

Evaluation and analysis of Noise levels due to Aircrafts in Urban area: Lucknow City

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ABSTRACT

Airplanes in India and all over the world serve a great mode of transport as they save time. But in recent years, Indian cities have emerged to be one of the most noise polluted cities in the world, causing several health related problems to the dwellers. Despite implanting better engines in the airplanes that cause less noise, airplanes have remained a great source of noise pollution for the residents living near the airports. Near Delhi airport, the residents of the Vasant Kunj area in South Delhi complained about such nuisance. So, Lucknow is also one such big city, which serves as the capital city of Uttar Pradesh, there are many schools, residential areas and Hospitals located near this big airport(which is second after the Delhi Airport). So the objective of this study is to evaluate noise levels at these 2 nearby locations of Lucknow airport and compare them. In the times of rapid growth, aircrafts are playing an immense role in saving time and traversing greater distances. Engines of the airplanes are the major source of noise and can exceed 140 decibels (dB) during takeoff. The aim of this study is to evaluate noise levels at two nearby locations of **Chaudhary Charan Singh Airport, Lucknow**. These two locations are namely, NKM school Sector 9b Vrindavan Yojna-2 which is a educational building and the other one is near Omaxe City, Bijnour Road, Lucknow. This airport has two terminals, namely, T₁, for International facilities and T₂, for domestic services. At present, it operates 75 flights everyday (on an average), out of which 67 are domestic and 8 are international.

Keyword: Noise Pollution, Aircrafts, Lucknow Airport, WHO

1.INTRODUCTION

The term Noise has been derived from "Nausea", a Latin word, which translates as "Unwanted sound". Noise is known to have several health effects on human as well as animal lives. It is known to have both physiological and psychological health effects. Underdeveloped and developing countries of Africa and Asia face this problem at a large scale as they are already deprived of the funds. Noise pollution is mainly because of construction activities, heavy traffic on roads, industrialization, sounds at parties and weddings, large gatherings, etc. Noise is relative as it can be problematic for one person and can be normal for other person. Cardiovascular diseases have been becoming common in humans due to long time exposure to increased levels of sound. Sound is the pressure variation in the media and is sensed by ears. Some creatures can sense extraordinarily low sound levels that are not audible to humans. Mutts and bats are its examples. Marine or aquatic life also gets affected by increased sound levels as they may fall prey to predators and their navigation, food chain, reproduction also get hampered.

2.STUDY AREA

Chaudhary Charan Singh Airport, Lucknow is the second busiest airport of North India after Indira Gandhi International Airport, Delhi as well as one of the major airports of India. For the study, outside of Omaxe City,

Bijnour Road, Lucknow and NKM School Sector 9b Vrindavan Yojna are chosen as they are located near the airport and the noise produced by passing by airplanes can nuisance to the residence.

3.IMPORTANCE OF STUDY

The city of Lucknow, being the capital city of the highest populous state of India, Uttar Pradesh serves as one of the important centers for the air travel throughout the country and abroad. Being the 11th busiest amongst all the international airports, it is important to evaluate the noise pollution at nearby places of the airport at important locations such as hospitals, schools and residential areas. The city is also home to many historical monuments and the recent growth in IT sector and education centers has increased the number of air passengers and that's why it is important to evaluate the noise levels associated with airplanes near Lucknow Airport. Lucknow City is popularly referred to as the 'Nawabs' City.' Situated on the banks of the Gomti River, its history dates way back to the Suryavanshi dynasty times. Nawab Asaf-ud-Daula established Lucknow, capital of Uttar Pradesh. It served as the capital of Awadh's nawabs in the olden days and that's why it is also called the Nawabs' city.

4.MATERIALS AND METHODS

This study on evaluation and comparison of environmental noise pollution was conducted in Lucknow during the end of July, 2020, Post-Covid. The two sampling locations that were selected for the study of the noise are outside of NKM School Sector 9b Vrindavan Yojna and Omaxe City, Bijnour Road, Lucknow. For the measurement of sound levels, Sound Level Meter (YFE Model YF-20) in the 'A' weighing network is used. The airplanes data(names, type Arrival/ Departure time) was given by Airport Authority of India, posted at AAI Central Head Quarter, Rajiv Gandhi Bhawan, Safdarjung Airport, Jor Bagh, New Delhi, 11003.

