

Assessment of Noise Quality at Different Metro Construction Site in Lucknow

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Abstract— Noise is usually associated with construction work due to rapid urbanization. Noise may adversely affect your health, including effects such as stress, sleep disturbance, high blood pressure and even hearing loss. Noise pollution means any sound that is undesired by the recipient. The effect of sound on human depends upon its frequency. Human ear are known to be sensitive to an extremely wide range of intensity varied from 0 to 180dB. The noise is generated by the human through various ways. In present research article various sources of noise pollution, measurement of noise dB scale equipments used in the measurement of noise levels impact of noise adverse health effects of noise pollution.

Key words: Noise, Metro Construction, Lucknow

I. INTRODUCTION

Lucknow the capital of Uttar Pradesh is situated between $26^{\circ} 52^{\prime}$ N latitude and $80^{\circ} 56^{\prime}$ longitude, 120 m above sea level. The population of city is 2817105 as per 2011 census and has an area of 310sq. km. Noise is often defined as unwanted sound which is the result of pressure changes in a medium [usually air] caused by vibration or turbulence. The amplitude of these pressure changes is stated in terms of sound level and the rapidity with which these changes occur sound levels are measured in decibels (db) unit sound frequency is stated in terms of cycles per second or now a day; hertz(Hz). Audible sound can be at frequencies between about 16 and 20000Hz the air is most sensitive in the range of frequencies between about 500 and 4000 Hz less sensitive at higher frequencies and much less sensitivity coincides with the range for voice communication (Roberts, 1978.Santra,1998)

Noise has a significant impact on the quality of life (WHO; 1980). Effects are seldom catastrophic and often only transitory, but adverse exposure. it often causes discomfort and sometimes pain, noise dose not causes ears to bleed and noise induced hearing loss usually takes years to develop. Noise induced hearing loss can indeed impair the life, through a reduction in the ability to hear important sound and to communicate with family and friends. While the loss is temporary at first, they become permanent after continued exposure and there is no medical treatment to counteract the effect. When combined with presbycusis; hearing loss naturally occurring with the aging process. The result is a premature impairment that grows inexorably with age. Effects are determined mainly by the duration and intensity but they are also influenced by the frequency. Long lasting high level sound are the most damaging to hearing and generally the most annoying. High frequency sound tends to be more hazardous to hearing and more annoying then low frequency sound. The noise problems of the past pale in significance when compared with those experienced by modern city dwellers; noise pollution continues to grow in extent frequency and severity as a result of population growth

urbanization and technological development [5] Due to exposure of noise people are suffering from difference kinds of diseases like hearing impairment, interference with spoken communication sleep disturbances cardiovascular disturbances, Annoyance etc.

II. SOURCES OF NOISE

Chief sources are rapid urbanization and also are the motors and exhaust system of automobiles. In addition, noise from the roadway is generated by commercial activity, construction, religious activities, ceremonials, festivals etc. Noise levels and its effects depend such as infrastructure, number of vehicles, road quality, weather and climate. Further sources are factories like, Hindustan Aeronautical Limited, Eveready, TELCO, construction metro railway stations, diesel shades, motor garages and workshops etc.

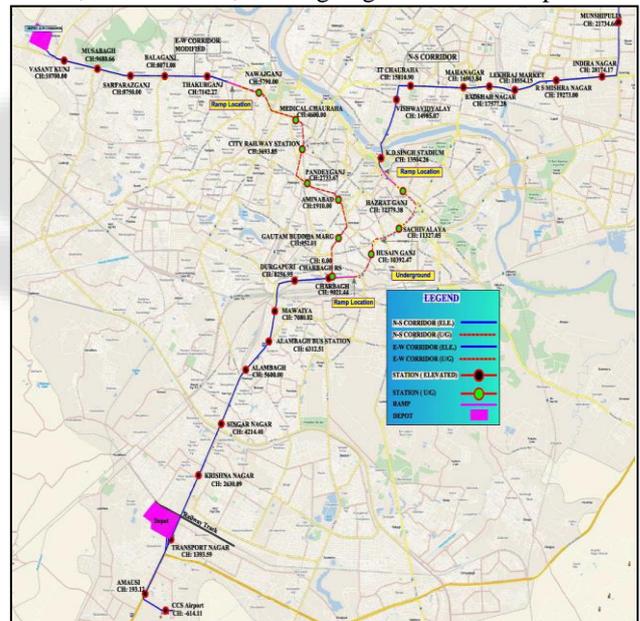


Fig. 1:

