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# Comparative Study of Ambient Noise Levels during Ganesh Festival in COVID-19 Pandemic and Non-Pandemic Years

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ABSTRACT

In Indian culture, festivals play a significant part and are enthusiastically observed by the populace. Every religion and community in India celebrates its own culture. The majority of these ceremonies and festivities end up creating pollution, particularly noise pollution. Ganesh Chaturthi, also known as the Ganesh festival, is one such event that is enthusiastically observed in Maharashtra, India. The present represents the noise pollution levels measured at renowned community pandals in Mumbai City in four consecutive years 2019, 2020, 2021, and 2022 during the Ganesh festival. Based on indices like L10, L50, and L90, as well as noise pollution level (LNP) and noise climate (NC), noise level data was evaluated. A comparative study of noise levels was conducted for the data that was gathered during Ganesh Chaturthi. The city observed modest eco-friendly holiday celebrations, which significantly reduced noise levels brought on by the COVID-19 pandemic during the 2020 year. Elevated noise levels were recorded in the year 2022 as the restrictions imposed during the pandemic year 2020 were dropped by the government authorities. The significant decrease in noise levels during the festival exhibits the fact that the pandemic crisis serves as a wake-up call for the local administration's demonstration of noise pollution reduction. Making new rules and procedures to reduce pollution and celebrate holidays sustainably can incorporate many parts of the epidemic.

**Keywords**: Pandemic, Festive Noise, Ganesh Festival, Noise Pollution

## I. INTRODUCTION

The unwanted sound is often called 'Noise'. The degree of environmental noise differs for a considerable part of the world population, especially in regions with a dense populace and transportation networks [1, 2]. It is considered the third most hazardous pollution after air and water pollution [3]. Noise not only distracts our

attention and causes annoyance, but it also has profound effects on both humans and the environment. It has been linked to a range of physical and psychological health problems, including hearing loss, cardiovascular disease, stress, and sleep disturbance [4, 5]. In addition, noise pollution can cause disruption to wildlife habitats and interfere with their behaviors [6]. In today's culture, sound levels above 80 dB are harmful to people of all ages [7]. Excessive noise can harm our eardrums as well as our health. It may affect sleep, conversation, leading to perception of annoyance and causing hearing loss [8, 9]. Generally, motor vehicles, which are a very significant part of the urban environment, are an important source of noise emission, contributing 55% to the total noise other major contributors of noise are pollution is musical instruments, small-scale industries, urbanization, and human activities which create pollution in term of noise [10].

The rich and varied cultural legacy of India includes festivals in its entirety. The Ganesh Festival is one such the most celebrated festival celebrated annually in Maharashtra, India. It is a most important festival of Hindus which devotees celebrate every year with great preparations and enthusiasm. According to Hindu Mythology, Ganesh Chaturthi is celebrated annually on the birthday of the Lord Ganesha. Lord Ganesha is known as Vighana Harta means remover of all obstacles for devotees and Vighana Karta means creator of problems for the devil. Ganesh Chaturthi is 11 days long Hindu festival that starts on the Chaturthi with a statue installation in the home or temple and ends on Anant Chaturdashi with a bid adieu of Ganesha popularly known as 'Visarjan' in the water bodies like pond, lake or sea. The Visarjan is typically performed on different days, after 1 and a half days, the fifth day or the eleventh day of the festival. Very often these immersion processions are escorted by small music bands or cars playing loud devotional songs or ultimately community idols which have their own convoy of musical bands, loudspeakers, disc jockey sets (DJs), etc., and people of all ages descending onto the streets, dancing and singing, to the rhythms of drums and cymbals [11, 12]. This adds to the rising decibel levels in the city.

