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Noise Pollutionin Jodhpur City

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Abstract-

All things that happen on the surface of the Earth have two faces, just like a coin. This is also true of development. One of its adverse effects is noise pollution. Noise pollution is one of the most significant problems in any metropolitan lifestyle. Households, cars, manufacturing units and other human activities have all grown in quantity along with the population growth. These human endeavours collectively affect human existence in a variety of ways, both good and bad. Noise pollution is one issue that has a detrimental effect on people's health in cities and the surrounding area.In this research, the noise trend in Jodhpur City is evaluated.

Jodhpur is going through development under a rapid pace. Development is accompanied by various environmental challenges of which noise pollution is one. Current paper is based on the observations of noise levelsat three locations in different parts of Jodhpur City. Area under different categories namely industrial, residential, commercial and silence zones from the year 2019 to 2021 and results found that the noise level has been much higher than the statutory limits set by Central Pollution Control Board in the areas monitored. According to the findings of this study, some areas of Jodhpur City are highly susceptible to noise pollution.Present paper is an attempt in bringing out the situation of noise pollution in the Jodhpur city in the last few years and its impact on theresidents of Jodhpur.

Keywords: Urbanization, Noise pollution, Equivalent noise level, Evaluation, Jodhpurcity.

Introduction

"Earth provides enough to satisfy every man's needs, but not every man's greed," as the father of our country Mahatma Gandhi Ji once said. The quality of the land, water, and air has declined because of man's development-related activities, with the trend towards increased urbanization, it has a negative effect on man's health both directly and indirectly. In Jodhpur city and the surrounding area, human intervention has

caused severe environmental degradation. Along with other pollution problems, noise pollution is a significant environmental worry in the metropolis.

Whether it be water, air, or noise pollution, all environmental pollution issues have historical origins and have become much worse in recent years as a result of the increased use of contemporary technologies [1]. Vibrations in the air or another medium that reach human ears and trigger a hearing sensation are the source of sound in our surroundings. However, noise is described as a sound that interferes with social activity and has undesirable physiological and psychological impacts on a person when it becomes loud, sharp, disagreeable, or unwanted [2].

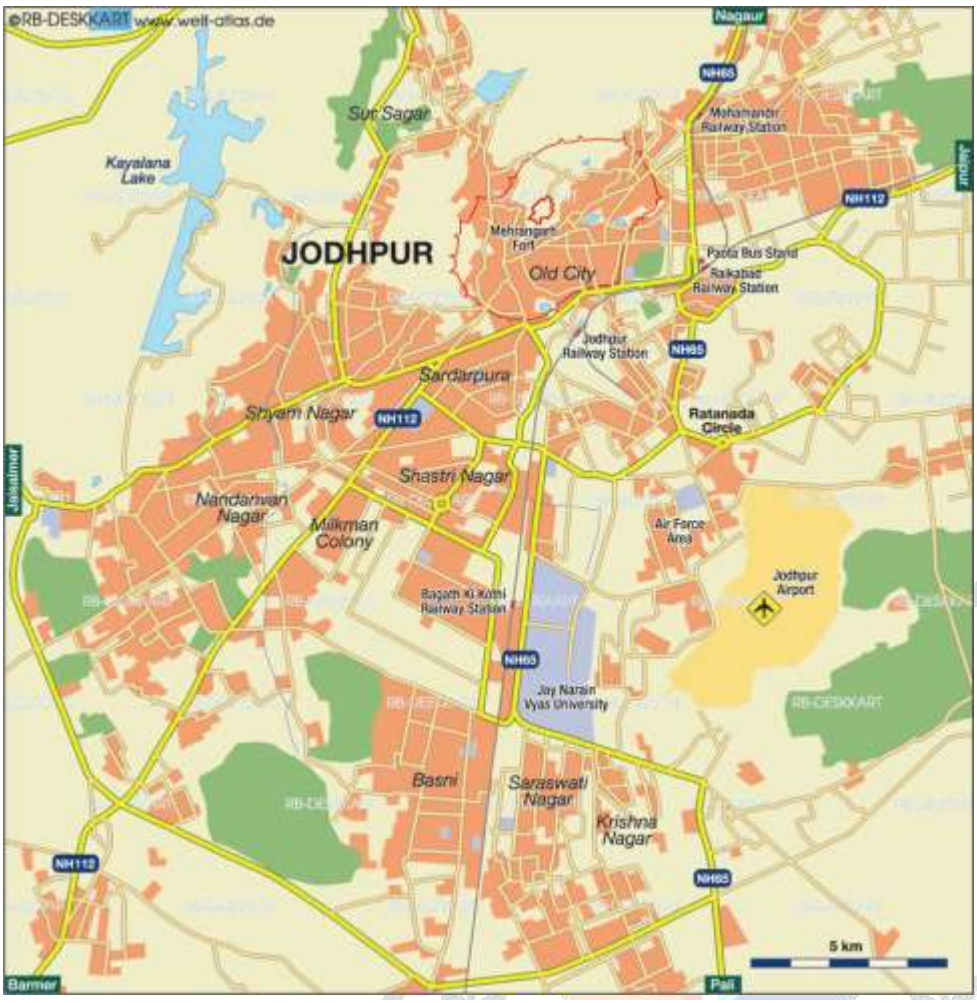
Guangzhou, China, came in first place globally for noise pollution, while Zurich, Switzerland, came in last. In the 2017 World Economic Forum report, Delhi was placed second. Chennai once again earned the distinction of being the Indian city with the most noise pollution in 2020, following Mumbai's first-place finish in 2018 and Chennai's second-place in 2019. Measures are being made in Rajasthan to monitor the level of noise pollution in the cities of Alwar, Balotra, Bharatpur, Bhilwara, Bhiwadi, Bikaner, Chittorgarh, Udaipur, Kishangarh, Kota, Pali, Sikar, Jaipur, and Jodhpur (source-Business Standard).

According to the World Health Organization, one in three individuals in Europe are adversely affected by traffic noise. In addition to the health effects on individuals, noise pollution has a major social and economic impact. Noise pollution disrupts sleep, which has a negative effect on a person's performance at work during the day. It also causes hypertension and cardiovascular disease, which adds to the burden on the health system and costs more time and money. It also has a negative impact on children's academic performance.

Site Description

Popular tourist attractions in Jodhpur display its rich past and culture.Marwar'srulers worshipped sun and because the city experiences sunshine all year long, it isknown as "Sun City". It is also known as Blue City because, under certain circumstances, copper sulphate turns blue, lending the houses their renowned uniform blue colour.

Location:



The city of Jodhpur is located in Rajasthan, a province in northwest India, in the Thar Desert. It is well known for its manufacturing of furniture, handicrafts, glass bangles, carpets, marble products, and distinctive food.In its Mehrangarh Fort, a former palace that is now a museum, from the fifteenth century, are displayed weaponry, artwork, and ornate royal palanquins (sedan chairs). The fort, which is perched on a rocky outcrop, peers down on the walled city, where many of the buildings are decorated in the distinctive blue of the area.Jodhpur had an area of 233.5 kilometers2 ,with an altitude of 231 metres .it came into being in the year 1459.

The coordinates for Jodhpurcity are 26.2389° N latitude and 73.0243° E longitude. Jodhpur has a hot desert climate (KöppenBWh), which is only slightly cooler than a hot semi-arid climate (KöppenBSh) because of its extremely high potential evapotranspiration. Even though it mostly falls from June to September and has an average depth of 362 mm (14.3 in), rainfall can vary considerably.

Demography:

The current metro area population of Jodhpur in 2022 is **1,548,000**, a 2.52% increase from 2021. The metro area population of Jodhpur in 2021 was 1,510,000, a 2.58% increase from 2020. The metro area population of Jodhpur in 2020 was 1,472,000, a 2.65% increase from 2019.

