A 'SOUND ANALYSIS' OF NOISE POLLUTION

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PART I

BACKGROUND RESEARCH

NOISE

The most common definition of noise is "unwanted/undesirable sound." A sound may be unwanted because it is:

Loud Unpleasant or Annoying Intrusive or Distracting
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NOISE POLLUTION

Noise pollution, at the very basic level, is displeasing human, animal or machine-created sound that disrupts/threatens the activity, health, welfare or balance of human or animal life. It is not easy to measure because the definition of noise depends on the *context* of the sound and the *subjective* effect it has on those hearing it.

Noise pollution can originate from simple sources such as a drilling machine, road traffic, unpleasant radio ads, even constant human chatter to more complex machinery such as large trucks and aeroplanes.

NOISE LEVEL COMPARISON

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NOISE LEVEL EXPOSURE

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Decibel Exposure Time Guidelines

Continuous dB	Permissible Exposure Time	
85 Db	8 hours	Accepted standards for
88 Db	4 hours	exposure time for continuous
91 Db	2 hours	time weighted average noise, according to NIOSH and CDC,
94 dB	1 hour	2002. For every 3 dBs over
97 dB	30 minutes	time before possible damage
100 dB	15 minutes	can occur is cut in half.
103 dB	7.5 minutes	
106 dB	3.75 min (< 4min)	
109 dB	1.875 min (< 2min)	
112 dB	.9375 min (~1 min)	
115 dB	.46875 min (~30 sec)	

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MEASUREMENT OF NOISE LEVEL

It is measured in Decibel with an instrument called Sound Level Meter. It consists of three internationally accepted weighing networks.

Filters A, B and C are used in sound-level meters which mimic iso-loudness curves over frequency under different conditions of sound intensities, i.e. for sounds of low, medium, and high loudness levels, respectively.

A weighing scale- Severely filters the frequency

B weighing scale- Moderately filters the frequency

C weighing Scale- Hardly filters frequency

The A-filter has been adopted globally. Therefore, sound pressure levels frequently quoted in audiology literature simply in dB are A-weighted levels.

Brad and Kjaer 2260 Sound Analyser is the most widely used for the analysis of traffic noise emissions in busy streets and cities.

AIM

The project aims to evaluate the impact of noise pollution on the environment and quality of life.

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OBJECTIVES

To identify the sources of noise pollution.	To measure the extent of noise pollution at various locations.
To study temporal patterns of noise pollution at various time points.	To explore the possible reactions of the people against excessive noise.
To assess the impact of noise on human quality of life.	To identify and suggest suitable measures for the reduction of noise levels.
To identify preventive measures to reduce the impact of noise pollution.	To assess and analyse the dimension of traffic generated noise pollution.
To identify critical noise pollution areas where noise barriers should be installed.	To stress the need for advanced urban planning against noise in a residential area.

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SCOPE

Although noise pollution is a global issue, this project's scope is limited to the city of **Bangalore.** The case study relates to one selected Apartment named **"The Elgin"** on **Langford Road.**

Noise level measurements used in the study are **official reports** published by the KSPCB (Karnataka State Pollution Control Board) at various noise monitoring stations in the city at different times.

The study uses the records of noise level monitoring for the **latest available time-period** and does not intend to study the trend of noise pollution over the years.

This project is undertaken for **academic purposes** only.

RESEARCH METHODOLOGY

This project on noise pollution undertakes quantitative and qualitative research.

Quantitative research involves the collection of statistical numbers of noise levels at various time points and at different locations, their sources and impact using structured data gathering techniques.

Qualitative research involves the collection of subjective opinions, purposeful observations and exploration of possible reasons for high noise levels and methods to prevent the same.

Secondary data was collated for background research relating to noise pollution in different cities, their sources and the impact of the same. Measures undertaken by authorities to check noise pollution were also collected through credible internet sources and publications of the government pollution control board.