The meter was placed 1.3-1.5m above ground level. Noise level of the aircraft was taken for each passing aircraft when it was passing overhead and for each location, the readings were taken for 2 days; and in total for 4 days.

$$L_{avg} = 10 \log \frac{1}{N} \sum_{j=1}^N 10^{\left(\frac{L_j}{10}\right)}$$

N= number of sample

L_j = sound power level measured at reference power level 10^{-12} W, dB(A)

j= 1,2,3...n

5.MEASURING INSTRUMENT

5.1 Specifications of the Sound Level Meter

SL-1352 IEC 61672-ICLASS2 Class

Main processing (Main channel)

Instantaneous sound pressure level- L_p

Equivalent continuous sound pressure level L_{eq}

Sound exposure level - L_E

Maximum sound pressure level – L_{max}

Minimum sound pressure level – L_{min}

6.RESULTS AND DISCUSSION:

Day 1: L_{avg} calculated at this location is 66.24792 dB which is greater than 55 dB as well as 40 dB. The readings were taken at this location from 01:00 PM to 10:00 PM and the analyses of the data showed that the planes which were flying from Lucknow tend to cause more noise than the ones that were coming for landing. The maximum noise recorded at this location was produced by SEJ9665 which is a Boeing 737-800 medium type of aircraft and the minimum noise was produced by VTCLF (Falcon 2000 medium type of aircraft). All these aircrafts shown in the table were all coming to Lucknow.

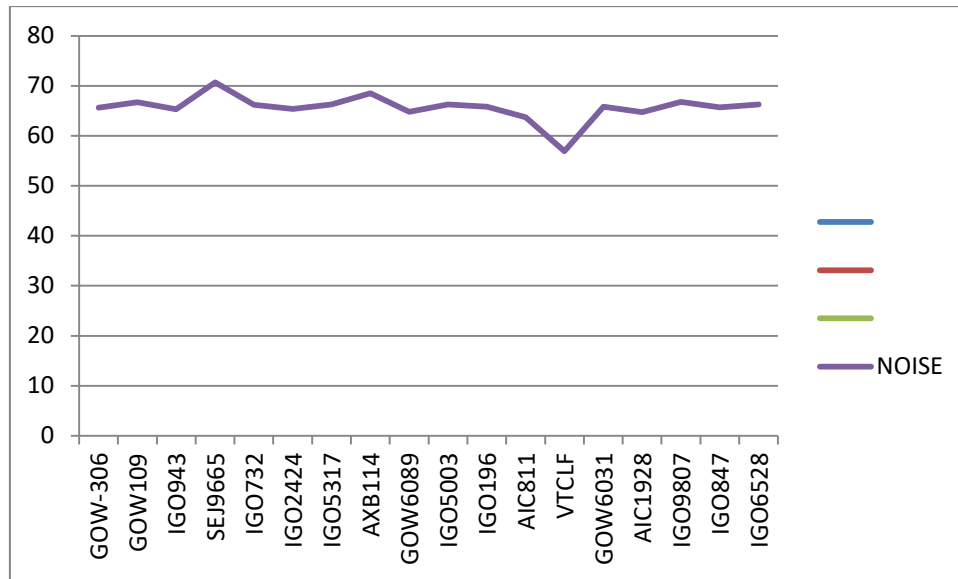


Fig-1 Graph showing Noise levels associated with different aircrafts in Omaxe City, Lucknow

Table-1 Aiplane Noise data at Omaxe City, Bijour Road, Lucknow.

Day 1 (28/07/2020)

NAME	NOISE
GOW-306	65.6
GOW109	66.7
IGO943	65.3
SEJ9665	70.7
IGO732	66.2
IGO2424	65.4
IGO5317	66.3
AXB114	68.5
GOW6089	64.8
IGO5003	66.3
IGO196	65.8
AIC811	63.7
VTCLF	56.9
GOW6031	65.8
AIC1928	64.7
IGO9807	66.8
IGO847	65.7
IGO6528	66.3

Day 2 (30/07/2020) : L_{avg} calculated at this location is 67.15897 dB which is greater than 55 dB as well as 40 dB. The readings were taken at this location from 6:45 AM to 10:15 PM and the analyses of the data showed that the planes which were flying from Lucknow tend to cause more noise than the ones that were coming for landing. The maximum noise recorded at this location was produced by SEJ9111 which is a Boeing 737-800 medium type of aircraft and the minimum noise was produced by VTFGM (diamond 40 Small type of aircraft). First 6 aircrafts shown in the table were all taking off from Lucknow.

