

# 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 the 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 like construction instruments or equipments used in metro construction site and traffic hindrance are cause of noise pollution. Noise pollution in the recent times has been well recognized as one of the major cause that impact the quality of life in urban areas across the globe. The aim of this study was to assess the sources and noise levels, and possible impacts on selected metro construction site. Its adverse impact on health is like hearing impairment, agitation, depression.

**Key Words:** Noise, Stress, Intensity

## 2. INTRODUCTION

Lucknow the capital of Uttar Pradesh is situated between 26° 52' N latitude and 80° 56' 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 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.

1. **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

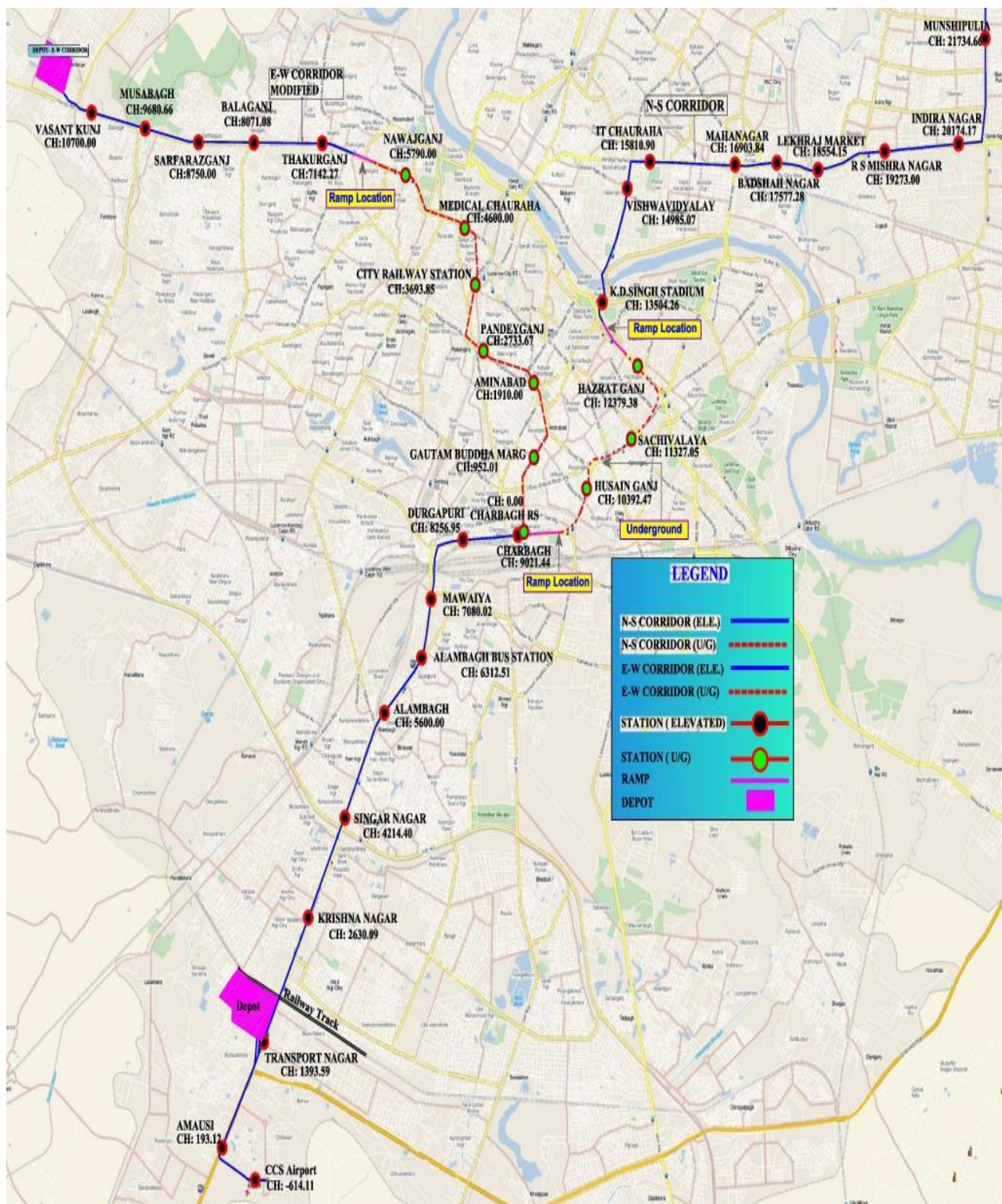
### DISTANCES BETWEEN METRO STATIONS

S.NO.	NAME OF STATIONS	INTER- STATION DISTANCE
		(In m)
1	CCS AMAUSI AIRPORT	0
2	AMAUSI	807.23
3	TRANSPORT NAGAR	1200.47
4	KRISHNA NAGAR	1236.50
5	SINGAR NAGAR	1584.31
6	ALAMBAGH	1385.60
7	ALAMBAGH ISBT	712.51
8	MAWAIYA	767.51
9	DURGAPURI	1176.93
10	CHARBAGH	764.49
11	HUSSAINGANJ	1371.03
12	SACHIVALAYA	934.58
13	HAZRATGANJ	1052.33
14	K.D. SINGH BABU STADIUM	1124.88
15	VISHWAVIDYALAYA	1480.81

16	IT COLLEGE JUNCTION	825.83
17	MAHANAGAR	1092.93
18	BADSHAHNAGAR	673.44
19	LEKHRAJ MARKET	976.87
20	RAMSAGAR MISHRA NAGAR	718.85
21	INDIRANAGAR	901.17
22	MUNSHIPULIYA	1560.49
	TOTAL NETWORK	22348.76







**3. Methology and Material:** The sound level meter “HTC SL1350” 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.

#### 4. LITERATURE REVIEW

##### 4.1 Hiral J. Jariwala, Huma S. Syed, Minarva J. Pandya, Yogesh M. Gajera [8]

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.