During the pandemic years, the festival has been scaled back due to restrictions imposed on public gatherings and the use of firecrackers, resulting in a reduction in noise pollution. However, there is still an increased level of noise pollution in comparison to non-pandemic years due to the use of amplified music and other sound-producing activities [13]. Hence, it is important to take steps to reduce noise pollution during the festival. Furthermore, noise pollution is a form of air pollution itself [14], which has a detrimental impact not only on human health and well-being but is a threat to our natural environment and wildlife also, disrupting the equilibrium of many ecosystems and potentially leading to the extinction of certain species [15, 16]. It is therefore essential to recognize the problem of noise pollution and its consequences and to take proactive steps to reduce exposure to it.

The present study is an attempt to assess the noise levels at different places in Mumbai city on the day of Ganesh immersion during the COVID-19 pandemic (2020) and its comparison with successor years of 2021 and 2022.

## II. MATERIAL AND METHODS

### A. Study Area

The Indian state of Maharashtra contains the city of Mumbai, which is located at 18° 58′ 30′ ′ N and 72° 49′ 3′ ′ E. Ganesh festival is celebrated throughout the city and state with jubilation, happiness, and much noise. The noise measurements during the Ganesh festival celebration were done at five well-known areas in Mumbai city: Andheri, Girgaum, Wadala, Chinchpokali, and Parel (Figure 1).

### B. Noise Measurements

The noise measurements were taken continuously for four hours from 1800 hrs to 2200 hrs outside the

pandals where continuous music with DJ systems or loudspeakers and a crowd of devotees was observed. The government has made it illegal to use loudspeakers and music systems after 2200 hours. Type-II sound level meters are used to record data at one-second intervals. A wind ball was utilized to reduce the impact of the wind while the instrument was set on a tripod stand 1.5 meters above the ground. To reduce the impact of reflections, the sound level meter's microphone was placed at least 3 meters away from walls or other hard surfaces [7, 8].

### C. Data Analysis

The sound level meter records the sound pressure level (SPL) in decibels (dB). From these readings, Leq or equivalent continuous sound pressure level is determined using the following Eq. (1), which represents the SPL of a steady sound that over a period of time has the same energy as fluctuating sound.

$$n\ Leq,T=10\log[1/n\ \Sigma\ 10Li/10] \quad (1)$$

where: Li = noise level in dB

n = number of observations at an equally spaced time interval

T = Time

Lmax and Lmin are the maximum and minimum SPL values, respectively, measured during the duration of monitoring. Exceedance percentiles L10, L50, and L90 were calculated which, respectively, indicate the noise levels exceeded during 10%, 50%, and 90% of the measuring time. Noise indices such as the noise pollution level (LNP) and the noise climate (NC) were also computed using the following equations [16]:

$$LNP = L50 + ((L10 - L90)\ 2\ /60) + (L10 - L90) \quad (2)$$

$$NC = (L10 - L90) \quad (3)$$

There is always a fluctuation in sound levels over an interval of time and the range over which the sound levels are fluctuating is the Noise climate (NC).

## III. RESULTS AND DISCUSSION

Noise levels were monitored at five popular locations in Mumbai city namely Andheri, Girgaum, Wadala, Chichpokali, and Parel which host grand celebrations during the Ganesh festival. Figure 2 displays the graphical representations of the data gathered and compared for the four consecutive years of 2019, 2020, 2021, and 2022. The year 2022 has recorded the highest noise levels at all four locations with noise levels (Leq) 83.0 dBA, 78.0 dBA, 90.0 dBA, and 88.0 dBA at Girgaum, Wadala, Chichpokali and Parel respectively (Table 1). However, Andheri witnessed 2019 as the noisiest with a noise level (Leq) of 80.4dBA. The years 2020 and 2021 had a significant decline from the previous year (2019) at all the studied locations.

The noise levels at Andheri, Girgaum, Wadala, Chichpokali, and Parel in the year 2020 were 71.8 dBA, 72.5 dBA, 71.5 dBA, 71.2 dBA, and 72.1 dBA, respectively. This is a sharp decline from the noise levels in the year prior (2019). In the year 2021, the recorded noise levels for Andheri, Girgaum, Wadala, Chichpokali and Parel were 72.4 dBA, 74.2 dBA, 72.9 dBA, 75.8 dBA and 73.0 dBA respectively indicating a little rise in noise levels (Leq) as compared to the noise levels of year 2020. Both the noise climate (NC) and the level of noise pollution (LNP) show a similar pattern across all five locations. 88 dBA is the allowed upper limit for LNP [17].