As part of the research design and approach, a case study is undertaken in particular to analyse in-depth the sources and effects of noise pollution. A residential apartment complex in urban Bangalore has been chosen for this purpose.

Noise levels at the case study location – "**The Elgin Apartment**" was measured using a noise level meter. **Primary data** was collected for this case study using two methods. A: **personal observation method** and B: **direct interview method**, wherein responses from residents of the apartment were collected using a questionnaire.

Literature collection and Literature Review: Different newspaper articles, research papers, internet journals and related reports about noise pollution in various cities (Bangalore in particular) were collected and it was studied in detail. Such studies were useful to obtain knowledge about the levels and impact of noise pollution.

Questionnaire survey and preparation: Structured questionnaire was prepared for direct interview of 80 respondents and results were summarised using a spreadsheet. A blank Questionnaire is enclosed along with.

Data analysis: The secondary data collected were tabulated and represented in the form of tables and graphs to help conclude. Calculation of **averages, range, Percentage change method and Ranking techniques** are applied for analysis. The primary questionnaire data being qualitative and subjective has been summarised for analysis.

EFFECTS OF NOISE POLLUTION

Noise pollution has a lot of consequences that do not present themselves right away. It affects the human body as well as the environment negatively. The mind is disturbed for long hours. It even causes several ailments, like hearing impairment. It can also cause headaches, sleeping disorders, cardiovascular issues and mental imbalance depending on the intensity.

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METHODS TO CHECK NOISE POLLUTION

There should be minimum use of **sound producing instruments**. Regulations should be in place for the usage of loudspeakers and devices that are capable of producing sound beyond limits that can be tolerated by humans. For this, strong community laws are essential.

Community involvement is also required for the thoughtful planning of the buildings in the locality. Zoning codes can be used to draw the line between residential and commercial spaces. A sure-fire way to reduce any kind of pollution is to increase the vegetation.

Traffic noise is not inevitable, Cities can minimize traffic noise by banning honking, **maintaining** roads, constructing and sound barriers. They can also limit speeds of vehicles, enforce penalties for illegal vehicle modifications.

Legislative Measures

The **Pollution Control Board** and the **High Court** have already taken effective measures to bring sound pollution under control. Adequate measures should be taken to ensure that noise related restrictions are not violated.

Stringent anti-pollution laws should be enacted and enforced.

Ban of fire crackers should be imposed and electric horns should be replaced by bulb horns.

Replacement of old automobiles with new ones. Old automobiles are a major source of noise pollution. They create unappealing and very loud sounds. Their replacement with new ones will go a long way in reducing noise pollution. It will also lessen the emission of soot and toxic substances into the atmosphere.

Put sustained pressure on the relevant city or governing authorities to introduce **noise regulation policies**. Governing and city authorities are highly placed at introducing policies which can help reduce noise pollution. The laws should limit the amount of noise in public and private places to reduce noise pollution. The policies can also be integrated into transportation network construction and activities such as low-noise road surfaces, low-noise tracks, redesigning street spaces, enforcing speed limits and reducing traffic volume.

NOISE POLLUTION LEGAL CONTROLS UNDER DIFFERENT LEGISLATIONS

(a) Constitution of India

Right to Life: Article 21 guarantees the right to prevent noise as a pollutant reaching him/her. Right to Information: Right to know the norms and conditions on which Government permit the noise producing industry.

Right to Religion and Noise: Does not include the right to perform religious activities on loud speakers.

Directive Principal of State Policy – Aims to make the environment pollution free. Fundamental Duties: To clean the Environment

(**b**) Cr.P.C. Section 133 – Power to issue an order to remove or abate the nuisance caused by noise.

(c) I.P.C. Public Nuisance 268-295 provides for penalising excessive noise pollution.

- (d) Law of Torts: Noise pollution is considered as a civil wrong
- (e) Factories Act: Reduction of Noise and Oil of Machinery
- (f) Motor Vehicle Act regulates the use of horns and change of engines.