**4.2 Ganiyu, s.a. and Adedeji, Y.M.D. (2010) [7]:** Noise can cause hearing impairment, hypertension. Ischemic heart disease, annoyance, premature ejaculation, bowel movements, sleep disturbance, death and decreased sexual performance

**4.3 Alice Elizabeth Gonzalez, journal of Environmental Protection [1]:** 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.

**4.4 Debasish Pal and Debasish Bhattacharya [4]:** 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.

**4.5 BhavenTandel , Dr. Joel Macwan , Pratik N. Ruparel [2]:** 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.

**4.6 Kalaiselvi and Ramachandraiah 2011 [10]:** 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.

**4.7 Datta JK, Sadhu S, Gupta S, Saha R, Mondal NK, Mukhopadhyay N.2006 [3]:** 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.

**4.8 Jyoti, Ajay Dahiya [9]:** 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 well being. Traffic noise on existing urban roadways lower the quality of life and property values for persons residing near these urban corridors due to explosion of population and rapid industrialization the transportation in the city increased to unimaginable height, but due to the want of efficient Mass Transit System, individual vehicular growth also touched escalating height. The major adverse impact of noise includes interference with communication and disturb in sleep. Generally a request to reduced or step is favoured by most of the respondents. Public education appears to be the most effective tool to control noise pollution.

**4.9 Dr.B Ravishankar, Shailaja VN [5]:** Noise pollution is displeasing or excessive noise that may disrupt the activity or balance of human life. The source of most outdoor Noise worldwide is mainly caused by machines and transportation system, motor vehicles, aircrafts and trains. Poor urban planning may give rise to noise pollution since side-by-side industrial and residential buildings can result in noise pollution in the residential areas. Noise pollution affects both health and behavior. Unwanted sound (noise) can damage psychological health. Noise pollution can causes annoyance and aggression, hypertension, high stress levels, tinnitus, hearing loss, sleep disturbance, and other harmful effects. Noise can reduce the ability to pay attention to tasks. This is a concern at the work place when it comes to workers, safety and also reduces productivity.