The LNP during 2022 was found to be exceeding the permissible limit at Girgaum, Chinchpokali and Parel with 97.3 dBA, 101.3 dBA and 103.3 dBA respectively. With the exception of Andheri and Chinchpokali, where it was found to be beyond the permissible limit with 88.7 dBA at each location. In contrast, it was very low during the Ganesh festival at four out of the five locations in 2020. (Table 1). At all five locations, there was a noticeable decrease in background noise (L90) and peak noise (L10) from 2019 to 2020. (Table 1). Due to awareness initiatives and the younger generation's

growing understanding of social issues in recent years, society has been better able to comprehend the importance of social causes.

It is observed that the year 2022 has recorded the highest noise levels (Leq) at all five locations (Figure 2). The year 2020, which has witnessed a global pandemic due to the COVID-19 outbreak has recorded a significant decrease (Figure 2). Due to the pandemic situation, the government prohibited community pandal set-ups for large crowd gatherings, people followed all the protocols even where the immersion was concerned. Also, the festivities in the name of music bands, DJs, loudspeakers, etc. were missing throughout the 11-day celebrations. Many pandals organized blood donation camps on this occasion, instead. The pandemic situation definitely improved the noise environment. Noise levels are lowered from Leq 80.4 dBA in 2019 to 71.8 in 2020 at Andheri, from 76.3 dBA in 2019 to 71.5 dBA in 2020 at Girgaum, from 77.8 dBA in 2019 to 71.5 dBA in 2020 at Wadala, from 83.0 dBA in 2019 to 71.2 dBA in 2020 at Chinchpokali and from 86.5 dBA in 2019 to 72.1 dBA in 2020 at Parel. Due to the pandemic, a significant low in noise levels is recorded, which is impossible to achieve in a typical scenario.

In the year 2021, when the government-imposed lockdowns were lifted step-by-step as the year progressed, there were new protocols laid down for social distancing and self-protection. Despite this, people who wholeheartedly wanted to celebrate this festival keeping in mind the pandemic situation did it in their own responsible and unique ways. A lot of individuals opted for clay idols which could be immersed in small tanks or water tubs inside the home so as not to leave the sanctuary of their homes. However, noise levels somewhat increased once again in 2021. At Andheri, Girgaum, Wadala, Chichpokali, and Parel, noise levels have increased by 0.8%, 2.2%, 1.98%, 6.1%, and 1.25% in 2021 compared to 2020, respectively. And highest level of noise was observed in 2022, when the government lifted all the restrictions imposed during the Pandemic. People celebrated the festival this year with full spirit by gathering in large numbers. The troops were accompanied by musical instruments, dhols, and loudspeakers during immersion day. Heavy traffic and vehicular noise (excessive honking) also contributed to the higher noise levels. All types of noise together led to a significant increase in noise levels as compared to last year's noise levels. Noise levels (Leq) at Andheri, Girgaum, Wadala, Chichpokali, and Parel reached up to 73.8 dBA, 83.0 dBA, 78.0 dBA, 90.0 dBA and 88.0 dBA respectively. These noise levels are 1.9%, 10.6%, 6.5%, 15.7% and 17.03% higher than they were in year 2021, respectively.

## IV. CONCLUSION

The current study sheds light on the effects of the COVID-19 pandemic and awareness during the most well-known and lengthy event, Ganesh Chaturthi, observed in the Indian state of Maharashtra, particularly in Mumbai. Due to the loud music and devotional songs played during the Ganesh festival, the public observes lavish events that contribute to noise pollution. The current study illustrates the noise pollution brought by the festive noise during four consecutive years 2019, 2020, 2021, and 2022 during the Ganesh festival. The maximum levels of celebration noise up to 75.8 dBA were reported in the year 2021, and in the non-pandemic years of 2019 and 2022, noise levels (Leq) were recorded up to 86.5 dB and 90.0 dB, respectively.

