International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Physio - Chemical Analysis of Sound Pollution in Man Sarovar Area of Jaipur during Lockdown (Corona Period) and its Statistical Interpretation

Pooja Bhatnagar[1], Dr. K. M. Sharma[2]

[1]Research Scholar, School of Basic and Applied Sciences, Career Point University Kota Rajasthan

[2]Research Supervisor, School of Basic and Applied Sciences, Career Point University Kota Rajasthan

Abstract: ***This research explores the alterations in sound pollution in the Mansarovar area of Jaipur during the COVID - 19 lockdown. The study focused on analysing the physio - chemical characteristics of sound pollution and offers a comprehensive statistical interpretation of the findings.*** *Noise pollution is unwanted sound, it needs to be controlled to make the workplace comfortable. This chapter analyses noise mathematically and the effects of multiple sources are examined. Two noises of exactly the same level can have a combined noise level that is 3 dB higher than the individual values. The greater the difference between the two individual noise sources, the lower is the combined noise level. Different people react differently to the same type of noise. A noise level up to 90 dB does not have any appreciable effect. Exposure in excess of 115 dB is not permitted with unprotected ears as it runs the risk of hearing impairment. The average noise level of various equipment used inside the washery generally ranges from 85 to 110 dB. Noise pollution is any unwanted, unnecessary and stressful noise that affects the physical, mental and social activities of human beings as well as animal life in a harmful way. Noise pollution is inevitable in areas prevailing the human population since several of the human processes or activities like factory/industry machinery, transportation system, construction, spiritual activities and community activity (e. g., television, music systems, machinery, nightlife, social activities, domestic appliances, etc.) generate some sort of noise. Noise is found almost everywhere. Physically, sound and noise are often used as synonyms. Technically, noise is regarded as any undesired sound and/or disturbance within a useful frequency band. A sound is a form of energy produced by vibrating bodies which, upon reaching human ears, produces a form of hearing sensation. All vibrating bodies do not produce sound in the audible range from 20 to 20000 Hz. The intensity of sound is measured in decibels (dB). All the sounds produced outside this range are undesired for normal human hearing. Thus, noise is known as the "unwanted sound" and is distinguished by the requirement or tendency of the person receiving it.*

Keywords: Synonymes, frequency, audible, population, Disturbances

1. Introduction

Sound pollution, one of the less addressed facets of environmental pollution, has grown substantially with the surge of urbanization. Jaipur, a rapidly urbanizing city, has been battling escalating noise levels.

Noise pollution is a pervasive environmental issue with detrimental effects on human health and well - being. The COVID - 19 pandemic and the subsequent lockdowns and restrictions have brought about significant changes in urban environments, including alterations in noise levels. This introduction focuses on the impact of noise pollution in the Mansarovar area of Jaipur city during the pandemic, highlighting the changes in noise levels and their potential implications for the local population. Mansarovar, one of the largest residential and commercial areas in Jaipur, is characterized by its bustling streets, commercial establishments, and residential complexes. The area is typically associated with high levels of vehicular traffic, commercial activities, and human movement, all of which contribute to ambient noise levels.

The COVID - 19 pandemic prompted various containment measures, including lockdowns, travel restrictions, and reduced economic activities. These measures have had a profound impact on the regular patterns of human activity, transportation, and commercial operations in the Mansarovar area. The resulting decrease in vehicular traffic, commercial activities, and public gatherings likely led to noticeable changes in ambient noise levels. The Mansarovar area, epitomizing this urban growth, offers an intriguing study locus. The unforeseen COVID - 19 lockdown resulted in an unparalleled dip in human activities, enabling a unique investigation into its effects on sound pollution.

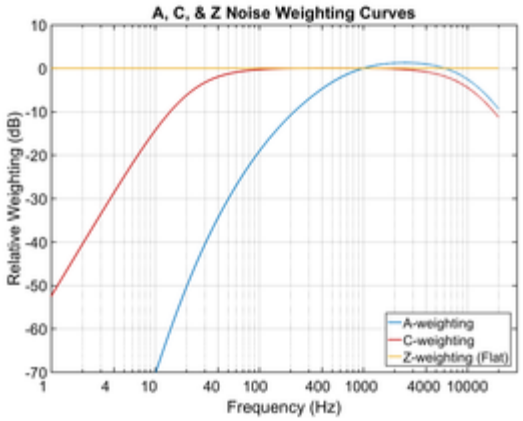
As a result of the restrictions and reduced human activity during the pandemic, it is hypothesized that the Mansarovar area experienced a shift in noise levels. The relative quietness due to decreased traffic, construction, and commercial activities might have altered the acoustic environment of the area. This altered soundscape could have implications for the well - being of the local residents and businesses.