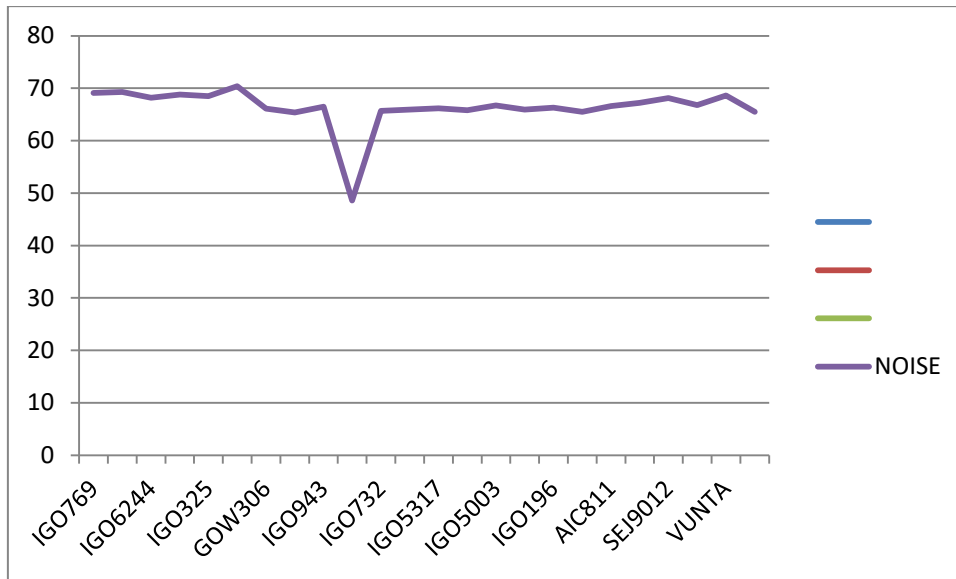


Fig-2 Graph showing Noise levels associated with different aircrafts in Omaxe City, Lucknow

Table-2 Aiplane Noise data at Omaxe City, Bijnour Road, Lucknow.

NAME	NOISE(dB)
IGO769	69.1
GOW4433	69.3
IGO6244	68.2
IGO243	68.8
IGO325	68.5
SEJ9111	70.4
GOW306	66.1
GOW109	65.4
IGO943	66.5
VTFGM	48.6
IGO732	65.7
IGO2424	65.9
IGO5317	66.2
IGO451	65.8
IGO5003	66.7
GOW6171	65.9
IGO196	66.3
ABY777	65.5
AIC811	66.6
IGO847	67.2
SEJ9012	68.1
IGO856	66.8
VUNTA	68.6
IGO6528	65.5

Day 3(01/08/2020) The readings were taken at this location from 1 PM to 10:30 PM. From 1 to 6 PM (GOW306 to IGO196) the planes were of landing type and from 6 PM to 10:30 PM, the planes were taking off and the current analysis showed that at this location, the planes that were going to land caused more noise than the ones that had taken off from the Airport. The highest noise recorded was due to VUBKB which is IAF Antonov 32 (medium) type of airplane and was coming for landing.