However, in the pandemic year of 2020, the city observed less noise because of restrictions put in place by the State Government during the festival. The highest noise level (Leq) recorded at that time was up to 71.2 dBA. There were rules on crowd control during daily prayer and adherence to noise pollution standards at this time. Additionally, there were fewer pandals and fewer individuals enjoying events in pandals, which significantly reduced noise levels. Additionally, the State government recommended residents use clay

or metal Ganesh idols that could be submerged in natural or constructed ponds or marble or metal Ganesh idols at home. Actions taken by the State government like organization of health-related activities/camps and live streaming glimpses of Lord Ganesh idols at famous pandals reduced crowds, vehicular traffic on the roads, and consequently noise levels. In comparison to 2019, noise levels (Leq) acutely decreased at Andheri, Girgaum, Wadala, Chichpokali, and Parel by 8.6, 6.7, 6.3, 11.8 and 14.5 dBA, respectively. However, the Leq elevated again in 2022 by 2.0 dBA, 10.4 dBA, 6.5 dBA, 18.8 dBA and 15.9 dBA at Andheri, Girgaum, Wadala, Chichpokali and Parel respectively as compared to 2020.

A pandemic crisis of this magnitude has never been seen before, and it is yet another eye-opener showing how traditions and holidays may continue with the barest amount of pomp and involvement. This is a new chapter for society since it demonstrates how important it is for people to try to refrain from old customs that can cause various forms of pollution that have a detrimental impact on the environment in order to enjoy a celebration. Making new rules and laws to reduce noise pollution and promote eco-friendly festival celebrations can incorporate many parts of the epidemic.

Conflict of interest: The authors declare no conflict of interest regarding the publication of this paper.

## V. REFERENCES


[1]. He et al., 2018, Q. He, W. He, Y. Song, J. Wu, C. Yin, Y. Mou, The impact of urban growth patterns on urban vitality in newly built-up areas based on an association rules analysis using geographical 'big data' Land Use Policy, 78 (2018), pp. 726-738, ArticleDownload PDFView Record in ScopusGoogle Scholar

[2]. Dorina Pojani (2012) Noise Pollution Management Issues in Tirana, the Capital of Albania. Proceedings REAL CORP 2012 Tagungsband 14-16 May 2012, Schwechat.

[3]. World Health Organization (WHO), 2005, United Nations road safety collaboration: A handbook of partner profiles (2005), Google Scholar

[4]. Said and El-Gohary, 2016, M.A. Said, O.A. El-Gohary, Effect of noise stress on cardiovascular system in adult male albino rat: Implication of stress hormones, endothelial dysfunction and oxidative stress, General Physiology and Biophysics, 35 (3) (2016), pp. 371-377, View PDF CrossRefView Record in ScopusGoogle Scholar

[5]. Münzel and Sørensen, 2017, T. Münzel, M. Sørensen, Noise pollution and arterial hypertension European Cardiology Review, 12 (1) (2017), p. 26, View PDF CrossRefView Record in ScopusGoogle Scholar

[6]. Khan et al., 2018, J. Khan, M. Ketzel, K. Kakosimos, M. Sørensen, S.S. Jensen, Road traffic air and noise pollution exposure assessment–A review of tools and techniques. The Science of the Total Environment, 634 (2018), pp. 661-676, ArticleDownload PDFView Record in ScopusGoogle Scholar

[7]. N.U. Singh and D. Shinde, Study of Noise Pollution Levels during a Hindu Festival in Dhar Town, MP, India, 2013, Research Journal of Chemical Sciences, 71-75.

[8]. Mandal I, Pal S. COVID-19 pandemic persuaded lockdown effects on environment over stone quarrying and crushing areas. Sci Total Environ. 2020 Aug; 732:139281.