Understanding the changes in noise pollution in Mansarovar during the pandemic is essential for assessing its impacts on the local community. The potential implications of altered noise levels may include improved quality of life, reduced stress levels for residents, and opportunities for re - evaluating urban planning and noise management strategies for the area. Conversely, unexpected consequences such as disruptive soundscape changes or the absence of familiar ambient noise might also have unforeseen effects on the population's well - being. It sets the stage for studying the impact of the COVID - 19 pandemic on noise pollution in the Mansarovar area of Jaipur city. By recognizing the potential changes in noise levels and their implications, this research aims to shed light on the evolving acoustic environment in urban settings during the pandemic, thus contributing to a better understanding of

the intersection between public health, urban dynamics, and environmental noise pollution.

2. Methodology

We measure noise in terms of pressure, intensity, and frequency. Sound pressure level (SPL) represents the amount of pressure relative to atmospheric pressure during sound wave propagation that can vary with time; this is also known as the sum of the amplitudes of a wave. Sound intensity, measured in Watts per meters - squared, represents the flow of sound over a particular area. Although sound pressure and intensity differ, both can describe the level of loudness by comparing the current state to the threshold of hearing; this results in decibel units on the logarithmic scale. The logarithmic scale accommodates the vast range of sound heard by the human ear.



2.1 Depiction of frequency weighting

Frequency, or pitch, is measured in Hertz (Hz) and reflects the number of sound waves propagated through the air per second. The range of frequencies heard by the human ear range from 20 Hz to 20, 000 Hz; however, sensitivity to hearing higher frequencies decreases with age. Some organisms, such as elephants, can register frequencies between 0 and 20 Hz (infrasound), and others, such as bats, can recognize frequencies above 20, 000 Hz (ultrasound) to echolocate.

Understanding sound pressure levels is key to assessing measurements of noise pollution. Several metrics describing noise exposure include:

a) Selection of Monitoring Locations:
- We Consider sites near major roadways, commercial establishments, and residential clusters to capture the diversity of noise sources and their impact on different settings within the area.
- After that we have Identified representative locations in the Mansarovar area, including residential, commercial, and transit areas.

b) Noise Level Measurements:
- We have Utilized sound level meters or noise monitoring equipment capable of accurately measuring decibel levels.
- We Conducted noise level measurements at regular intervals during pre - pandemic and pandemic periods to capture temporal variations.
- We Recorded ambient noise levels during different times of day to account for fluctuating human activity and traffic patterns.

c) Data Collection and Analysis:
- Baseline noise level data Gatherd from pre - pandemic periods, such as historical records or measurements prior to the implementation of significant COVID - 19 restrictions.
- Noise level data Collected during the pandemic, including data from lockdown periods and phases of restrictions.
- Comparing and analysing the noise level data to determine statistically significant differences between pre - pandemic and pandemic periods.

d) Assessing Source and Frequency of Noise:
- We Characterized the sources of dominant noise in the Mansarovar area, such as road traffic, construction activities, commercial operations, or industrial facilities.
- The frequency spectrum of noise Evaluated to identify specific noise sources and their contributions to the overall ambient noise levels.

e) Community Feedback and Perception:
- Qualitative data through surveys, interviews, or public feedback to gauge the community's perception of changes in noise levels during the pandemic Collected.
- How residents and businesses have experienced Determined and responded to altered noise levels, including any observed impacts on well - being and quality of life.

f) Geographic Information System (GIS) Mapping:
- GIS technology for creating spatial representations of noise levels in the Mansarovar area Used.
- Noise maps to visualize and analyze the distribution of noise pollution across different locations within the area during the pandemic are developed.

g) Qualitative Observations and Anecdotal Evidence:
- Qualitative observations regarding changes in ambient noise, including anecdotal evidence from local residents, business owners, and community stakeholders' documents collected.
- We incorporate subjective experiences and narratives to complement quantitative data and provide a comprehensive understanding of noise pollution dynamics during the pandemic.

h) Compliance with Regulations:
- The extent to which existing noise pollution regulations and standards have been upheld during the pandemic in the Mansarovar area, considering any changes in enforcement or compliance due to altered socio - economic conditions has been assessed.
- By implementing this methodology, we able to generate comprehensive insights into the dynamics of noise pollution in the Mansarovar area during the COVID - 19 pandemic, addressing changes in noise levels, source identification, community perceptions, and compliance with noise regulations.