III. LITERATURE REVIEW

A. Rajiv B.Hanashal Yogesh B. Patial(2012)

Noise pollution in the recent times has been well recognized as one of the major trepidations that impact the quality of life in urban areas across the globe. Kolhapur an ancient city of India is rapidly emerging as industrialized and urbanized city and has started facing severe noise pollution problems. Day-time urban noise quality assessment was studied in Kolhapur for five critical zones viz. Educational Commercial-cum-residential Industrial-cum-residential Recreational and silence zone. Noise pollution indices viz. L10, L50, L90, noise climate (Nc) equivalent continuous noise level (Leq), noise pollution level (Lnp) and noise exposure index (NEI)

were compound for all zone. Results indicated that the highest Leq of 72.25 d B A was observed in industrial- cum – residential zone followed by 64.47 dB A in commercial- cum- residential zone, 63.71 dB A in educational zone 53.26 dB A in recreational zone and 42.48 dB A in silence zone. For educational zone, Leq observed were above the statutory limits, while for other zones it was marginally below. The noise assessment study clearly revealed the alarming condition of noise pollution in Kolhapur.

B. Surabhi Srivastava (2014)

Any unintended presence of matter energy in the environment is known as pollution. Noise pollution is one of the pollutions which have its critical effect on the health of existing population. From researches it has been proved that noise may damage human hearing efficiency and neuron cells of brain. Realizing that noise pollution is one of the problems of north- east India I focused to develop some ecofriendly control devices for the mitigation from noise pollution. Due to rapid industrializations and increasing population of the cities. It has an exponential growth in number of vehicles and generator sets. Which is the basic cause of noise? The population is facing the problem of noise pollution during the travelling hours from 8:00 to 9:00 pm as studied in survey of the city in this paper there are some solutions for the noise pollution through eco-friendly control devices which are designed for the vibration control, which is one of the major causes of generating noise pollution.

C. Hiral J. Jariwala, Huma S. Syed, Minarva J. Pandya, Yogesh M. Gajera

It will also continue to grow because of sustained growth in highway, Rail and air traffic which remains major sources of environmental noise .in factory workplace workers are exposed to high noise due to machinery in routine. The potential health effects of noise pollution are numerous; pervasive persistent medically and socially significant. Noise produces direct and cumulative adverse effects that impair health and that degrade residential social and working environment with corresponding real (economic) and intangible (well-being) losses. Noise represents an important public health problem that can lead to hearing loss. Sleep disruption. Cardiovascular disease social handicap reduced productivity negative social behavior annoyance reactions. Absenteeism and accident .it can impair the ability to enjoy one’s property and leisure time and increases the frequency of antisocial behavior. Noise adversely affectaniyus general health and well-being in the same way as dose chronic stress. It adversely affects future generations by degrading governmental controls should be to protect citizens from adverse effects of airborne pollution including those produced by noise. People have the right to choose the nature of their acoustical environment it should not be imposed by other.

D. Ganiyu, s.a. & Adedeji, Y.M.D.(dep. Of architecture federal university of technology, akure)

According to Wikipedia (2010): Noise can cause hearing impairment, hypertension. Ischemic heart disease, annoyance, premature ejaculation, bowel movements, sleep disturbance, death and decreased sexual performance

E. Mahipal & Basudeo Prasad²

Scientist, CSIO, EMID, Sector 30, Chandigarh, India Journal of Industrial Pollution Control (2015): Due to heavy urbanization, industrialization, population explosion and thereby deforestation, ambient noise has increased to intolerable level in most of the places. Therefore it has been immensely felt to monitor the noise intensity, its various parameters and quality to reduce it within permissible levels and further to meet the international standard.

F. Alice Elizabeth Gonzalez, journal of Environmental Protection, (2014), 5, 340-350 (http://www.scrip.org/jep)

Hearing Impairment -Effects on hearing faculties are known long ago and have been deeply studied. The first reference about a causal relationship between exposure to noise and hearing impairment dates, back from the early. The major effects of noise exposure on hearing are three acoustic trauma immediate and permanent effects due to acute exposure, permanent shift of hearing threshold level. Both the shift of hearing threshold level-and also tinnitus, if are to occur-may appear as reversible effects, but they also could evolve to permanent damages.