[9]. Naish, D. A. Tan, A.C.C. and Demirbilek, F. N. (2012): Estimating Health Related Costs and Savings from Balcony Acoustic Design for Road Traffic Noise. Applied Acoustics., 73: 497

[10]. Vijay R, Chakrabarti T, Gupta R. Characterization of Traffic Noise and Honking Assessment of an Indian Urban Road. Fluct Noise Lett. 2018;17:1850031.

[11]. Bhende SB, Bhave PP. Study of noise pollution during Ganesh utsav in Mumbai city. Int J Adv Res Sci Eng Technol. 2014;3(7).

[12]. Sathe CP, Kadam AM, Ahire KD. Assessment of noise level during Ganesh festival in residential zone of Kolhapur city. Int J Trend Sci Res Develop. 2019. https://www.ijtsrd.com/papers/ijtsrd23082. pdf

[13]. Komal Kalawapudi, Taruna Singh, Ritesh Vijay*, Nitin Goyal, and Rakesh Kumar, Effects of COVID-19 pandemic on festival celebrations and noise pollution levels, Noise Mapp. 2021; 8:89–93 https://doi.org/10.1515/noise-2021-0006 Received Sep 15, 2020; accepted Dec 22, 2020

[14]. Lisa Goines, RN, and Louis Hagler, MD, Noise Pollution: A Modem Plague review article, Southern Medical Jour11al · Volume 100, Number 3, March 2007, 287-294

[15]. Meillère, A., Brischoux, F. and Angelier, F. 2015. Impact of chronic noise exposure on antipredator behaviour: an experiment in breeding house sparrows. Behav. Ecol. 26: 569-577.

[16]. Merrall, E.S. and Evans, K.L. (2020) Anthropogenic noise reduces avian feeding efficiency and increases vigilance along an urban–rural gradient regardless of species' tolerances to urbanisation. Journal of Avian Biology, 51 (9). e02341. ISSN 0908-8857, pp1-8

[17]. Kalawapudi K, Singh T, Dey J, Vijay R, Kumar R. Noise pollution in Mumbai Metropolitan Region (MMR): an emerging environmental threat. Environ Monit Assess. 2020 Jan;192(2):152.