Methodology:

In order to assess the temporal variation of noise pollution load, threemajor noisy areas have been identified in respect toindustrial, commercial, residential and silent zones. Accordingly, noise levelsof each identified station namely,RSPCB,regional office had been chosen for category of commercial zone. Similarly, Soil Conservation Area under residential and MDM Hospital area for silent zones. The data of the three years that is from 2019 to 2021 has been analysed. Statistical techniques have been applied and graphical representation of the data analysis is done using SPSS.

Problem:

Any kind of sound produced due to natural phenomenon or man-made activities which is unpleasant in hearing to humans in particular and living beings in general is noise. When adverse change starts occurring due to either introduction of contaminants or due to increase in the amount of a substance in the environment that it starts having an adverse effect in the prevailing phenomenon is pollution. Pollutionis of various types but present paper focuses on noise pollution that is the noise having an adverse impact on residents of Jodhpur.

Causes:

Noise pollution can be broadly classified on the basis of the sources of its origin as Man Made Noise pollution and Environmental Noise pollution.Man, and activity are inseparable.His whole life cycle is full of activities which produce some kind of sound which vary in their intensity level. When it is unwanted, unpleasant noise then it becomes noise pollution.

1. Industrialization:

   Jodhpur is one of the important industrial cities of Rajasthan where one can see numerous big and small scale industries of various products and servicesLike Audio and Video Equipment Manufacturing, Boiler, Tank, and Shipping Container Manufacturing, Commercial and Service Industry Machinery Manufacturing, Cut and Sew Apparel Manufacturing, Electrical Equipment Manufacturing, Forging and Stamping, Glass and Glass Product Manufacturing.

   There are around 21200 registered industrial units in the district.Jodhpur city has observed an increasing trend in the number if industrial units from 12068 in 1998 to 20315 units in 2008 and 44006 units in 2018.Jodhpur is a hub for all kinds of Social, Cultural and Political activities being the district headquarter whichattracts people from all over the world for most meetings, workshops, weddings, concerts, contests, shows, music concerts, recreational activities, protests and demonstrations, celebration of festivals etc. Commercial advertising adds cherry to the cake with loud speakers usesin order to reach the maximum for maximum gains.

2. **Transportation:**The three modes of transportation—road, rail, and air—are effective at connecting Jodhpur to other areas of the state and nation. Every moving object creates sound, including every car on the road, train on the railroad, and plane in the sky. In the year 2021–2022, Jodhpur Airport served more than 7lakh passengers, making it the 44th busiest airport in India. A single trip generates noises of up to 130 dB.Up to 18 aircraft take off and land from September through March of 2021–2022, and 8 flights take off and land from April through August of 2022 in Jodhpur, both of which contribute to noise pollution.The ever-growing number of vehicles on road has increased drastically. The number of flights and the trains departing and coming to Jodhpur have not noticed a major change rather with the onset of Covid 19, the number of flights has decreased. Jodhpur junction which has a double electric line has 32 terminating trains,32 originating trains and 58 halting trains (source: Indian Rail info)Large number of vehicles on roads have been continuously increasing in the last three years. As per the Vehicle

registration data received from transport department, Jodhpur the number of vehicles has added on to the existing number with 72423 vehicles getting registered in 2018,70885in 2019,77864 in 2020 and 47864 in 2021. A result of the automobile revolution in urban centres, including Jodhpur, more vehicles are moving on previously-existing roads with a few modifications related to road enlargement and the construction of flyovers, which causes traffic jams where the constant use of horns by irate drivers adds decibels to the noise, resulting in noise pollution.

3. **Construction Activities:**.

Due to Jodhpur being the Chief Minister's constituency and the city's growing population over the past three years, construction-related activities have been ongoing and moving quickly in order to handle the city's expanding population. With each stage of development, there is a cost to be paid by man, and in this case, that cost is the rise in noise levels, which has an effect on those working on construction sites as well as those who live or work nearby. Direct effects include loud sounds that last for a short time. Indirect effects include sounds that last for a long time.

4. **Household Chores:** Gadgets have become a part of every man's life. Contemporary lifestyle cannot be imagined without them. From television to various other gadgets used by man to ease his daily activities and to make his life qualitative each used gadget produce sound when in use and it does have an impact not only on the users but also on theirsurroundings. More the households, more is the sound produced creating more of noise pollution. In relation to Jodhpur the number of families residing in the city had been 100951 in 1991,148101 in 2001 and 196436 in 2011.There has been an increasing trendper year in

the number of households residing in Jodhpur .The permissible limit of noise level in residential areas proposed by CPCB is 55dB during the day and 45 dB during night. Jodhpur city is observing increase in noise level in residential areas having increase in number of household which are industry in themselves where household chores are producing noise resulting into noise pollution.

5. **Poor Urban Planning:** Jodhpur's urban development had been haphazard. There are more houses in some neighbourhoods than in others, where large families must share a small room. Personal conflicts arise when supplies fall short of demand for necessities, which raises the city's noise pollution.

6.Environmental noise is the kind of noise that is generated by various environmental or natural activities. This can include thunderstorms that can be as loud as 140 dB or animal mating calls.

7.Besides these the sounds produced by various birds and animals reach up to 60 -80 decibelswhich also contribute in adding to the noise pollution

Central Pollution Control Board:

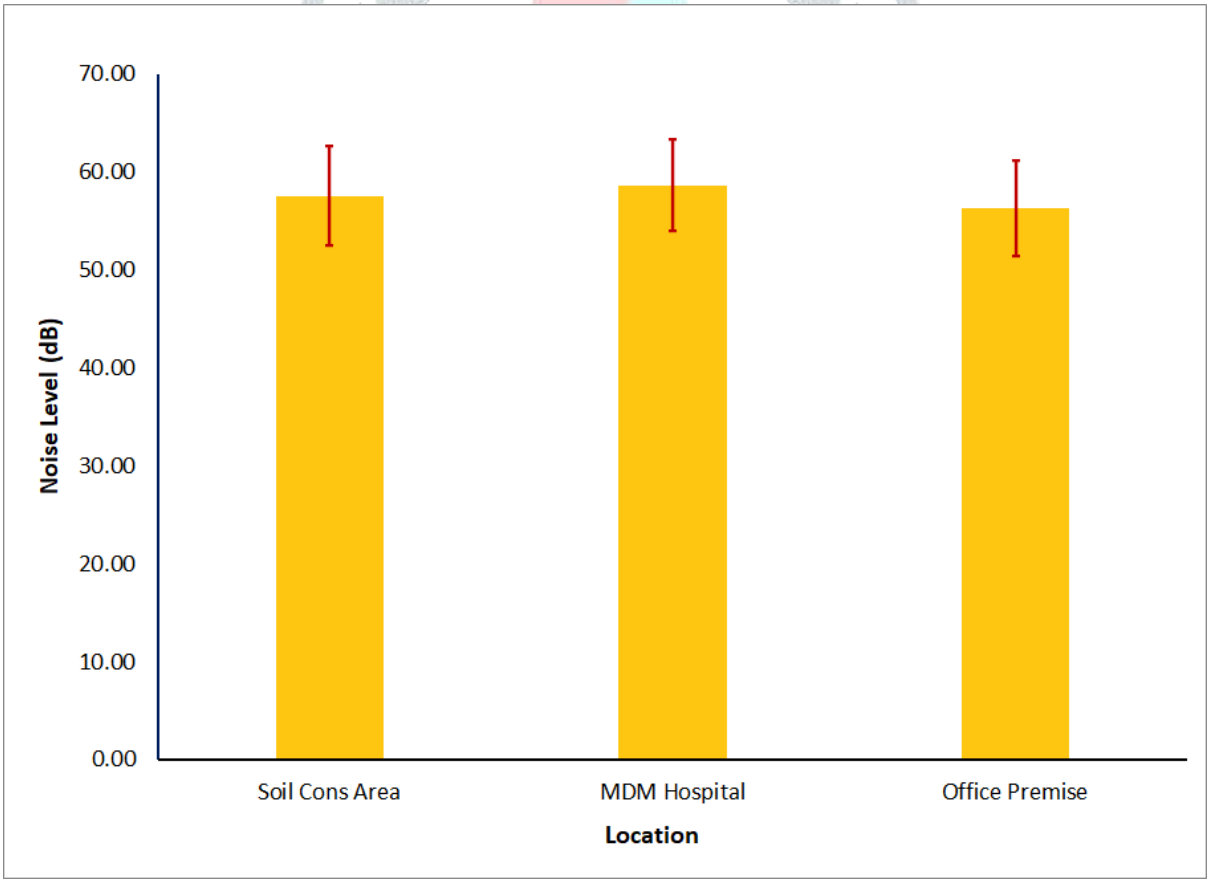
Considering The Ambient Air Quality Standards in respect of Noise given by CPCB for day time (6.00 am to 10.00 pm) and for night time (from 10.00 p.m. to 6.00 a.m.)in industrial area the standard limit of noise pollution during day time is 75 dB ,70 dB during night time, in commercial area the standard limit of noise pollution is 65 dB during the day and 55 dB for night, for residential area the per CPCB standards is 55 during day and 45 for night and lastly for the silent zone which is an area comprising not less than100 metres around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority here the permissible limit is 50 dB during day to 40 dB during night time. The data related to Jodhpur city was taken from RSPCB in which three different areas of the city were taken for Spatial temporal study. With application of statistical techniques following results were found.The monitoring locations taken under study have been categorised into three different types in RSPCB,regional office had been chosen for category of commercial zone. Similarly, Soil Conservation Area underresidential zoneand MDM Hospital area taken under silent zone and results which came out after analysis are as follows:

Noise Pollution Analysis

To test the noise pollution level in Jodhpur city, samples of noise were taken from three locations of Jodhpur city, these three locations are, the soil conservation area, MDM hospital, and office premises. The three locations can be categorized into three types of locations as far as the noise level is concerned. The soil conservation area is considered a residential zone, the office premises is considered as commercial zone, and the MDM hospital area is considered as silence zone. An analysis of noise pollution level is given in the following pages.

Location-wise (Overall)

Location	N	Mean	SD	F	df	p-Value	Result
Soil conservation area	57	57.58	10.6	0.93	2, 166	0.397	NS
MDM Hospital	55	58.66	5.44				
Office Premise	57	56.35	9.92				



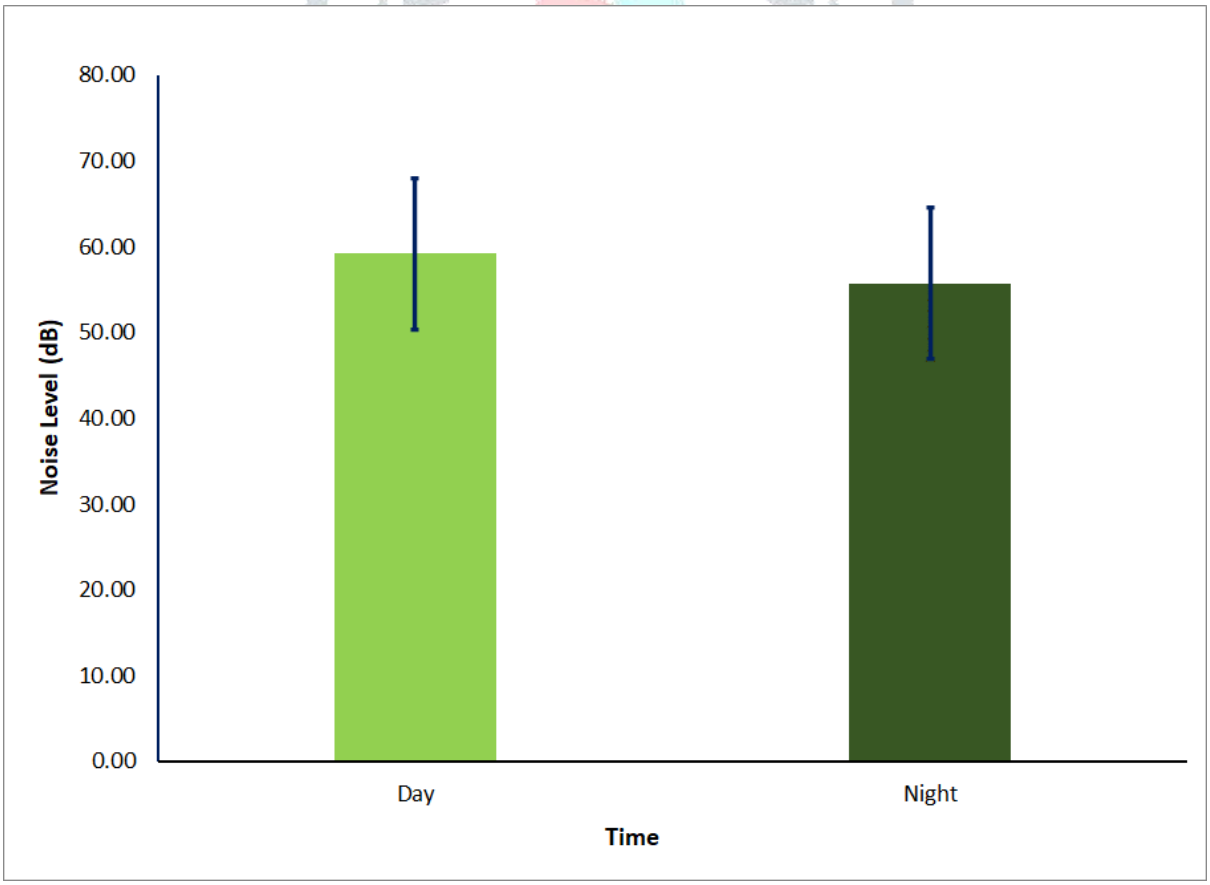
A non-significant difference in the noise pollution level of the three locations of Jodhpur city, namely the soil conservation area, MDM hospital, and office premises was found (F =0.93, p>0.05). The average noise level in these areas was around 57 dB with little difference in the noise levels of the three locations.

Time wise Test

Noise pollution is a slow and subtle killer and no doubt it adversely affects human health. This type of pollution is so omnipresent in today's society that we often fail to even notice it. Noise Pollution Level and its Harmful Effects on humans are up to 23dB noise is considered to be of no disturbance, 30-60 dB the noise adds stress, tension, psychological (illness, heart attack) effects to the human health, 60-90 dB of noise level causes damage to health, psychological and vegetative, 60 to 120 dB causes damages to health and ontological effects, above 120 dB has created painful on human health.

Time-wise

Location	N	Mean	SD	F	df	p-Value	Result
Day	86	59.22	8.83	6.53	1, 167	0.012	*
Night	83	55.75	8.84				