G. A wosusi A.O & Akindutire I. O, journal of Biology, Agriculture and Healthcare, ISSN 2224-3208(paper) ISSN 2225-093X (Online) Vol.4, No.26, (2014)

High level noise will be result into hearing loss. Evidence abound that constant noise exposure can damage sensitive structures in the ear. Noise-induced hearing loss, the second to age induced hearing loss results from damage of hair cells of the cochlea in the inner ear arising from continuous exposure to recreational and occupational noise. Blasts and other intense or explosive sounds can rupture the eardrum or cause immediate damage to the structure of the middle and inner ear, while, hearing loss due to prolonged noise exposure is generally associated with destruction of the hair cells of the inner ear. The observed increase in noise level in metropolitan cities above specified standard limit is responsible for rising incidence of deafness among the in habitant. Though, exposure to loud, distracting and possibly hazardous noise may be a common experience for everyone but to allow such exposure to have detrimental effects on ones hearing is a personal choice

H. Olorunt E.O., Ademola R.A., Sridhar M. K. C. Afr.J.Biomed Res.Vol.15 (may 2012)

Urban environmental noise pollution has impact on the quality of life and it is a serious health and social problem. The aim of this study was to assess the sources and noise levels, and possible impacts in selected residential neighborhoods of Ibadan metropolis. Structured questionnaire was used to elicit information from respondents on demographic and neighborhood characteristics, sources of noise and perceived effects of noise pollution. Noise levels meter was used to determine the noise levels. The study including that there is need for formulation and enforcement of permissible noise standard for residential neighborhood by the federal Ministry of Environment instead of using the current eight-hour standard of 90dB which is industrial setting.

I. Keerthana¹, Gobinath.R, Neelima Singhvi, Chitravel.V, Saranya.S, Kannan.T

This paper a study of traffic noise in Tirupur city has been done in the busy areas of the city which have high traffic flow in peak hours, results obtained in the study shows that the whole city is affected heavily by noise pollution more during the evening hours when compared to morning hours and in almost 90% of the area prevailing noise level is more than the ambient noise level. It has been found that in many areas the noise level prevailing averages around 85 db at 90% of the busy points of the city. Most of the noise is generated only due to horns of vehicles like rickshaws, buses, wagons & trucks etc., Tirupur being a small and congested city, creates chronic issues related to noise pollution. The city is rapidly developing, more and more vehicles are being used regularly which adds thrust on noise level in the city which in turn will create many health issues. Since the traffic noise is increasing more in this city day by day so this has to be analysed and controlled so that no health hazards pose. The effect of noise pollution is summarized below:

- a) Depression and fatigue, which considerably reduces the efficiency of a person.
- b) Insomnia as a result of lack of undisturbed and refreshing sleep.
- c) Straining of senses and annoyance as a result of slow but persistent noise from motorcycles, alarm clocks, call bells, telephone rings etc.
- d) Affecting of psychomotor performance of a person by a sudden loud noise (sound)
- e) It is a cause of frustration and is associated with difficulty in concentration, disturbance of rest, physical and mental fatigue.

J. Debasish Pal and Debasish Bhattacharya

This study examines the problems of reduction of individual's efficiency in his/her respective working places because of road traffic noise pollution in Agartala due to rapidly growing vehicular traffic. This paper deals with monitoring and modeling of the disturbances caused due to vehicular road traffic interrupted by traffic flow conditions on personal work performance. Total of two hundred seventy individuals from different road side Government Offices, Private Organizations and Commercial Business Centres on both sides of busy roads of the city were interviewed for attitudinal responses. Traffic volume count and noise indices data were collected simultaneously at six selected sites of the city. A relationship was developed between different traffic noise parameters and its harmful impact on work competency of individuals using MATLAB. Regression equations developed to predict the percentage of high annoyance among the individuals are fit based on noise parameters and parameters related to traffic movements. In addition, statistical analysis was also carried out between measured and predictive values of the percentage of highly annoyed group of individuals. The present model will draw the attention of the State Government and will help the policy to take the necessary steps to reduce this problem. Through questionnaire, the attitudinal response of individuals has been collected and it is clear that they are facing some major problems like headache, effect on work efficiency, less

concentration, fatigue, stress, and tiredness during the time period 8 AM–8 PM.

K. BhavenTandel , Dr. Joel Macwan , Pratik N. Ruparel

Traffic related noise pollution accounts for nearly two-third of the total noise pollution in an urban area. Noise, a byproduct of urbanization, industrialization and motorization, is increasingly recognized as an environmental nuisance that affects human health and wellbeing. Traffic noise on existing urban roadways lowers the quality of life and property values for persons residing near these urban corridors Surat is now the tenth largest city of India having an estimated population of 40 lakhs plus at present. An inconceivable population growth rate of 76.02 % was observed in the last decade as a result of rapid industrialization. Surat is well known as diamond city and is also famous for silk and jari industry. Owing to its rapid industrialization and better job opportunities, observation is made for the migration from all over India and particularly from Orissa, U.P., M.P., Bihar and Rajasthan. Due to explosion of population and rapid industrialization the transportation in the city increased to un-imaginary heights, but due to the want of efficient Mass Transit System, individual vehicular growth also touched escalating heights. As on 31-12-2006, the vehicles registered at R.T.O. is 13 lakhs plus. This is equivalent to the highest growth rate of Delhi. Thus the explosion of population, rapid industrialization and highest growth rate in vehicle population made the traffic problems complicated. This research paper highlights the noise pollution study carried out on three of the busiest urban corridors of Surat city.