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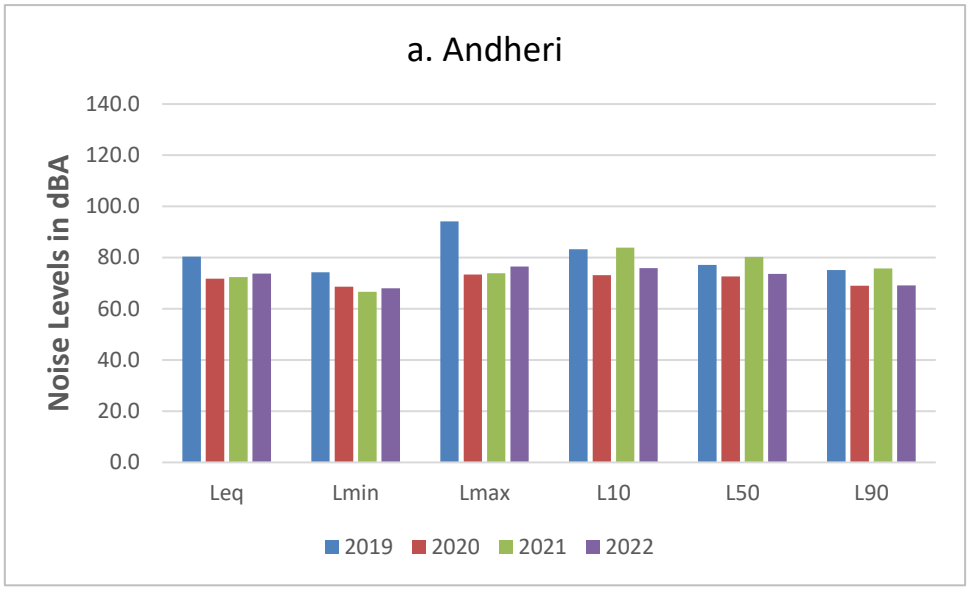
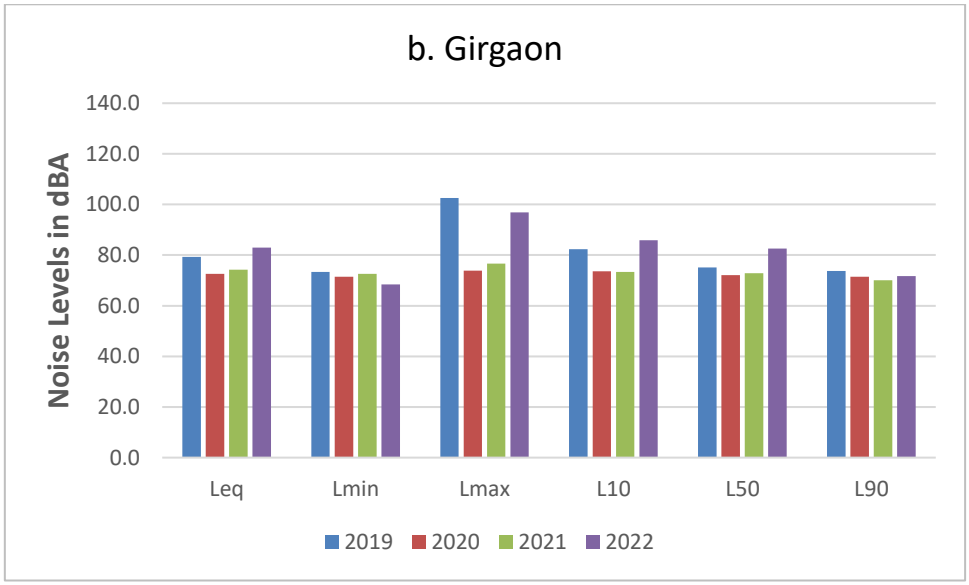
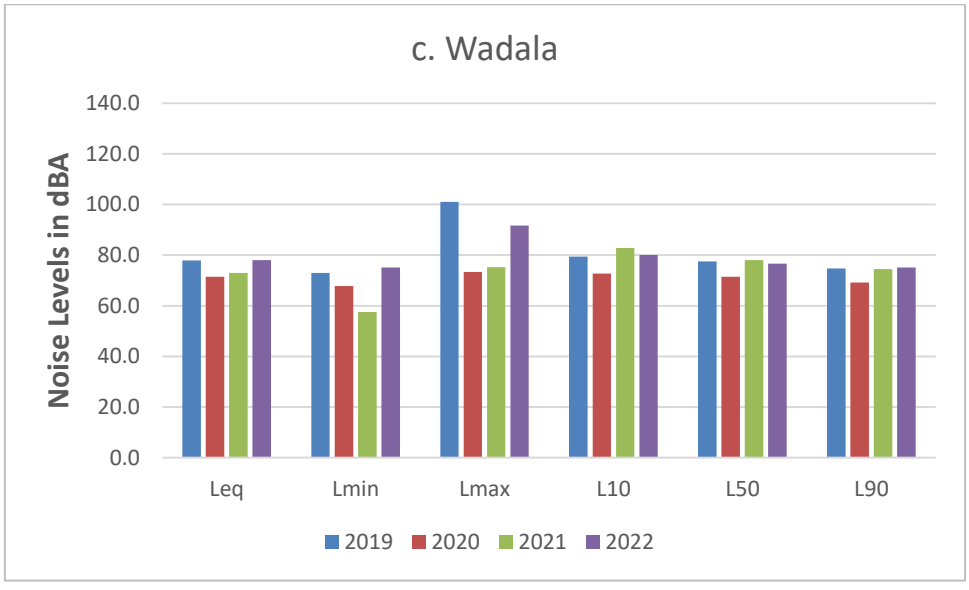
Table I : Noise Descriptors Representing Noise Environment During Ganesh Festival in Mumbai City