This paper aims at collecting various noise sources across Bangalore city and benchmarking the higher noise level sources. Based on the observations many different models are designed and tested using these noise sources with an instrument called SL4010 noise meter. The variation in noise levels are studied and statistically analyzed using various statistical tools and inferences are drawn for every model. The correct measurement and use of noise parameters associated with noise is essential as important decisions are to be made on the result of the investigations.

## 5.0 NOISE LEVELS COLLECTED FROM CSIR LUCKNOW

YEAR- 2012

Noise level Db (A) during Day and night Time 2012

Sl. No.	Area	Location	Noise level dB(A)	
			Day	Night
1	Residential	Aliganj	62.5	54.8
		Vikas Nagar	64.3	56.1
		Indira Nagar	66.8	58.3
		Gomti Nagar	63.4	52.6
		<b>Standard</b>	<b>55.0</b>	<b>45.0</b>
2	Commercial	Charbagh	72.8	66.9
		Alambagh	68.5	61.5
		Aminabad	70.1	54.6
		Chowk	71.2	58.8
		<b>Standard</b>	<b>65.0</b>	<b>55.0</b>
3	Industrial	Amausi	73.7	65.2
		<b>Standard</b>	<b>75.0</b>	<b>70.0</b>

YEAR- 2013

Noise level Db (A) during Day and night Time 2013

Sl. No.	Area	Location	Noise level dB(A)	
			Day	Night
1	Residential	Aliganj	62.2	58.3
		Vikas Nagar	63.3	55.4
		Indira Nagar	68.4	60.2
		Gomti Nagar	64.5	54.2
		<b>Standard</b>	<b>55.0</b>	<b>45.0</b>
2	Commercial	Charbagh	74.5	71.5
		Alambagh	68.2	64.2
		Aminabad	70.3	58.3



		Chowk	71.6	59.2
		<b>Standard</b>	<b>65.0</b>	<b>55.0</b>
3	<b>Industrial</b>	Amausi	68.9	65.5
		<b>Standard</b>	<b>75.0</b>	<b>70.0</b>

## YEAR- 2018

## Noise level Db (A) during Day and night Time 2018

SI. No.	Area	Location	Noise level dB(A)	
			Day	Night
1	<b>Residential</b>	Aliganj	71.9	59.5
		Vikas Nagar	66.3	57.0
		Indira Nagar	70.9	60.3
		Gomti Nagar	71.5	55.1
		<b>Standard</b>	<b>55.0</b>	<b>45.0</b>
2	<b>Commercial</b>	Charbagh	77.9	69.3
		Alambagh	70.2	59.1
		Aminabad	79.3	68.4
		Chowk	71.5	72.4
		<b>Standard</b>	<b>65.0</b>	<b>55.0</b>
3	<b>Industrial</b>	Amausi	76.4	72.3
		<b>Standard</b>	<b>75.0</b>	<b>70.0</b>

## 6.0 RESULT: NOISE READING COLLECTED FROM DIFFERENT PLACES IN LUCKNOW

## 1.Noise level Db (A) during Day and night Time Of Month 20 January 2019

SI. No.	Area	6.00-8.00 AM	8.00-10.00 AM	10.00 - 12.00 AM	12.00 - 2.00 PM	2.00 - 4.00 PM	4.00 - 6.00 PM	6.00 - 8.00 PM	8.00 - 10.00 PM	10.00 - 12.00 PM	12.00 - 4.00 AM	4.00 - 6.00 AM
1	HAZRATGANJ	61.60		82.80		81.90		84.10		61.40		61.00
2	IT CHAURAHA		63.80		68.50		72.80		64.80		55.10	

## Noise level Db (A) during Day and night Time Of Month 22 January 2019

3	HAZRATGANJ		81.60		83.60		85.50		83.50		62.00	
4	IT CHAURAHA	54.20		66.40		67.60		73.50		61.30		55.30

### Noise level Db (A) during Day and night Time Of Month 24 January 2019

SI. No .	Area	6.00-8.00 AM	8.00-10.00 AM	10.00 - 12.00 AM	12.00 - 2.00 PM	2.00 - 4.00 PM	4.00 - 6.00 PM	6.00 - 8.00 PM	8.00 - 10.00 PM	10.00 - 12.00 PM	12.00 - 4.00 AM	4.00 - 6.00 AM
1	POLYTECHNIC		73.00		78.60		80.80		80.90		57.60	
2	MUNSIPULIYA	59.60		72.70		71.80		80.60		76.40		55.20