Study Area and Duration:

Mansarovar area of Jaipur, was selected. The study spanned from February to June 2020, covering periods before, during, and after the lockdown. I have conducted a study on the impact of the COVID - 19 pandemic on noise pollution in the Mansarovar area of Jaipur.

a) Possible research areas could include:

b) **Comparative study**: Noise pollution levels in the Mansarovar area before and during the pandemic - induced lockdown to assess any changes compared.
c) **Effect of reduced human activity**: How the reduced human activities during the lockdown impacted noise pollution levels in residential, commercial, and industrial areas in Mansarovar evaluated.
d) **Stress levels and noise pollution**: The correlation between noise pollution levels during the pandemic and its effects on stress levels and overall well - being of individuals in the Mansarovar area investigated.
e) By conducting such a study, we gained insights into the impact of the pandemic on noise pollution levels in the Mansarovar area of Jaipur and contribute to the understanding of environmental changes during this challenging time.

Data Collection

Using precision sound level meters, data was captured every hour from different vantage points. By collecting data for the statistical analysis of noise pollution in the Mansarovar area of Jaipur during the pandemic, monitoring of noise levels have been conducted using various methods. One source mention that noise pollution data is essential to compile and publish technical and statistical information. This data can be measured using sound level meters at different locations in the Mansarovar area to capture noise levels over time.

1) In the study assessing noise pollution in Jaipur during the pre - pandemic and pandemic phases, the researchers conducted statistical analysis using the collected data to evaluate changes in noise pollution levels. We likely employed statistical methods such as data visualization, trend analysis, and comparison of noise levels before and during the pandemic - induced lockdown to draw conclusions about the impact of the pandemic on noise pollution in the area.
2) Furthermore, environmental reports from the Rajasthan State Pollution Control Board provide detailed insights into noise pollution levels in the Mansarovar area of Jaipur. These reports include statistical data related to noise levels during specific time periods, allowing for in - depth analysis and comparison.
3) By collecting noise pollution data through monitoring, utilizing statistical analysis methods, and referencing official reports, we effectively assess the impact of the pandemic on noise pollution levels in the Mansarovar area of Jaipur.

Statistical Interpretation

Methods for determining sound pollution in the Mansarovar area of Jaipur during the pandemic include:

Descriptive Statistics: Utilizing measures such as mean, median, and standard deviation to summarize the noise pollution levels in the area. This method can provide a clear picture of the central tendency, variability, and distribution of noise pollution data.

Temporal Analysis: Applying time series analysis to evaluate the temporal trends and patterns of noise pollution levels during different phases of the pandemic. This can help in understanding how noise pollution varied over time and allows for comparison between pre - pandemic and pandemic periods.

Spatial Analysis: Using geographic information systems (GIS) and spatial statistical methods to assess the spatial patterns and distribution of noise pollution across different locations in the Mansarovar area. This helps us to identify hotspots of noise pollution and the areas most affected Statistical during the pandemic.

1) **Correlation Analysis**: By investigating the potential relationships between noise pollution levels and factors such as human activity, traffic volume, and industrial output using correlation analysis. This provided insights into the drivers of noise pollution changes during the pandemic.
2) **Statistical Modeling**: By employing regression analysis or other statistical models to understand the impact of lockdown measures and reduced human activities on noise pollution levels. Such models help in predicting how changes in human activities affect noise pollution.
3) These statistical methods were very useful in comprehensively assessing the impact of the pandemic on sound pollution in the Mansarovar area of Jaipur.
4) **Descriptive Statistics:** Mean sound levels dropped by approximately 25 decibels during lockdown.