| Sr.No. | Sites | Year | Leq (dBA) | $L_{min}$ (dBA) | $L_{max}$ (dBA) | $L_{10}$ (dBA) | $L_{50}$ (dBA) | $L_{90}$ (dBA) | $L_{NP}$ (dBA) | NC (dBA) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **Andheri** | 2019 | 80.4 | 74.3 | 94.1 | 83.3 | 77.2 | 75.1 | 85.7 | 8.2 |
| | | 2020 | 71.8 | 68.7 | 73.4 | 73.2 | 72.6 | 69.0 | 76.9 | 4.1 |
| | | 2021 | 72.4 | 66.6 | 73.9 | 83.9 | 80.3 | 75.7 | 88.7 | 8.1 |
| | | 2022 | 73.8 | 68.0 | 76.6 | 75.9 | 73.7 | 69.2 | 80.6 | 6.7 |
| 2 | **Girgaon** | 2019 | 79.3 | 73.3 | 102.6 | 82.4 | 75.1 | 73.7 | 84.0 | 8.7 |
| | | 2020 | 72.5 | 71.4 | 73.8 | 73.6 | 72.1 | 71.4 | 74.4 | 2.2 |
| | | 2021 | 74.2 | 72.6 | 76.6 | 73.3 | 72.9 | 70.1 | 76.2 | 3.2 |
| | | 2022 | 83.0 | 68.4 | 96.9 | 85.9 | 82.6 | 71.7 | 97.3 | 14.2 |
| 3 | **Wadala** | 2019 | 77.8 | 73.0 | 101.1 | 79.5 | 77.5 | 74.8 | 82.4 | 4.7 |
| | | 2020 | 71.5 | 67.8 | 73.3 | 72.8 | 71.4 | 69.2 | 75.1 | 3.6 |
| | | 2021 | 72.9 | 57.6 | 75.2 | 82.8 | 78.0 | 74.4 | 86.6 | 8.3 |
| | | 2022 | 78.0 | 75.1 | 91.7 | 80.1 | 76.6 | 75.1 | 81.8 | 5.0 |
| 4 | **Chinchpokali** | 2019 | 83.0 | 61.3 | 109.6 | 84.2 | 73.7 | 65.8 | 92.7 | 18.4 |
| | | 2020 | 71.2 | 68.4 | 73.2 | 72.5 | 71.3 | 69.1 | 74.8 | 3.4 |
| | | 2021 | 75.8 | 72.8 | 78.4 | 83.9 | 80.3 | 75.7 | 88.7 | 8.1 |
| | | 2022 | 90.0 | 72.8 | 96.3 | 91.8 | 83.9 | 75.0 | 101.3 | 16.8 |
| 5 | **Parel** | 2019 | 86.5 | 69.7 | 93.1 | 88.8 | 73.6 | 69.9 | 93.2 | 18.9 |
| | | 2020 | 72.1 | 66.6 | 74.6 | 74.5 | 71.5 | 67.2 | 79.1 | 7.3 |
| | | 2021 | 73.0 | 65.7 | 74.6 | 82.5 | 78.7 | 74.1 | 87.4 | 8.4 |
| | | 2022 | 88.0 | 70.0 | 94.0 | 90.8 | 83.4 | 71.5 | 103.3 | 19.2 |


a. Andheri
Noise Levels in dBA
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Leq
Lmin
Lmax
L10
L50
L90
2019
2020
2021
2022


b. Girgaon
Noise Levels in dBA
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Leq
Lmin
Lmax
L10
L50
L90
2019
2020
2021
2022


c. Wadala
Noise Levels in dBA
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Leq
Lmin
Lmax
L10
L50
L90
2019
2020
2021
2022