(g) Noise Pollution Control Rule 2000 under Environment Protection Act 1996



PART II

CASE STUDY

NOISE POLLUTION AT

ELGIN APARTMENT, LANGFORD ROAD, BANGALORE

INTRODUCTION

A residential apartment "The Elgin" is chosen for the Case study.

The apartment is a corner building at the T -Junction joining Hosur Road and Langford Road. The geographical location precisely is Latitude 12.958302 and Longitude 77.605943. The building is characterised by high-rise walls and a red exterior. Behind the apartment, there are other residential and commercial buildings. There is vast defence land opposite the complex. The defence land consists of a school, among other military setups such as March ground, shooting practice range, canteen, arms reserve building, staff quarters and huge bell clock.

Adjacent to the Elgin apartment is the playground which is open relatively throughout the day. Next to the playground on the Hosur road, there is an old age home named Little sisters of the Poor. Baldwin Boys High School, a Mosque and a crematorium are also in the vicinity on Hosur Road. There are two main dense settlements on either side of the Hosur Road – Anepalya behind crematorium and Neelasandra behind defence land.



'THE ELGIN' IS A LANDMARK

A distinctive red brick structure, 'Elgin Flour Mills' has grown into a landmark on Hosur Road, Bangalore's South Eastern exit route. Elgin was one of the last recognisable landmarks on the route of the city in the 70s. Bangaloreans have fond memories of the imposing red brick edifice, in its extensive grounds that had been an indelible part of the landscape on Hosur Road for many years.

Over the years, the Elgin has become the heart of the city's residential area. Prestige Builders took over the property and redeveloped it into a premium residential complex while retaining the original building's distinct character.

Prestige Elgin being Prestige's 50th project in Bangalore was started in 1997. This landmark property won the FIABCI Prix d' Excellence Award in 2009 in the Heritage (Restoration) category. The Elgin Apartment was completed and occupied by 1999 and it consists of two residential blocks with a total of 52 homes and approximately 150 residents.



ELGIN – THEN AND NOW

WHY ELGIN?

This apartment building was chosen for the case study for the following reasons.

- This Apartment is a heritage building and a distinctive landmark of Bangalore. Excessive noise levels not only disturb people but also the sound vibrations affect the edifice of the building. It is our responsibility to conserve heritage buildings.
- There are two schools nearby Elgin Rashtriya Military School and Baldwin Boys High School. Both the schools have strength over 1000 children each. Noise from various sources interferes with learning and concentration of children.
- \circ There is an old age home nearby Elgin Little sisters of the poor. This is the home for elderly people who are particularly at risk.
- There are innumerable residential buildings which suffer similar noise pollution silently every day. The Elgin Apartment is one such representative example where the noise level study has been carried out. This sets an example to other residential complexes to conduct a similar study and take measures to safeguard themselves from noise.
- Other high-risk groups of people exposed to noise pollution regularly are pedestrians, cyclists, auto drivers, traffic policemen, school children, sick and aged people.



ALARMINGLY HIGH NOISE LEVELS

An independent study at the Elgin Apartment showed that the average noise level for the 1 hour during peak hours of traffic was 78.3dB and for non-peak hours, it was 77.4dB.

Noise monitoring conducted by Karnataka State Pollution control Board showed that the average noise level during peak hours was 71.5 dB and for non-peak hours, it was 61.7 dB still above the permissible limits for residential areas.

NOISE MONITORING DETAILS - LETTER NO.KSPCB/BCE/EO/2014-15/12944 DATED 12/12/2014

Sl.No.	Date of noise monitoring conducted at Elgin Apartment by KSPCB	Minimum in dB (A)	Maximum in dB (A)	LEQ in dB (A)
1	22.08.2014 between 2.16 PM to 4.19 PM	53.7	81.4	61.7
2	25.09.2014 between 5.45 PM to 7 45 PM	53.9	88	71.4
3	06.11.2014 between 9.26 AM to 12.26 PM	58.1	90.1	71.5

Noise monitoring personally conducted by apartment residents at The Elgin using the noise level meter during June 2017 revealed that the noise levels averaged 76.4 dB during peak hours and 68.4 dB during Non – peak hours. The details are shown below in a table.