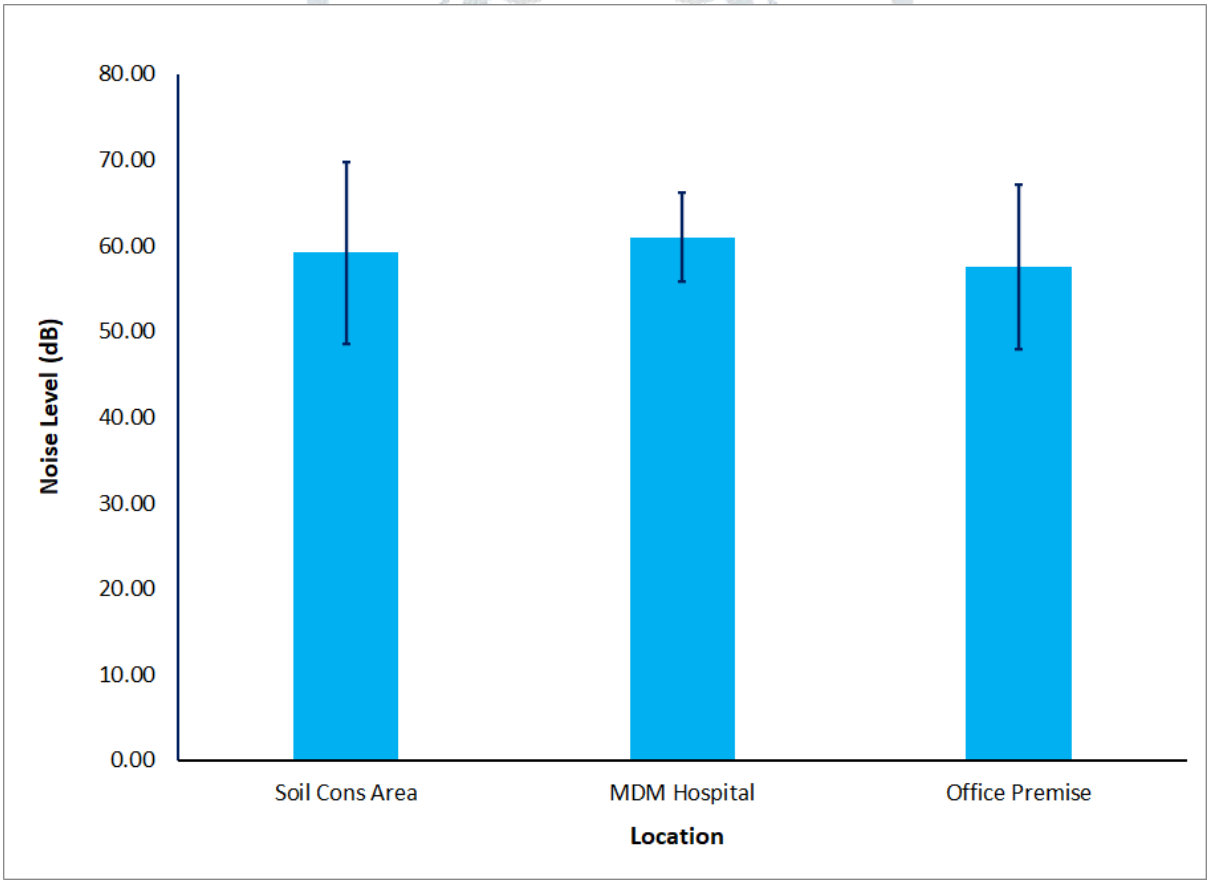


A significant difference in the noise pollution level, in the day-time, and in the night-time was found (F = 6.53, p<0.05) in the three locations of Jodhpur city, namely the soil conservation area, MDM hospital, and office premises was found. The average noise level in the day-time was 59.22 dB, which was higher than the noise level in the night-time. The average noise level at night-time was 55.75 db.

Location-wise (Day Time)

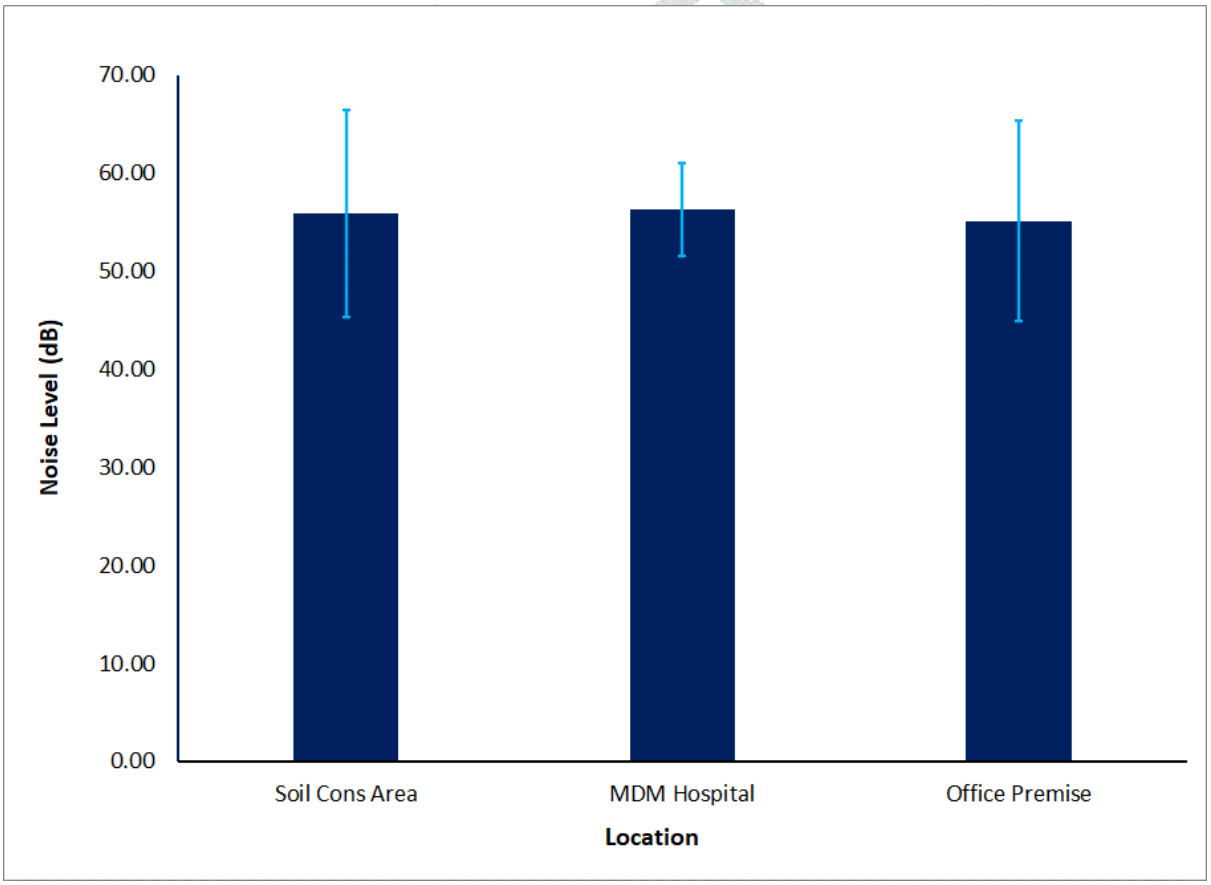
Location	N	Mean	SD	F	df	p-Value	Result
Soil conservation area	29	59.21	10.61	1.07	2, 83	0.347	NS
MDM Hospital	28	60.98	5.15				
Office Premise	29	57.55	9.63				

Further, noise pollution level at the three locations of Jodhpur city (the soil conservation area, MDM hospital, and office premises) was compared separately during the day and at night also. A non-significant difference in the noise pollution level of the three locations was found ($F = 1.07$, $p > 0.05$). The average noise level in the soil conservation area was 59.21 dB, at the Office premises it was 57.55 dB, and surprisingly at the MDM hospital area which is the silence zone the noise level was slightly higher than the other two zones. The average noise level was 60.98 dB at the MDM hospital area during day time.