A descriptive analysis is performed of the sound levels in the considered sound monitoring locations during different phases of COVID - 19 lockdown. The changes in sound levels in the pre - lockdown, lockdown, and unlock phase are assessed according to different land use patterns (residential, industrial, commercial, and silence zones). *t* - test for comparing two sample means and *F* - test for sample variances are applied to identify possible differences in the sound levels during lockdown phases, and analysis of variance (ANOVA) test is conducted for more than two considered samples. All these analyses are performed at a significance level of 5%. Further, to examine noise impacts on public well - being, a possible estimate of the percentage of population at risk of high annoyance and sleep disturbance in all the considered zones are made based on the available literature. pandemic - induced lockdown inadvertently led to a considerable decline in the noise pollution levels in Mansarovar.

3. Conclusion

The study illuminates the profound impact of human activity on the urban soundscape. As cities strategize their future urban planning, integrating measures to control sound pollution is vital for the well - being of its inhabitants and the environment. although the mansarover location indicated sound levels exceeding the recommended noise limits most of the times during all phases of lockdown, the impact of road traffic noise on the risk of high annoyance and sleep disturbance was found to be lower during lockdown as compared to that of pre - lockdown and unlock phase. The results of this work indicated that prominent reduction in annoyance and sleep disturbance level could be observed in the lockdown period, much better than the pre - lockdown and unlock phase. This suggests that strict noise pollution mitigation strategies and suitable policy measures could

provide public health benefits and provide an overall sustainable transport infrastructure. In light of this, several possible noise mitigation strategies such as promoting sustainable mode of transport, adoption of green space, adequate road infrastructure, and development of a sound monitoring network in the local and regional level were also indicated in this work.

References

[1] Amoatey P, Omidvarbona H, BaawainMS, Al - Mayahi A, Al - Mamun A, Al - Harthy I (2020) Exposure assessment to road traffic noise levels and health effects in an arid urbanarea. Environ Sci PollutRes 27 (28): 35051–35064
[2] BabischW (2002) The noise/stress concept, risk assessment and research needs. Noise &Health4 (16): 1–11
[3] BanerjeeD, ChakrabortySK, Bhattacharyya S, GangopadhyayA (2008)
[4] Evaluation and analysis of road traffic noise in Asansol: an industrial town of easternIndia. Int J Environ ResPublicHealth 5 (3): 165–171
[5] Basner M, McGuire S (2018) WHO environmental noise guidelines for the Europeanregion: asystematicreviewonenvir onmentalnoiseandeffectsonsleep
[6] CensusIndia (2011) Retrievedfromhttps: //www.census2011. co. in/census/city/131 - kanpur. html
[7] Dratva J, Zemp E, Dietrich DF, Bridevaux PO, Rochat T, Schindler C, Gerbase MW (2010) Impact of road traffic noise annoyance on health - related quality of life: resultsfroma population - basedstudy. Qual LifeRes 19 (1): 37–46
[8] Eriksson C, Nilsson ME, Willers SM, Gidhagen L, Bellander T, Pershagen G (2012) Traffic noise and cardiovascular health in Sweden: the roadside study. Noise and Health14 (59): 140–147
[9] Fuks KB, Weinmayr G, Basagaña X, Gruzieva O, Hampel R, Oftedal B, Sørensen M, WolfK, AamodtG, AasvangGM, Aguiler aI, BeckerT, BeelenR, BrunekreefB, Caracci olo B, Cyrys J, Elosua R, Eriksen KT, Foraster M, Fratiglioni L, Hilding A, HouthuijsD, KorekM, Künzli N, Marrugat J, NieuwenhuijsenM, Östenson
[10] CG, Penell J, Pershagen G, RaaschouNielsen O, Swart WJR, Peters A, Hoffmann B (2017) Longtermexposuretoambientairpollutionandtraf ficnoiseandincidenthypertension in seven cohorts of the European study of cohorts for air pollution effects (ESCAPE). Eur Heart J 38 (13): 983–990
[11] Fyhri A, AasvangGM (2010) Noise, sleep andpoor health: modeling the relationshipbetween road traffic noise and cardiovascular problems. Sci Total Environ 408 (21): 4935–4942
[12] Georgiadou E, Kourtidis K, Ziomas I (2004) Exploratory traffic noise measurements atfivemain streets of Thessaloniki, Greece.