NOISE MONITORING DETAILS - CONDUCTED BY APARTMENT RESIDENTS - JUNE 2017

Sl.No.	Date of noise monitoring conducted at Elgin Apartment by residents	Minimum in dB (A)	Maximum in dB (A)	LEQ in dB (A)
1	01.06.2017 between 2 PM to 4 PM	55.5	84.3	68.4
2	02.06.2017 between 6 PM to 8 PM	55.9	90.2	76.2
3	05.06.2017 between 9.30 AM to 11.30 AM	57.2	89.6	76.6

Interpretation of noise levels at Elgin: The two tables above show an increase in the noise level of 7% during peak hours of traffic and about 11% during non- peak hours over a period of fewer than 3 years despite the measures undertaken to check noise.

This increase is mainly attributed to a multi-fold increase in traffic volume at the junction.

SOURCES OF NOISE AROUND ELGIN APARTMENT

1. Heavy Vehicular Traffic: Elgin apartment faces Hosur Road which is a part of National Highway-7. It connects metropolis Bangalore from Brigade Road to business town Hosur in Tamil Nadu. It also links the CBD to Electronic City, an IT-hub. Therefore, a large population moves for their jobs and back home using this Junction every day resulting in heavy vehicle traffic.

2. Loud audio Pedestrian signal: At the T-Junction opposite Elgin, there is an audio pedestrian signal installed with very high decibel sound. This loud audio beeps every two minutes and runs for 15 seconds to facilitate pedestrians to cross the road. This feature is primarily meant to assist the visually impaired to cross the road. But the loud sound of the signal is so high that it prevents visually impaired pedestrians from crossing the road. Lack of information on the length of time of audio also confuses them as they take a longer time to cross the road. Thus, the audio pedestrian signal does not serve its purpose but only contributes to high decibel noise around affecting residents, motorists on road, traffic policemen, cyclists and pedestrians.

3. Other Noise sources: The following noises around Elgin contribute aggregating less than 20% of the total noise pollution.

- General Noise from the playground children shouting, mike sets, dance practices, drills etc.
- o Loudspeakers from various events at the ground
- Religious processions (& funeral processions) noise from drums, whistles and trumpets.
- Military exercises marches, drills, shooting practices, training etc.
- Fireworks during festivals, events, celebrations and processions.
- Drag racing bikes and cars, loud music, thunder etc.

Sl.N o.	Location	Peak hours in dB	Non- Peak hours in dB	traffic volume non- peak hours	traffic volume peak hours	percenta ge change in traffic volume	% Change in noise levels
1	Langford & Hosur Rd. Jn THE ELGIN	78.3	71.4	2,586	3,386	30.9%	9.7%
2	Richmond Circle	77	82.3	3,245	4,115	26.8%	-6.4%
3	Thimayya Rd and Hosur Rd. Jn.	78.4	77.4	3,914	4,823	23.2%	1.3%
4	ITC Gardenia	76.1	76.6	5,570	4,459	-19.9%	-0.7%
5	Kasturba & Vittal Mallya Rd.Jn.	76	77.2	2,408	3,850	59.9%	-1.6%
6	M G Road & Brigade Rd. Jn.	77.7	78.2	2,940	3,761	27.9%	-0.6%
7	Victoria Statue - Cubbon Rd.	79.4	75.4	2,970	4,585	54.4%	5.3%
8	Lalbagh Botanical Garden	76.7	72.2	2,749	3,054	11.1%	6.2%
9	Langford Rd. & Double Rd. Jn.	79.6	75.8	1,748	2,340	33.9%	5.0%
10	Siddaih Rd. and Double Rd. Jn.	80.6	70.1	1,493	1,929	29.2%	15.0%

DETAILS OF NOISE MONITORING AT ELGIN AND NEARBY LOCATIONS

The table above shows the noise levels during traffic peak hours (generally between 8 am to 11 am and 6 pm to 8 pm) and during non-peak hours (generally during 11 am to 6 pm) and also the percentage change in noise levels at Elgin Junction and nearby junctions.