### Noise level Db (A) during Day and night Time Of Month 26 January 2019

3	POLYTECHNIC	62.40		75.80		78.00		81.60		74.50		56.00
4	MUNSIPULIYA		64.90		72.00		78.90		79.40		55.60	

### 2.Noise level Db (A) during Day and night Time Of Month 2 Feb. 2019

SI. No .	Area	6.00-8.00 AM	8.00-10.00 AM	10.00 - 12.00 AM	12.00 - 2.00 PM	2.00 - 4.00 PM	4.00 - 6.00 PM	6.00 - 8.00 PM	8.00 - 10.00 PM	10.00 - 12.00 PM	12.00 - 4.00 AM	4.00 - 6.00 AM
1	HAZRATGANJ	65.50		84.50		82.30		83.90		74.30		62.40
2	IT CHAURAHA		63.80		66.40		73.00		66.10		63.60	

### Noise level Db (A) during Day and night Time Of Month 4 Feb 2019

3	HAZRATGANJ		79.30		83.60		84.80		84.60		62.30	
4	IT CHAURAHA	56.60		62.20		65.80		71.20		65.50		53.10

### Noise level Db (A) during Day and night Time Of Month 6 Feb. 2019

1	POLYTECHNIC	61.00		75.80		74.90		80.70		72.60		51.00
2	MUNSIPULIYA		68.70		71.50		79.80		81.60		56.00	

### Noise level Db (A) during Day and night Time Of Month 8 Feb 2019

3	POLYTECHNIC		72.90		79.30		78.50		79.40		48.70	
4	MUNSIPULIYA	64.50		74.50		73.00		81.50		75.90		54.00

### 3.Noise level Db (A) during Day and night Time Of Month 21 Feb. 2019

SI. No .	Area	6.00-8.00 AM	8.00-10.00 AM	10.00 - 12.00 AM	12.00 - 2.00 PM	2.00 - 4.00 PM	4.00 - 6.00 PM	6.00 - 8.00 PM	8.00 - 10.00 PM	10.00 - 12.00 PM	12.00 - 4.00 AM	4.00 - 6.00 AM
1	HAZRATGANJ	63.80		85.40		81.90		83.90		74.30		62.40
2	IT CHAURAHA		63.80		68.50		72.80		64.80		55.10	