Location	N	Mean	SD	F	df	p-Value	Result
Soil conservation area	28	55.90	10.50	0.12	2, 80	0.886	NS
MDM Hospital	27	56.26	4.72				
Office Premise	28	55.11	10.24				

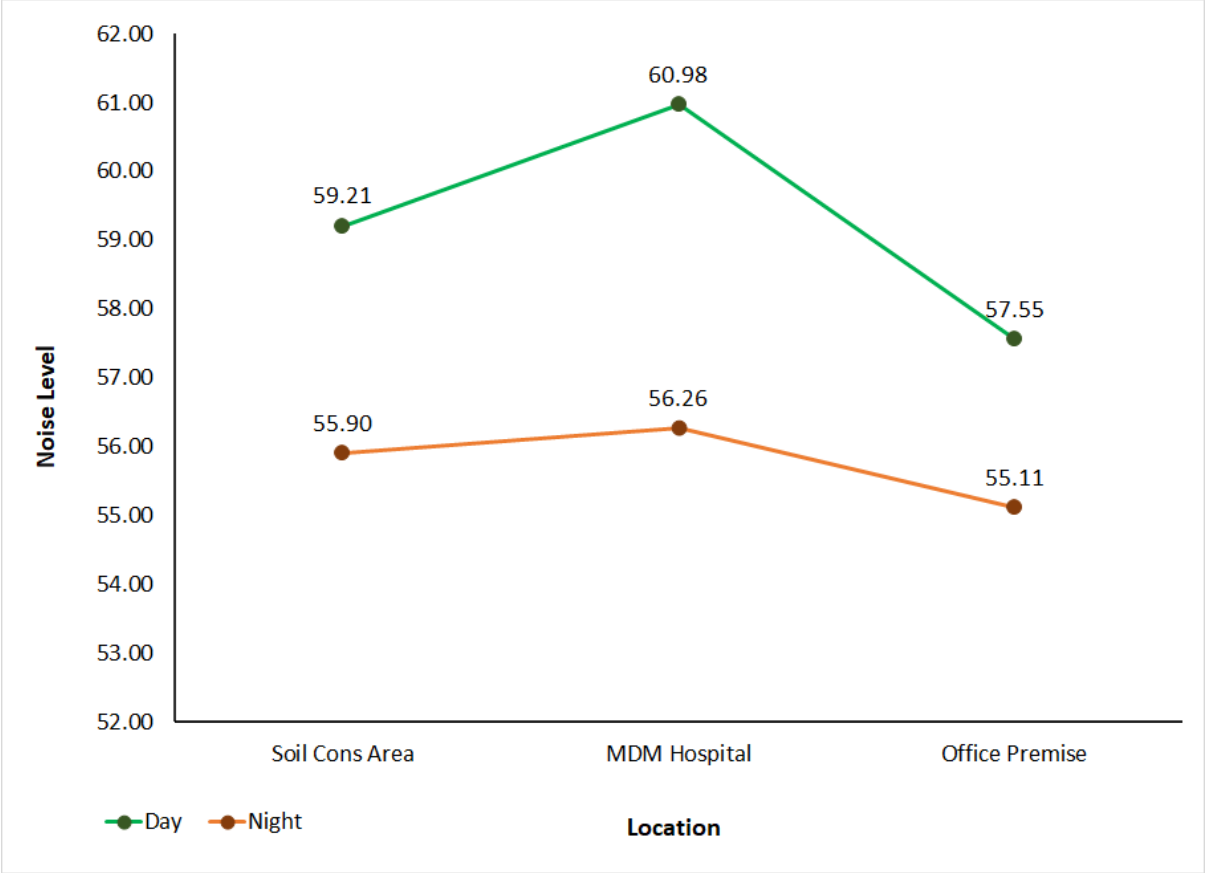
At night also a non-significant difference in the noise pollution level of the three locations was found ($F = 0.12$, $p > 0.05$). The average noise level in the soil conservation area was 55.90 dB, at the Office premises it was 55.11 dB, and surprisingly in night also, at the MDM hospital area, the noise level was slightly higher than the other two areas. The average noise level was 56.26 dB at the MDM hospital area at night.



Two-way interaction

Source	Df	SS	MS	F	p-Val	Result
Time	1	509.00	509.30	6.46	0.012	*
Location	2	150.00	74.90	0.95	0.389	NS
Time x Location	2	37.00	18.30	0.23	0.793	NS
Residuals	163	12849.00	78.80			
Total	**168**	**13545.00**				

The two-way interaction in the noise level at the three locations and in the day and night times also showed that time-wise there was a significant difference in the noise level ($F = 6.46$, $p < 0.05$) but time location there was a non-significant difference ($F = 0.95$, $p > 0.05$), and with respect to interaction also there was a non-significant difference in the noise level ($F = 0.23$, $p>0.05$).



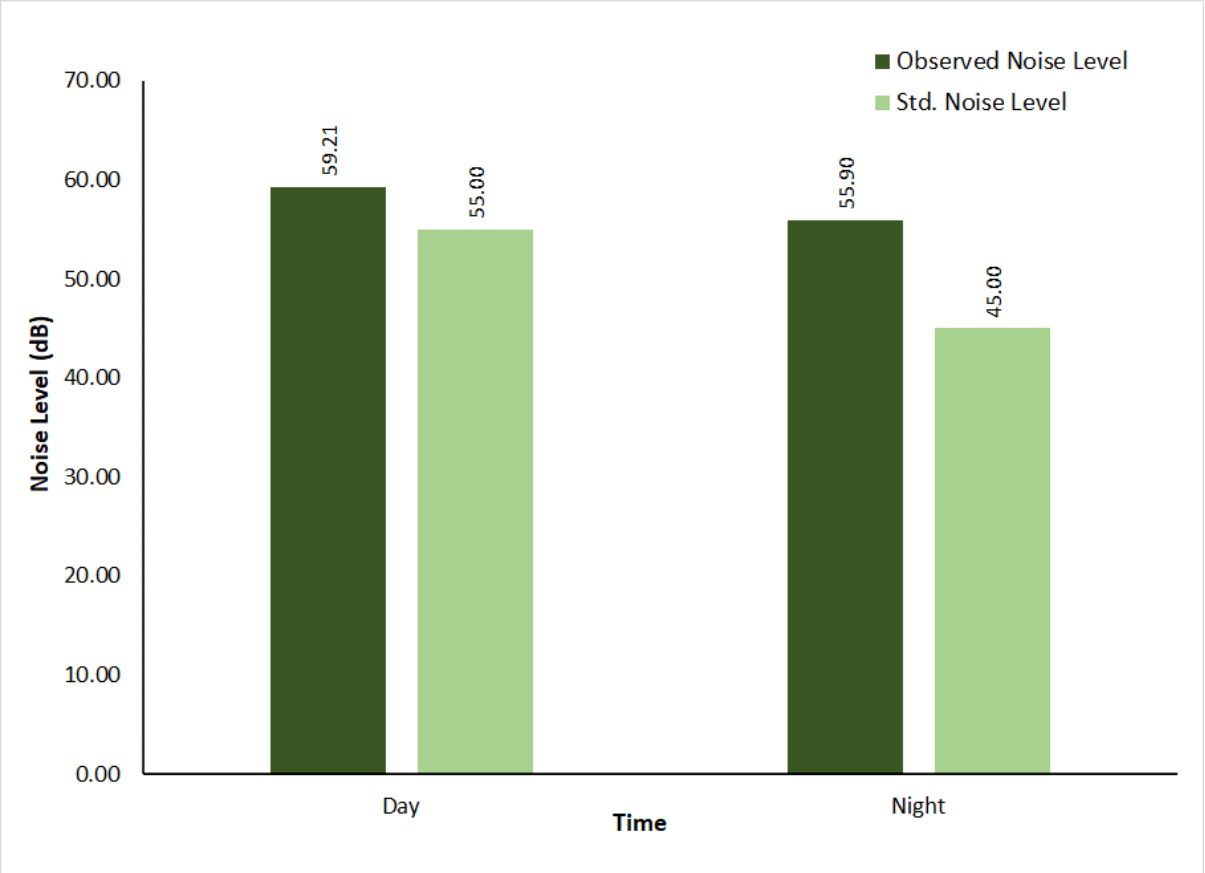
In conclusion, it can be said that location wise there is a non-significant difference in the noise level of the three locations which were considered as residential, commercial, and silence zones of Jodhpur city, but between day and night time there was a significant difference. In the day time noise level was significantly higher than the noise level in night time.

Comparison with Standard values

In the following tests comparison of noise levels in different types of areas with standard values was done. The three types of areas were the residential area (Soil conservation area of Jodhpur city), MDM hospital area (Silence zone), and Office premises (commercial zone). In these three areas, their noise levels day and night time are compared separately with standard noise levels. It was tested whether the noise level is significantly greater than the standard noise level or not.