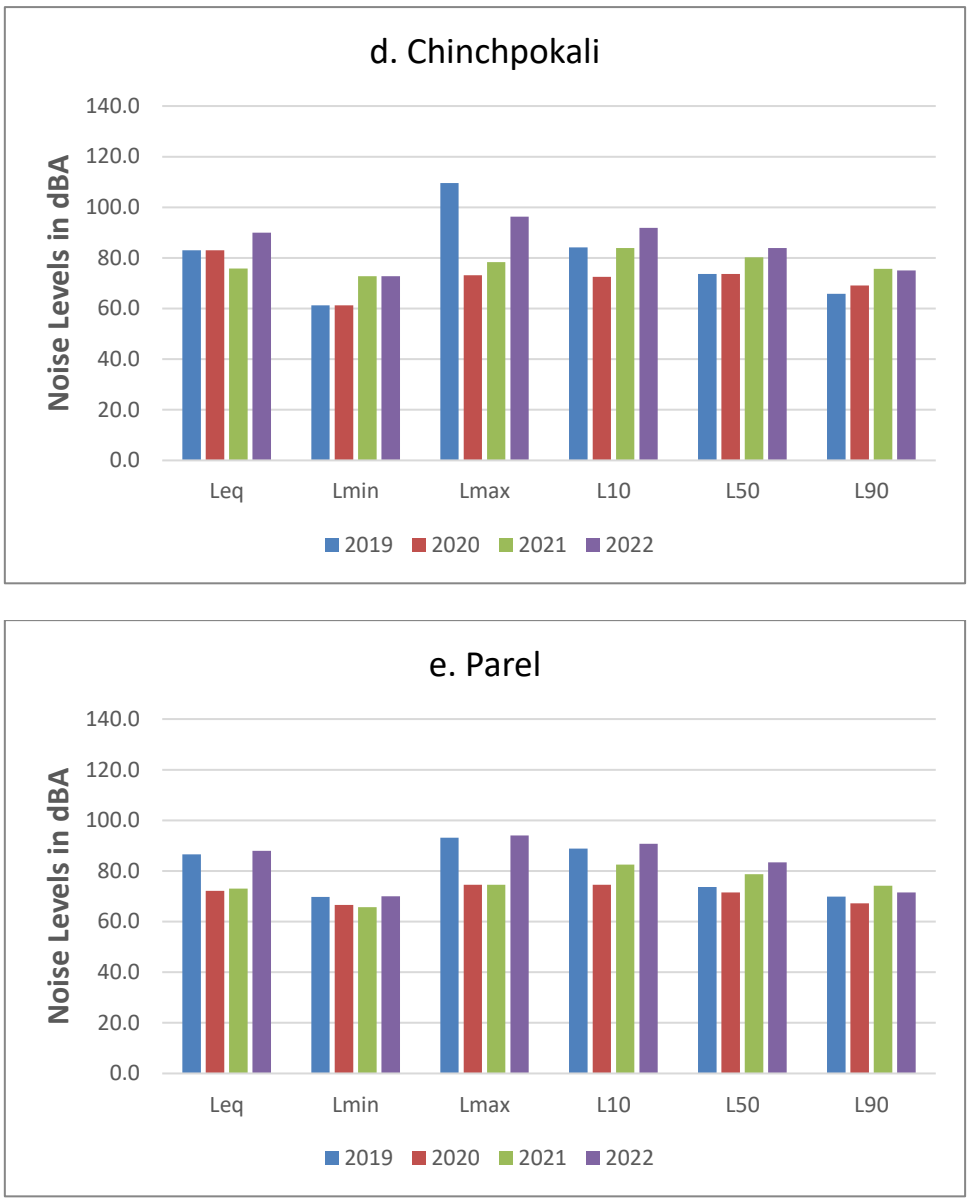



Fig 1: Comparison of noise levels during Ganesh Festival at: a) Dadar, b) Girgaum c) Wadala d) Chinchpokali and e) Parel in Mumbai City