### Noise level Db (A) during Day and night Time Of Month 23 Feb. 2019

3	HAZRATGANJ		81.50		84.60		84.80		84.60		62.30	
4	IT CHAURAHA	56.60		66.40		67.60		73.50		61.30		55.30

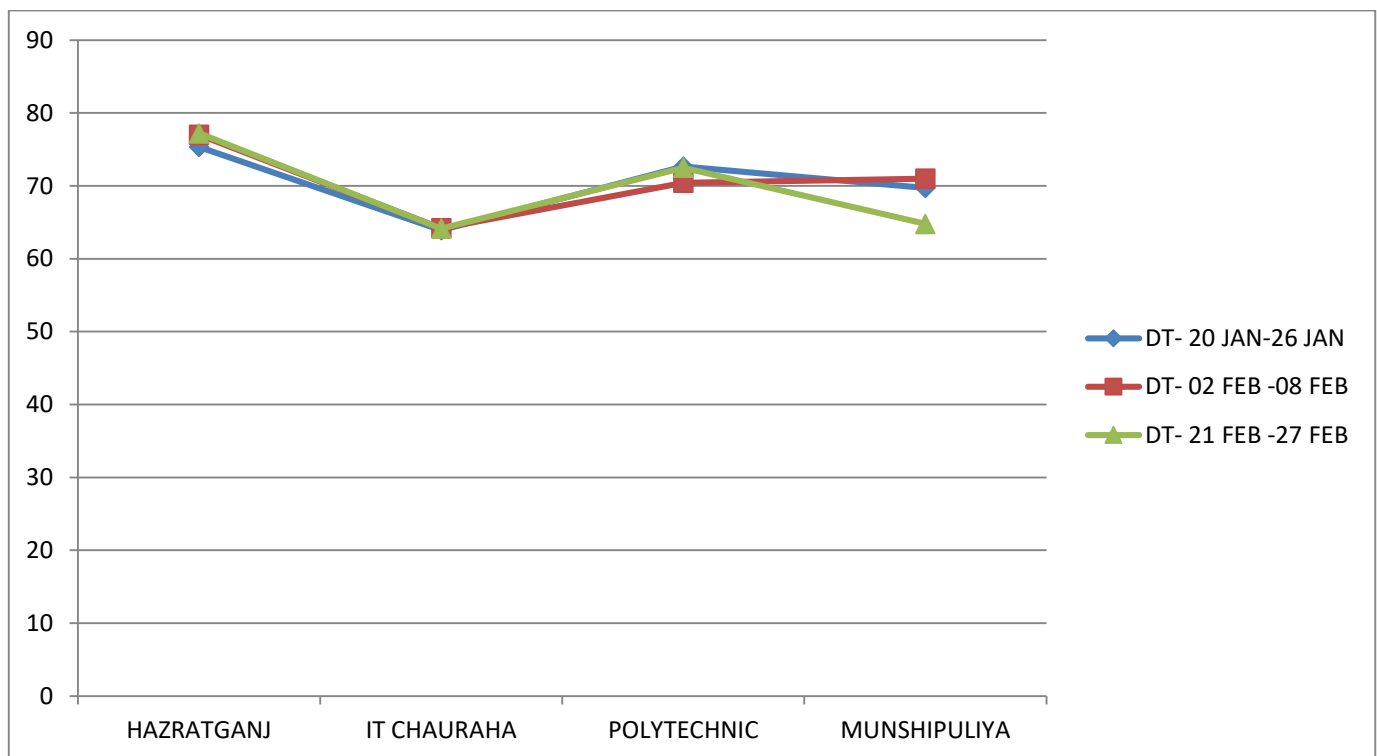
**Noise level Db (A) during Day and night Time Of Month 24 Feb. 2019**