Soil Conservation Area (Residential)

Time	N	Mean	SD	Std. Val	t	df	p	Result
Day	29	59.21	10.61	55	2.134	28	0.021	*
Night	28	55.90	10.50	45	5.495	27	0.000	***

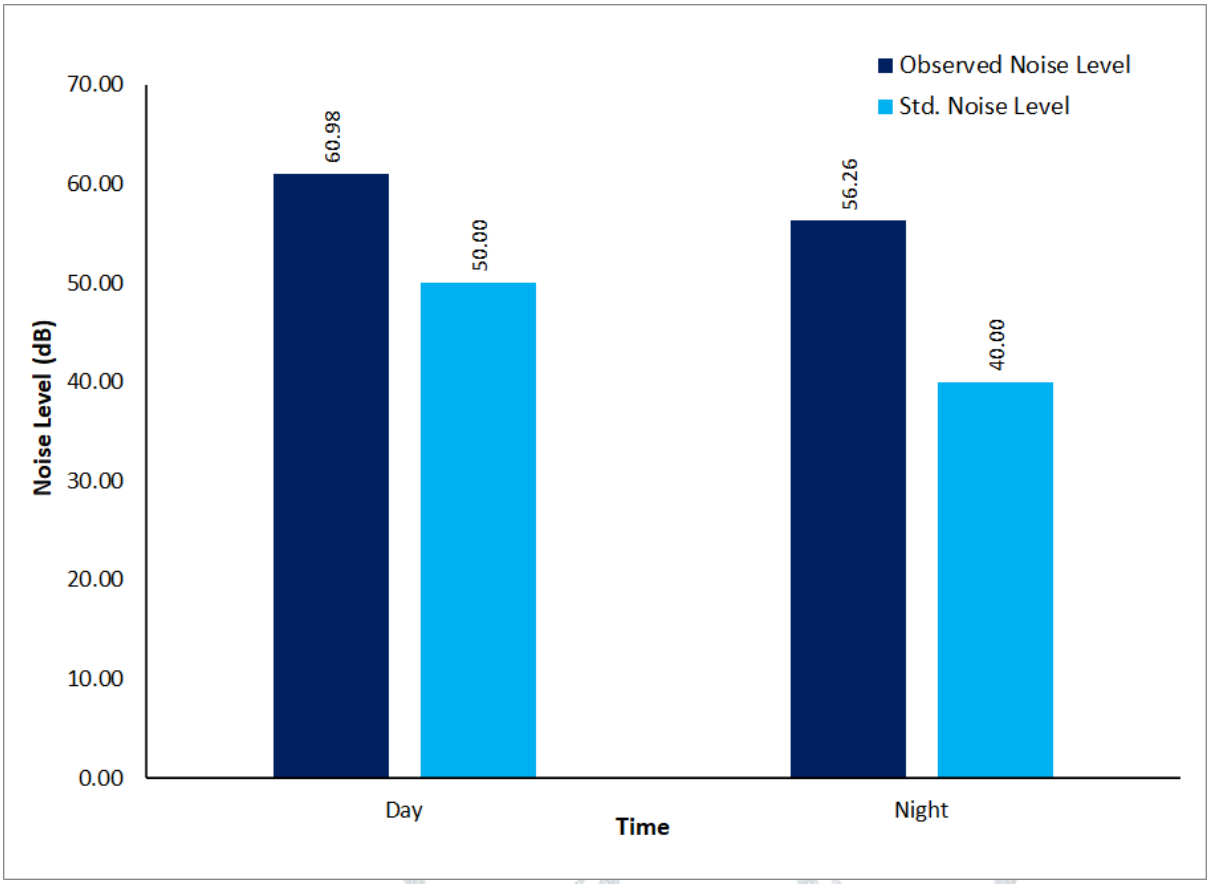


Test results given in the table above show that in both day-time and night-time, the average noise level in soil conservation areas which is considered residential zone was significantly higher than the standard noise levels. In the day-time, the average noise level was 59.21 dB which was significantly higher than the standard value of 55 dB in the residential zone during the day time ($t = 2.134$, $p<0.05$). Similarly in the night also the average noise level was 55.90. This noise level was also significantly high than the standard noise level in the residential zone during night time ($t = 5.495$, $p < 0.001$).

MDM Hospital (Silence Zone)

Time	N	Mean	SD	Std. Val	t	df	p	Result
Day	28	60.98	5.15	50	11.285	27	0.000	***
Night	27	56.26	4.72	40	17.898	26	0.000	***

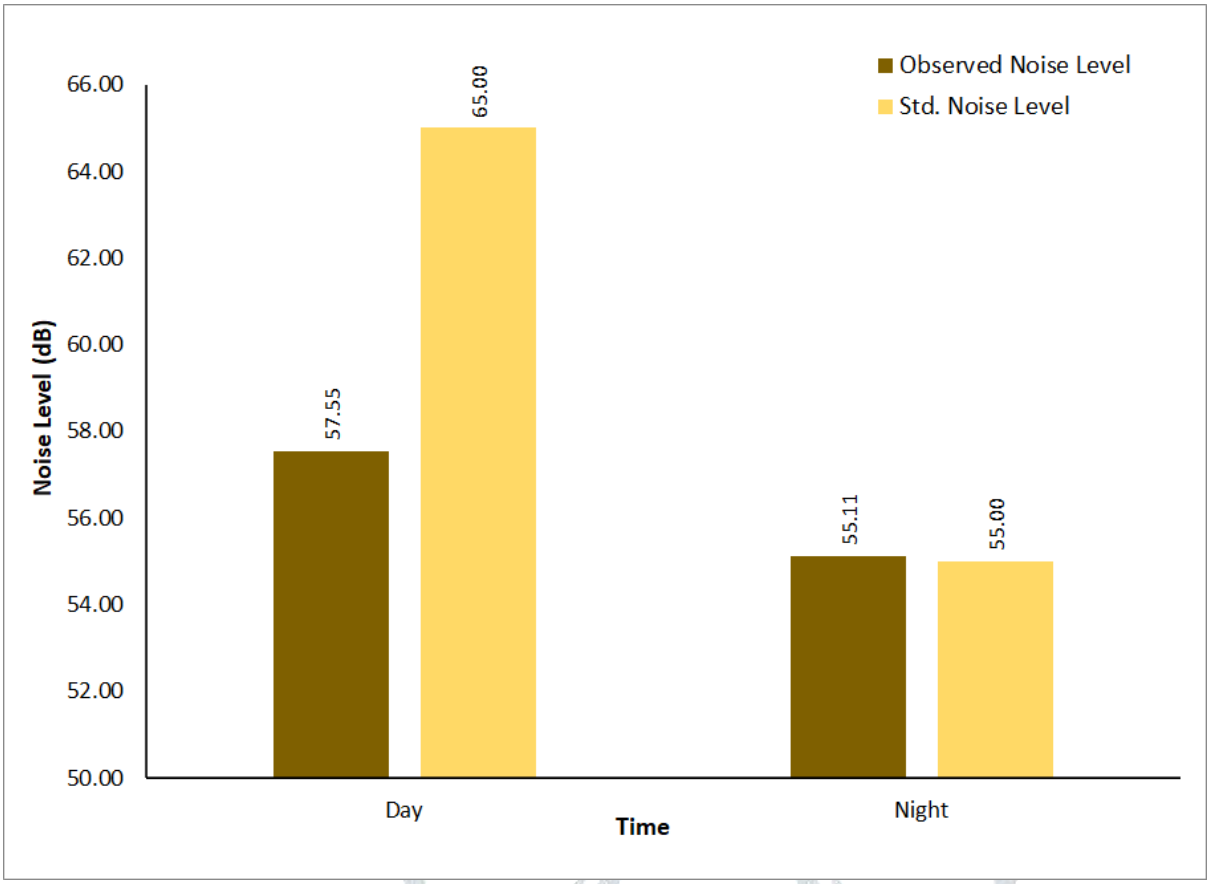
The second comparison was done for MDM hospital which is considered a silence zone. In the silence zone, the standard noise level during day time is 50 dB, in the night-time, the standard noise level is 40 dB. In the day-time, the observed noise level was significantly higher than the standard level ($t = 11.285$, $p<0.001$). Similarly in night-time also, the observed noise level was statistically highly significant above the standard noise level of 40dB ($t = 17.898$, $p < 0.001$).