There is an increase in noise levels by 9.7 % at Elgin Junction followed by the maximum change of 15% at the double road junction. Some show a negative percentage change in noise level indicating a decrease in noise level during peak hours which may be due to increase in noise during non-peak hours by other sources such as processions, ambulances, incessant and shrill honkings, neighbourhood noise etc.

The magnitude of traffic during peak and non-peak hours indicates that there is an increase in traffic volume. It can be concluded that the volume of traffic in terms of all vehicles have significantly increased during peak hours compared to non-peak hours. Thus, *correlation can be established that increased vehicular traffic is a major noise contributor at the Elgin apartment.*

QUESTIONNAIRE ON NOISE POLLUTION

Hi, I am doing a project on noise pollution. Can you please fill this for me?

PART 1 – ABOUT YOU

Name	Male	Female
Age (in Years) Under 20 20-40	40-60	above 60
Highest formal education: 10^{th} 12^{th}	Graduate	Post graduate
Residence		
Number of years have you been resident \Box <5	5-10	10-15

PART 2 - NOISE INFORMATION

1. What do you think are the main sources of noise around our Elgin Apartment?

Traffic Noise	Loud Audio Pedestrian Signal	Playground Noise
Processions	Loudspeaker noise from events	Military exercises
	Fireworks/Drag bikes/ others	

2. How does noise affect your day to day activities?

Loss of concentration in study/work	
Get annoyed while communicating	
Forced to talk louder	
Disturbs emotional condition	
Reduces physical performance	
Others	

3. What do you think are the health effects of exposure to excessive noise?

Stress	Loss of sleep	Hypertension	Headache	
Irritation	No disturbance	Don't Know		

4. Can you please recommend some suggestions to check noise levels around?

Education/ Awareness	Stringent Law Enforcement	
Governmental Efforts	Involve NGO's/Celebrities	
Promote Public/Non-motorised transport	Other Measures	

THANK YOU / Aryan Joshi

analysis of **QUESTIONNAIRE SURVEY**

1. The table and graph show the composition of respondents classified into their age and gender.

Age group of Respondents	Male	Female	Total
under 20	12	8	20
20 -40	10	6	16
40 -60	12	22	34
above 60	4	6	10
Total	38	42	80

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2. The table and graph shows the respondents perception of major noise sources around Elgin.

Noice Sources	Total Respondents
Traffic Noise	80
Loud Audio Pedestrian Signal	61
Playground Noise	42
Loudspeaker Noise from events	33
Processions	22
Military Exercises	9
Fireworks, drag races, etc	7



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3. The table and graph shows perceived	noise sources	classified into a	age and gender
respondents.			

PERCIEVED NOISE SOURCES AT ELGIN								
Age	unc	ler 20	20-40		40-60		above 60	
Noice Sources / Gender	Male	Female	Male	Female	Male	Female	Male	Female
Traffic Noise	12	8	10	6	12	22	4	6
Loud Audio Pedestrian Signal	8	6	4	3	10	20	4	6
Playground Noise	4	5	6	3	8	12	2	2
Loudspeaker Noise from events	4	4	6	2	6	8	1	2
Processions	2	2	1	2	5	8	1	1
Military Exercises	1	1	1	1	2	2	1	0
Fireworks, drag races, etc	0	1	1	1	1	1	1	1



The above graph is a percentage bar graph showing responses about perceived noise sources around Elgin. The graph shows different noise sources as perceived by different respondents divided into various age groups and sub divided into male and female. An inference that can be drawn from the above graph is about 60% of total noise Around Elgin is contributed by vehicular traffic and loud audio pedestrian signal.