1	POLYTECHNIC	60.70		75.80		78.00		81.60		74.50		56.00
2	MUNSIPULIYA		63.70		72.00		78.90		79.40			55.60

**Noise level Db (A) during Day and night Time Of Month 27 Feb. 2019**

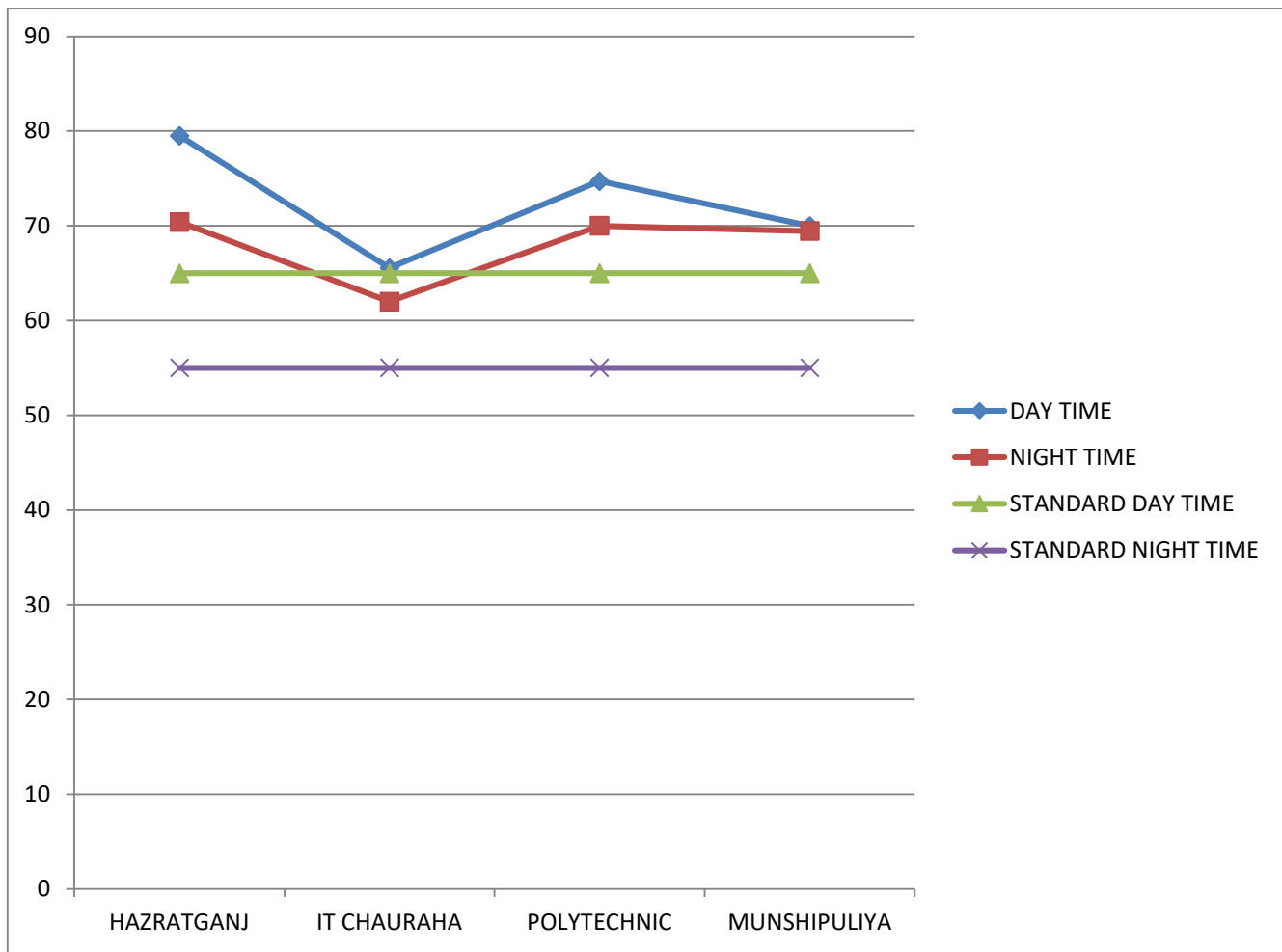
3	POLYTECHNIC		73.00		78.60		80.80		80.90			57.60
4	MUNSIPULIYA	61.60		71.00		73.40		80.60		76.40		55.20