L. Savale P. A. (2013)

This paper explores the sources, effects and suggestions for controlling the excessive noise. Automobiles, industries, highway transport, airports, railways and public address system turns out to be major sources of noise pollution. Most of our day-to-day activities, by knowingly or unknowingly every one of us contribute to generate noise pollution. Often neglected, noise pollution adversely affects the human being leading to irritation, loss of concentration, loss of hearing. Efforts shall be made to identify the sources of noise pollution and the reasons for increase of noise levels .Efforts shall be made to reduce the undesired noise levels from noise generating sources. This leads to marginal reduction of noise levels at the source. If it is still un-bearable then scientific methods of noise control can be employed. The Statutory Regulations have prescribed the noise level exposure limits. The educated peoples may complain to the Statutory Board for violation of noise level limits by any noise generator. The suitable action will be taken to attenuate the noise levels and controlling pollution. In future, public education, government and NGOs can play significant role in controlling the noise pollution.

M. Narendra Singh & S. C. Davar 2004

The study examines the problem of noise pollution in the wake of its ill effect on the life of the people. A cross-section survey of the population in Delhi State points out that main source of noise pollution is loudspeakers and automobiles.

However, female population is affected by religious noise a little more than male population. Major effects of noise pollution include interference with communication, sleeplessness, and reduced efficiency. The extreme effects e.g. deafness and mental breakdown neither is ruled out.

Generally, a request to reduce or stop the noise is made out by the aggrieved party. However, complaints to the administration and police have also been accepted as a way of solving this menace. Public education appears to be the best method as suggested by the respondents. However, government and NGOs can play a significant role in this process.

N. Shreerup Goswami & Bijay K. Swain 2017

The noise pollution studies over the years have focused on the monitoring, recording, modeling, geospatial mapping, and exposure-effect relationship. The review of papers demonstrated that road traffic noise is the predominant cause for annoyance among the respondents. The evidence comes mostly from studies focusing on health impacts. Only 10% of articles enumerated zone-specific noise pollution. 44.89% of articles reported details of subjective response data with the help of a questionnaire tool, while 14.3% of articles reported details about the noise in workplaces of different areas of India. Ten percent of articles attributed to the harmful effect of festive noise. Studies in relation to the physiological and sleep disturbances in Indian condition are negligible. Noise pollution limits are being breached in almost all Indian cities. Violations are the worst in urban areas. The laws should be properly implemented in India to control this ever-growing menace. The government is now working on devising new noise pollution standards. City-wise noise pollution mitigation strategies should be worked out at all levels. It is concluded that coordinated and long-term integrated noise pollution research (comprising assessment of noise descriptors, noise mapping, prediction by noise modeling, and experimental studies to demonstrate exposure-effect relationship, advanced study on acoustic absorption material) is the need of the hour.

O. Kalaiselvi and Ramachandraiah 2011

Paper assessed equivalent sound level values LAeq 24 h and LAeq 1 h of Chennai city and found the noise levels were more than 80 dB. The study also depicted that construction of flyovers resulted in a decrease in 3 dB (A) Leq along the road. The study concluded that auto-rickshaws were the main cause of traffic noise pollution than other vehicles. The different noise levels in different parts of the city are attributed to different geomorphology, vehicular density, and poor urban planning of the city.

P. Datta JK, Sadhu S, Gupta S, Saha R, Mondal NK, Mukhopadhyay N.2006

Cities and towns of the world are now facing enormous rise of noise pollution problem due to very high population rise, transport congestion and associated commercial and industrial activities. Burdwan, a district headquarter (100 km away from Kolkata) is one such town where noise pollution is very frequent. In order to assess noise level, noise data were collected from various places of the town by sound level meter with a duration of 30minutes/location during specified

time like 6.00am, 10.00am, 1.00pm, 4.00pm and 6.00pm. Most of the monitoring places either belong to silence category or commercial category areas. From the tabulated data, it was found that sound level lies within the range of 64-85dB or above in different time at different places. The locations that belong to the silence zone have the noise level up to 90dB. Statistically noise level in all these zones differ significantly at their peak hours. Noise pollution adversely affects our environment as well as human beings. Sound causes both pathological and psychological disorders in human beings. Implementation of rules and regulations under section 20, 21J, 41, 68(I), 70, 90, 111A of Environment Protection Act, 1986 and of course various technological methods and public awareness are very essential to check. They monitored noise level in silence, commercial, and industrial zones of Burdwan town. The maximum noise level at silence zone was reported as 90 dB. The study depicted that the noise caused both pathological and psychological disorders in human beings.