4. The table and graph shows noise effected changes on day to day life of respondents.

Noise effected changes	Number of respondents
Lose concentration in study/work	75
Get annoyed while communicating	46
Forced to talk louder	55
Disturbs Emotional condition	35
Reduces Physical performance	22

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5. The table and graph shows health impact of noise pollution on respondents.

Health factor	Number of people
Stress	5
Loss of Sleep	20
Hypertension	12
Headache	15
Irritation	24
No disturbance	3
Don't Know	1

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6. The graph shows the recommendation of Respondents to check noise levels around Elgin.

Suggestions to check noise	Number of respondents
Education/Awareness	80
Stringent Law Enforcement	62
Governmental Efforts	75
Involve NGO's/Celebrities	45
Promote Public/Non-motorised transport	70
Other Measures	12



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RECOMMENDATIONS TO REDUCE NOISE POLLUTION AROUND

Enforcement of Rules – Deploy more number of traffic policemen to keep a check on flow of traffic and regulated movement, which could keep a tab on vehicular noise. Defective silencers, shrill horns and noisy old commercial vehicles should be banned, with high penalties imposed to dissuade people from ferrying them on the roads.

Efficient management of **traffic lights:** These control smooth vehicle flow to reduce braking and acceleration. Prohibit entry of certain **heavy vehicles** like trucks in a certain part of streets. **Police spot checks** for horn, silencer and other noise levels of vehicles using a hand held device and fine the offenders.

Make **Noise barriers-** Effective noise barriers can reduce the noise levels by 10-15 decibels. Barriers can be formed using high, vertical walls.

Spread public awareness regarding noise pollution through social media, especially online campaigns on Twitter, Instagram and Facebook apart from traditional mediums such as TV, newspaper. Celebrities and famous citizens can also be roped in for campaigns that help spread the message.

Increase **vegetation** – If the height and width of the tree and density of the foliage is optimal, it can prevent noise pollution to a great extent. Trees such as Azadirachta Indica (Neem), Auricularia Columnaris (Cook pine), Polyalthia Longifolia (Mast tree) and Saraca Ashoka (Ashoka tree) are quite efficient in dampening the noise levels due to their dense foliage. The size that they grow to is most ideal to absorb a considerable amount of noise.

Ban use of horns in silence zones and sensitive spaces like schools, colleges and hospitals. Install big signboards indicating silence zones and fines that would be levied for honking. Launch **'no Honking day. Shrill horn manufacturers** to be shut down and stores selling these may be raided and confiscated from time to time.

Appeal to government to make **Noise control test mandatory** which could monitor the horn, the silencer, gear shift and brake application noise levels. Have a **sound level meter** at noisy junctions and display real time noise level readings.

Massive increase in public transport, like bus service, metro and mono rail will help reduce vehicular traffic. BMTC must go digital with developers coming up with multiple applications and should share data on BMTC's operation real time with commuters on their smartphones. This ensures better utilization of BMTC fleet, less waiting time for commuters and also allows BMTC to plan routes to suit commuters need thereby increasing revenue. Appeal to BMTC to **check the buses** for noise pollution during routine maintenance checks.

Introduce **dedicated bus lanes** by congesting roads for private transport can reduce travel time for buses and increases travel time for cars and bikes. Clubbed with digital information on public transport, more commuters shall opt to go for buses since it is always faster to go by bus on dedicated bus lanes.

Street for people programme: Ensure safe barrier free walkway crossing for pedestrians,

cycle track, designated spaces for hawkers, bus and auto stops, demarcated street parking and pedestrian oriented lighting can assist in promoting people to commute short distances by walking.

Discourage private motorised transport in the larger interest of citizen's right to life and equitable access to public roads for walkers, cyclists and non-motorised transport. Stop widening of roads and construction of elevated corridors. Demolish fly overs and replace them with walking track, cycling track and green spaces.