**GRAPH OF AVERAGE NOISE LEVELS IN dB**



1. MEASUREMENT OF NOISE LEVEL (dB) ON DATE 20 -26 JAN 2019

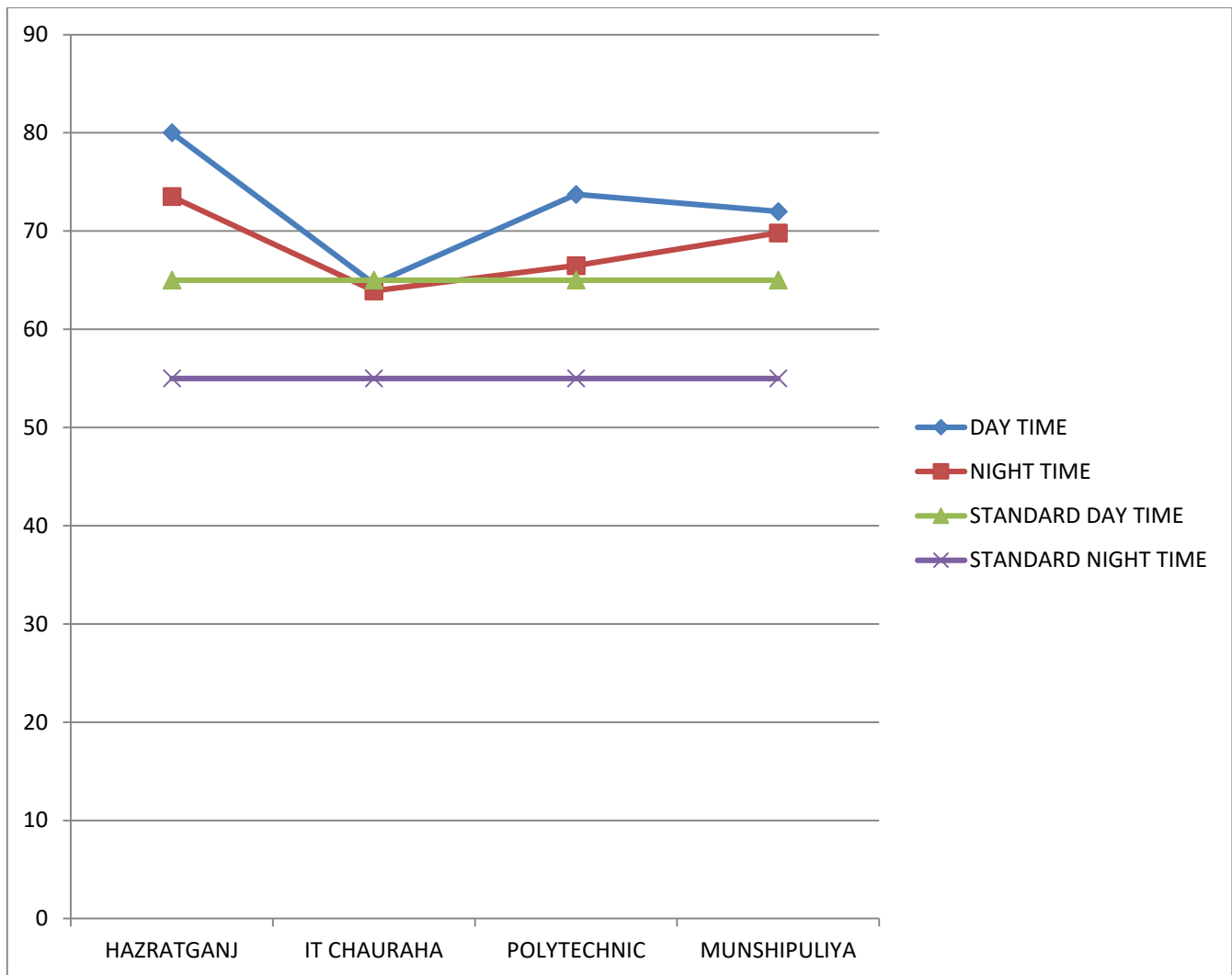
SI. No.	Area	Location	Noise level dB(A)	
			Day	Night
1	METRO CONSTRUCTION SITE	HAZRATGANJ	79.50	70.40
		IT CHAURAHA	65.55	62.00
		POLYTECHNIC	74.70	70.00
		MUNSHIPULIYA	69.98	69.44
		<b>Standard</b>	<b>65.00</b>	<b>55.00</b>