Office Premise (Commercial Area)

Time	N	Mean	SD	Std. Val	t	df	p	Result
Day	29	57.55	9.63	65	-4.167	28	1.000	NS
Night	28	55.11	10.24	55	0.055	27	0.478	NS

The third comparison was made between noise levels in the commercial zone with standard noise levels in this zone. The standard noise levels in this zone are 65 dB and 55 dB during day and night times respectively. The test result shows that in both day and night time the observed noise levels were not significantly higher than the standard noise levels in these regions. In day time ($t = -4.167$, $p > 0.05$) and in night time ($t = 0.055$, $p > 0.05$). Although, the observed noise levels in the commercial zone were not significantly higher than the standard level, but the noise level is also not significantly below the standard levels.



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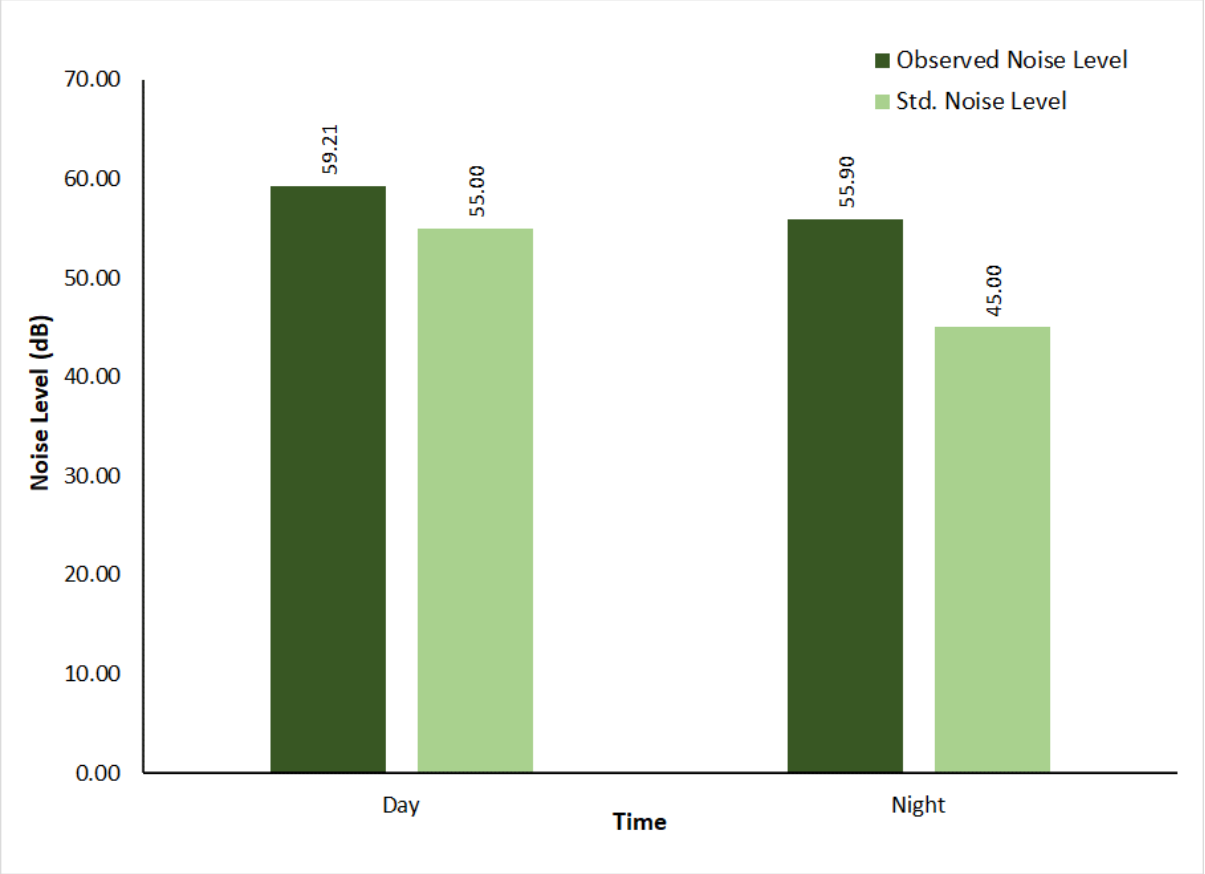

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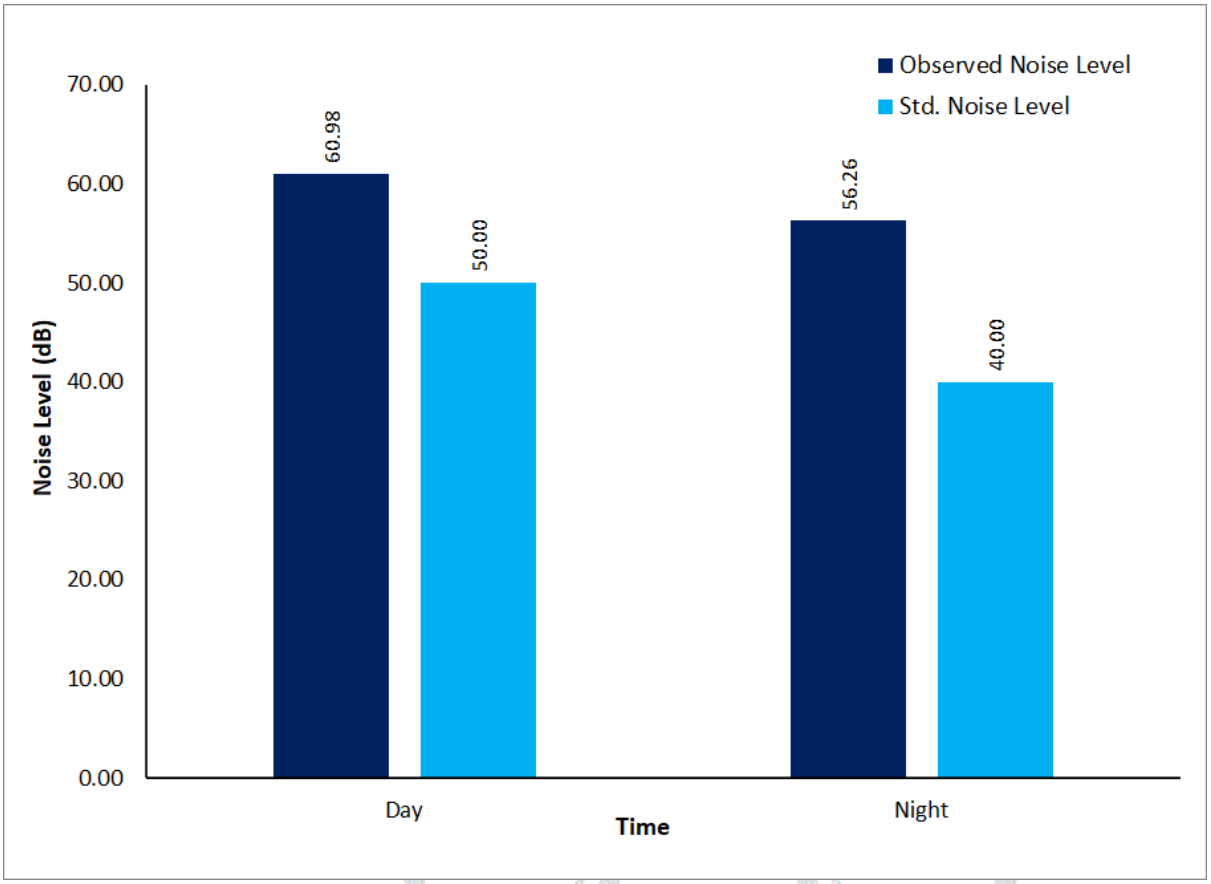