National urban Transport policy 2014 aims to encourage measures that allocate road space on a more equitable basis with people as its focus by reserving lanes and corridors exclusively for public transport and Non-motorised transport modes of travel. Implementation is required by improving paths for pedestrians and cyclists with good shade giving trees.

Restrict car usage in city centres: A revolutionary transformation is seen globally where city residents have gone car free and rely on shared cars, bikes and public transport. Car clubs and car sharing is the new mobility for sustainable transport. Modern City planners have no car spaces for its residents. Apartments are being developed with no car parking spaces. Car ownership in cities is lower than in suburban and rural areas in the western nations (Europe and UK). It is no longer rational to drive and have to park cars in cities like Mumbai and Bangalore. Cities of the future are better off with fewer cars which means 'End of the Car age'.

Implement **Metro Phase II**, commuter rail service and permit maxi cab aggregators to operate can reduce road traffic thereby reducing noise pollution.

MEASURES TAKEN BY THE ELGIN RESIDENTS

Increased vegetation – Long trees have been grown on the sides of the apartment facing Hosur Road and Langford road.

Protest was held opposing the excess noise pollution caused.

Neighbouring school Children of the school held no honking signboards for few days to create awareness among drivers

Petition was filed against widening of Hosur road which only brings the noise more closer to the apartment building and also increases latent demand for cars and thus induced traffic.

Insulation measures at homes were taken involving installation of sound proof window glasses and heavy curtains to obstruct noise.

Many residents have got their balcony facing road closed for daily use.



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ROAD AHEAD FOR ELGIN RESIDENTS

The immediate need is **government intervention**.

Planning authorities need a long term vision to reduce high decibel noise around.

Large groups of people need to organise and participate in **noise awareness campaigns** and the public at large must also pledge to create less noise at their ends.

Government should ensure taking **effective measures** in interest of the citizens' fundamental right to life.

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INTERPRETATION

The secondary data and questionnaire response revealed that

Vehicular traffic is the main source of noise pollution.

Traffic Noise level is high in and around all nearby residential and commercial areas.

Noise pollution is higher in peak hours than non-peak hours.

Noise pollution has **auditory as well as non-auditory effects** on health.

High dB Noise exposure results in stress, hypertension, sleeplessness, headache, irritation, reduced performance and therefore negatively impacts human quality of life.

Children, elderly and pedestrians are at high risk of excess noise exposure.

Measures to check noise at it s source of generation helps in reducing noise pollution than insulation measures.

Governmental efforts and strict measures are necessary to curb noise.

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EVALUATIONS AND LIMITATIONS

This study does not explore all sources of noise pollution other than traffic since vehicular traffic is the main cause of noise in Bangalore.

The data hinders us from conducting comparative studies as it is collected for inconsistent periods of time.

The published data does not provide sufficient information in establishing cause and effect relationship between noise and its sources, noise and its health impact.

The opinions expressed in questionnaire might vary with gender, age and socio economic background of the respondents.

The project helped me interpret graphs and tables and understand the mechanism of noise level meter.

The study helped me to explore impacts of noise on quality of life.

The study increased awareness of my fundamental rights to demand change in form of lowered decibels.

CONCLUSION

Noise from vehicles is the main cause of concern and may significantly contribute to total noise pollution in Bangalore.

There is direct correlation between increase in magnitude of traffic and increase in decibels of noise. Noise pollution is significantly higher in peak hours.

Noise pollution adversely affects health and therefore reduces quality of life.

It is critical to realise the link between health and our transport choices.

Enhancing public and non-motorised transports, dedicated bus and cyclist lanes, increasing vegetation, conducting awareness programs and enforcing strict rules are the most effective tools to control noise pollution.

Advanced urban planning needs a vision towards equitable road usage, noise zoning, installation of noise mitigation barriers, and discouraging private motorised facilities.

There is a need to identify protection against noise as citizen's fundamental right to life.

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