2. MEASUREMENT OF NOISE LEVEL (dB) ON DATE 2 -8 FEB 2019

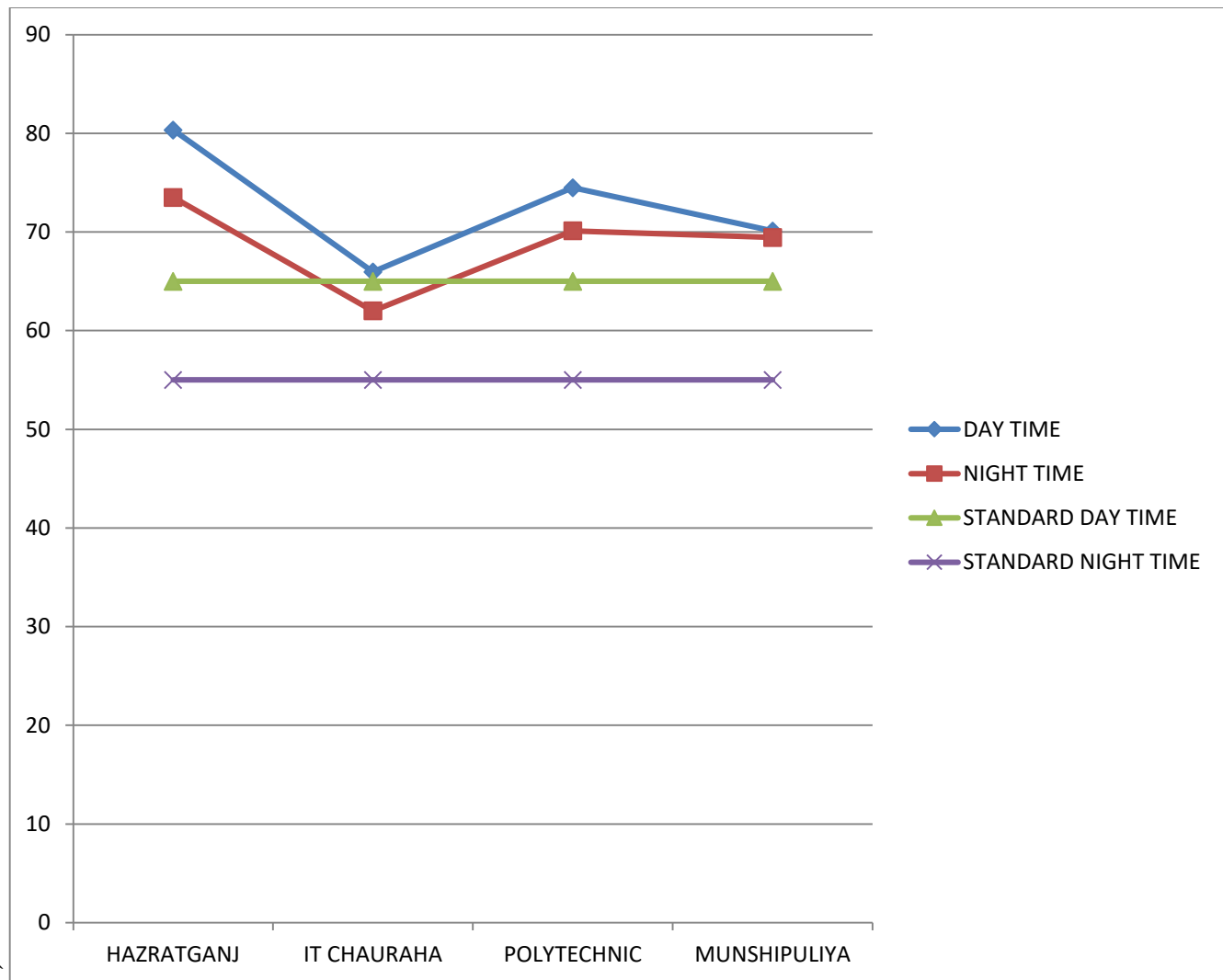
SI. No.	Area	Location	Noise level dB(A)	
			Day	Night
1	METRO CONSTRUCTION SITE	HAZRATGANJ	80.00	73.50
		IT CHAURAHA	64.63	63.90
		POLYTECHNIC	73.73	66.48
		MUNSHIPULIYA	72.00	69.80
		<b>Standard</b>	<b>65.0</b>	<b>55.0</b>





3. MEASUREMENT OF NOISE LEVEL (dB) ON DATE 21 -27 FEB 2019

SI. No.	Area	Location	Noise level dB(A)	
			Day	Night
1	METRO CONSTRUCTION SITE	HAZRATGANJ	80.33	73.50
		IT CHAURAHA	65.95	62.00
		POLYTECHNIC	74.48	70.12
		MUNSHIPULIYA	70.10	69.44
		<b>Standard</b>	<b>65.0</b>	<b>55.0</b>



**7. Conclusion:** This paper explores 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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