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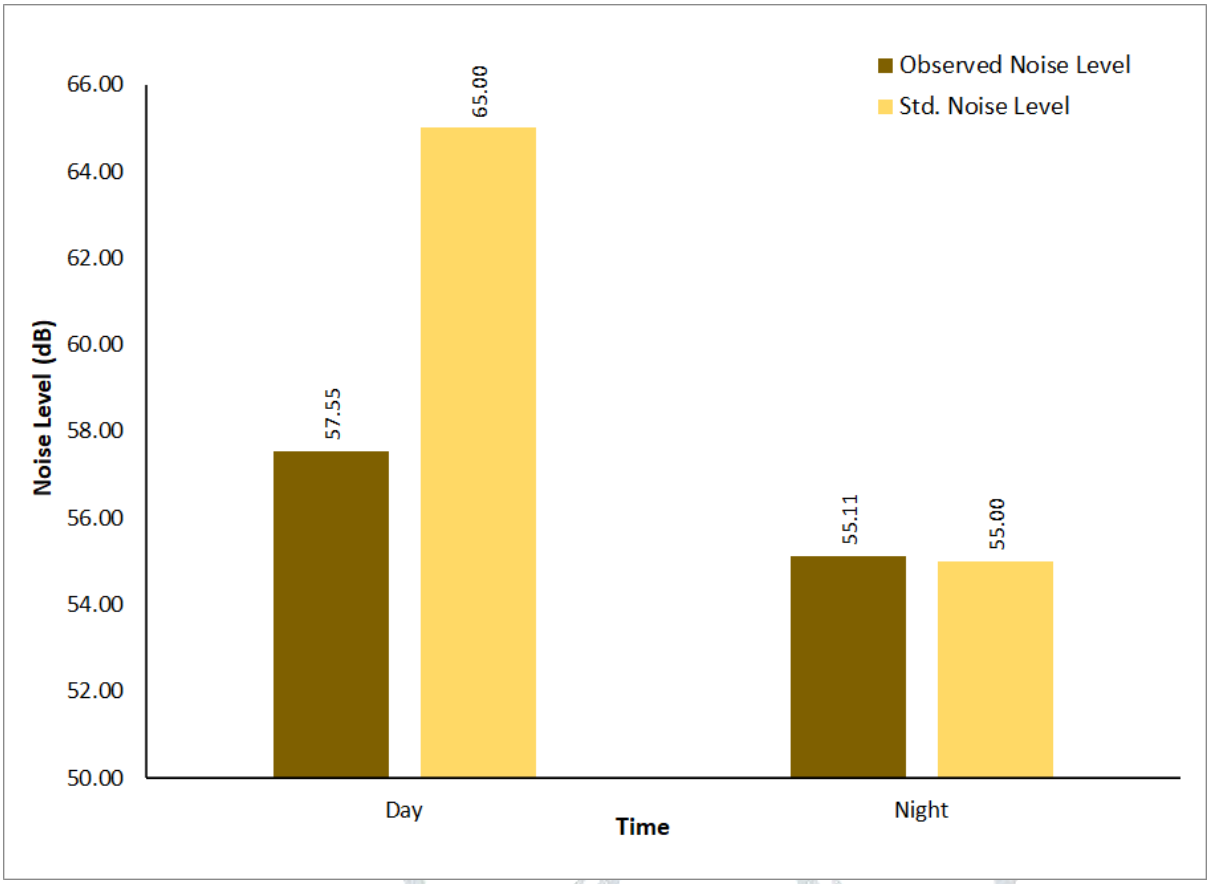
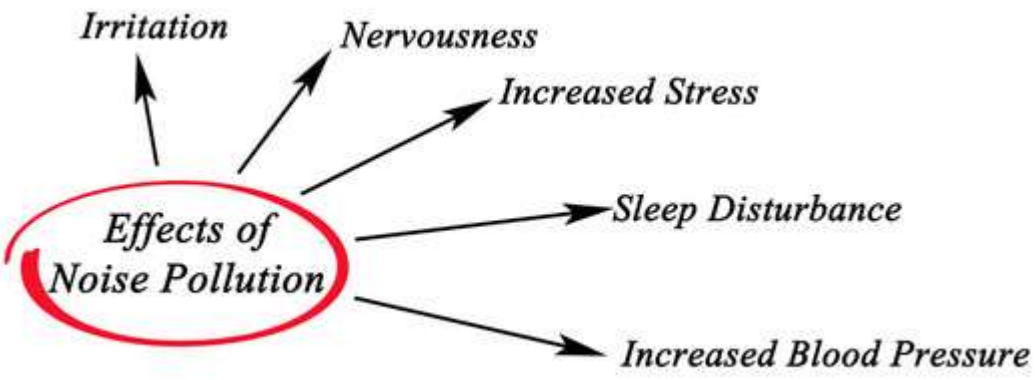


The effects of noise pollution on human health are given below:

1. **Physical Effects:**The direct impact of noise pollution can be seen on hearing impairment. When an individual is exposed for a longer period to noise than it results in the shifting ofthe hearing threshold of a person whereas exposure to sudden and high- intensity sound over a short period leads to total deafness. Besides the impact on the hearing capacity of individual noise pollution also has an impact on the vocal cords of an individual. As to communicate during noise pollution people raise their pitch to carry on the conversation.Besides physical effects people of Jodhpur also suffer from various physiological effects of noise pollution like the malfunctioning of arteries, heart,vision problems(dilation of pupil of the eye, impairment of night vision etc.),memory problems like concentration issues, retainingissues, muscular strains and neuro problems.A healthy mind resides in a healthy body-the Psychological manifestations of noise cannot go unnoticed as that plays a key role in controlling the above two reasons.



Measures for checking Noise Pollution

It is important to spread knowledge about the effects of noise pollution on the environment, particularly with regard to human health, and the steps that can be done to lessen these effects.

Psychological Effect: Noise's psychological effects should not be overlooked because they are a major factor in regulating the first two factors. Using the analysis and statistics presented above. The impact of noise pollution in the residential, commercial, and silent zones is greater than the CPCB permissible limits, with the exception of the industry zone during the day and at night. As a result, aggressive behaviour, anxiety, hysteria, hypertension, depression, and fatigue have been reported, all of which, if persistent, can lead to chronic and serious health problems. Its immediate effects can be seen in a person's level of productivity.

- More trees need to be planted in the vicinity of built-up areas because they help to lessen the level of noise pollution.
- When subjected to loud noise, earplugs should be worn.
- Keep the volume in your home between 35 and 40 decibels (dB) during the day and 35 to 35 dB at night.
- Residential areas ought to be far from locations with lots of traffic
- It is best to avoid using earphones for extended periods of time, particularly at loud volumes.
- Jobs having regularexposure to elevated sound levels should be avoided.

Unplanned urbanisation significantly contributes to the city's environmental deterioration. It is possible to find a solution to this issue of noise pollution with appropriate eco-city planning. A solution to this issue will also be sought through public involvement in noise pollution control. In the prevention and control of noise pollution, raising general awareness of environmental issues may be helpful. The Noise Pollution (Regulation and Control) Rules, 2000 must be implemented by RPCB within a reasonable amount of time under the proper jurisdiction of Jodhpur City. All of these initiatives, if implemented, will undoubtedly contribute to lowering the level of noise pollution and improving the standard of life for Jodhpur residents, thus enhancing the city.

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