noise pollution from various source through advocacy, public interest litigation, awareness and educational campaigns, since 2003. Despite increased enforcement and stringency of laws, now, being practiced in urban areas, rural areas are still affected by noise pollution. The Supreme Court of India has banned playing of music on



loud speakers after 10:00 p.m. In 2015, the National Green Tribunal directed authorities in Delhi to ensure strict adherence to guidelines on noise pollution, saying noise is more than just a nuisance as it can produce serious health hazards. However, implementation of the law remains poor. It is the need of time to think and act seriously in this direction by all citizens and abide by rules.

Conclusions

Noise pollution seriously impacts public health. Research suggests that it can raise stress levels, blood pressure levels and chance of stroke. Hearing impairment and absent mindedness is a result of noise pollution. Children are much vulnerable to the adverse effects of noise. Noise is ever present, everywhere. Noise pollution is a silent killer which is directly or indirectly a health hazard. Noise causes sickness and other ailments which lead to loss of income due to reduced work capacity. Noise actually has ascended as one of the fundamental toxic substances of condition. Congested traffic area, unplanned road network, reduced one way traffic, construction of silence zone in the main area of the society, unplanned urban sprawl etc are issues to be addressed under noise pollution. During the peak traffic hours, schools, hospitals situated in the heart of the city are affected severely by noise pollution. Noise, should continued to be investigated because of its presence in numerous occupational and residential environments. Speech based noise interference by means of cell-phones and i-pods, is a serious matter of concern. They generate a strong potential for deleterious effects of noise on performance, health and general well-being. When evaluating the effects of noise on performance, researcher, should not only consider the intensity and duration of noise but also the content and schedule of the exposure and the type of task being performed. Reducing noise in our surroundings is the need of time for which all of us must join hands to make life peaceful on this earth.

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