Q. Mondal NK, Das K. 2013

They studied the attitude of trainee teachers of two educational institutions of Birbhum and Burdwan towards the environmental noise. In this study, it was noticed that both male and female teacher trainee knew the basic concept of noise and was non-significant among them ($p < 0.05$). It was reported that 50.36% of respondents believed that noise-induced hearing loss happened when noise level exceed 85 dB. Thirty-nine percent of respondents opined that there should be the minimum level of noise in the academic institutes and hospitals, etc. Ninety-eight percent of respondents agreed that traffic noise caused irritation in the urban area. 94.16% of respondents believed that their sleep had been interfered by the vehicular noise during the night. 14.59% of the total samples agreed that noise had an effect on blood pressure.

R. Ziauddin A, Bahel RS, Siddiqui NA2007

Dehradun city is one of the fastest growing city in Asia. The noise pollution in such urban growing areas is monitored Leq and traffic density in Dehradun city and found acute traffic noise pollution. Maximum noise pollution level was 102.7 dB and Leq was 83.7 dB.

IV. METHODOLOGY & MATERIAL

The sound level meter, used in this study measuring sound pressure between 20 to 20,000 Hz was the instrument was 32-140 dB(A) with an accuracy of + 5% (Operation Manual, Cirrus Research Ltd. 1994). The noise level will be record at a minimum distance where cumulative noise will be expected from different sources. Monitoring will carried out at a height of 1.5 m and 1 m away from the chest for 30 min. at interval of 15 seconds. The measurement of noise levels will be taken during the daytime (6 am to 10 pm) and night time (10 pm to 6 am). All measurements were made with the (A) weighing filter at a height of receptor organ, i.e., ~1.5metre from the ground level. Sound level meter recorded noise in the form of Event Leq. and LN cycle. LN cycle represent that N% of the time, the noise level will be below the given value of Y viz. at different metro constructions site. The short Leq (equivalent continuous sound level) concept was proposed by

Komorn and Luquet (1981), Leq is the level which, if maintain constant for the same period as the measurement, would contain the same amount of energy as the fluctuating noise level. It will measure directly by an Integrating averaging sound level meter. It was a linear integration over time. The Leq formula as per international standard IEC 804 used for calculation was given below.

In India, Noise pollution (Regulation and Control) Rule 2000, have been framed under the Environment (Protection) Act, 1986. These are set of guideline for regulation and control of noise. The ambient levels of noise for different area/zone specified in the rules are indicated in chart

Three different metro construction sites within the Lucknow city were identified for the experiment. The different categories of area, will of each category were selected and at three different days time the noise level will be record by using the "Sound Level Meter". The Meter was place about 1.5m above ground level at each point. The Average noise level for each area will be calculate and are classified for safe danger or injurious on the basis of the noise level. A sound level meter consists of a microphone, amplifier, rectifier and a display meter. The sound Pressure level in dB is directly read out from the instrumental. A mechanical energy accompanies a sound wave, and the rate at which sound energy arrive at, or passes through, a unit are a nominal to the direction of propagation is known as the sound intensity. The relative intensity level of one sound with respect to another is defined as ten times the logarithm of the ratio of their intensities. Levels defined in this way are expressed in decibel is one tenth of a bel.

V. CONCLUSION

This paper explores the sources, effects and suggestions for controlling the excessive noise due to construction of metro and its effect on traffic, highway transport, airports, railways and public address system turn out to be major sources of noise pollution. Most of day-to-day activities, by knowingly or unknowingly every one of us contribute to generate noise pollution. Often neglected, noise pollution adversely affects the human being leading to irritation, loss of concentration, loss of hearing. Efforts shall be made to identify the sources of noise pollution and the reasons for increase of noise levels. Efforts shall be made to reduce the undesired noise levels from noise generating sources. This leads to marginal reduce of noise levels at the source. If it is still un-bearable then scientific methods of noise control can be employed. The Regulation has prescribed the noise level exposure limits. The educated peoples may complain to the statutory board for violation of noise level limits by any noise generator. The suitable action will be taken to attenuate the noise levels and controlling pollution. In future public education, government and NGOs can play significant role in controlling the noise pollution.

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