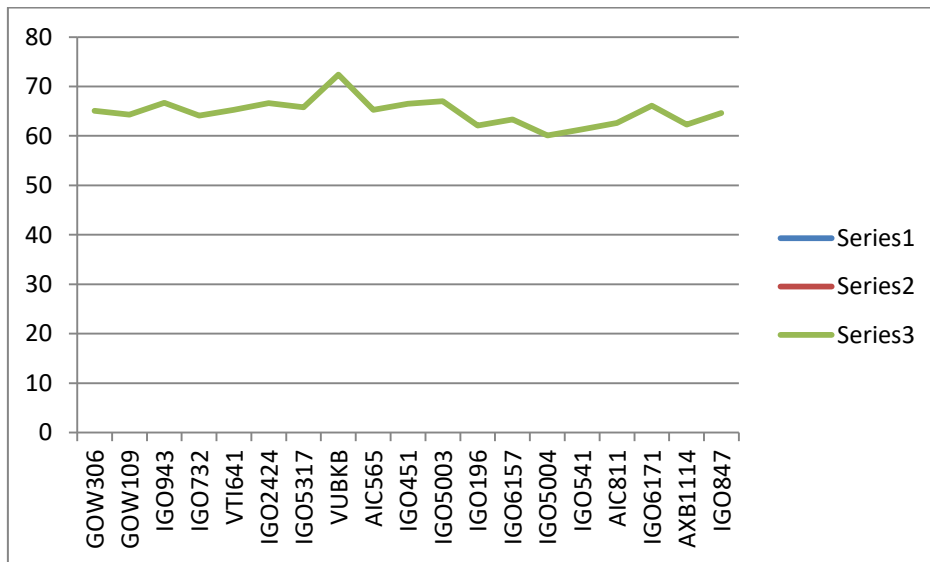


Fig-3 Graph showing Noise levels associated with different aircrafts near school

Table-3 Aircraft generated noise near NKM School, Vrindavan Yojna

NAME	NOISE(dB)
GOW306	65.1
GOW109	64.3
IGO943	66.7
IGO732	64.1
VTI641	65.3
IGO2424	66.6
IGO5317	65.8
VUBKB	72.4
AIC565	65.3
IGO451	66.5
IGO5003	67
IGO196	62.1
IGO6157	63.3
IGO5004	60.1
IGO541	61.3
AIC811	62.6
IGO6171	66.1
AXB114	62.3
IGO847	64.6

Day 4(02/08/2020): The readings at this location were taken from 06:25 AM to 06:30 PM. L_{avg} at this location which is NKM School, Vrindavan Yojna, Lucknow is 64.47384 dB and the readings were recorded from 06:30 AM to 06:30 PM. First 5 aircrafts mentioned in the table are departures from Lucknow airport. At this location, from the analysis of the data it is clear that these 5 planes that were departing from Lucknow airport caused less noise than the ones coming for landing.

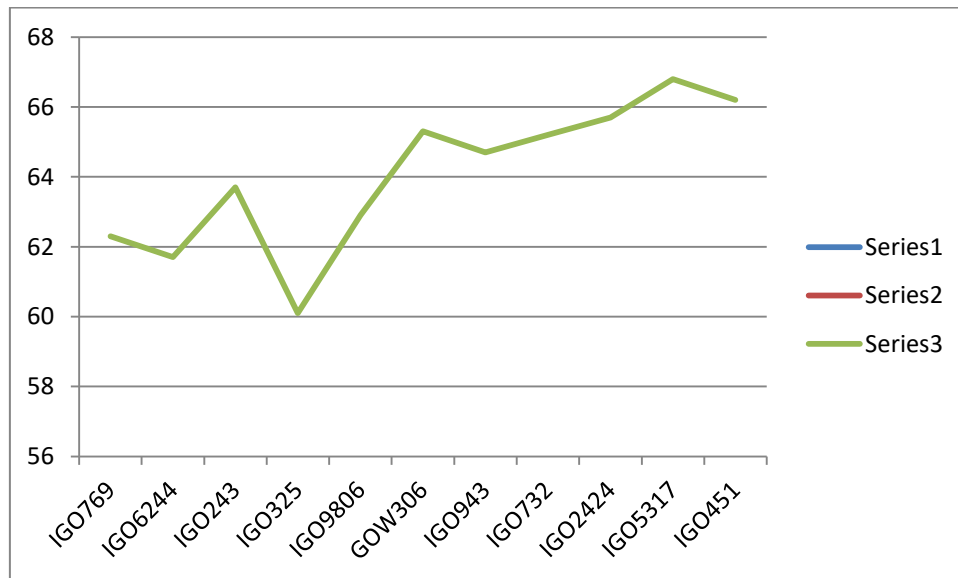


Fig-4 Graph showing Noise levels associated with different aircrafts near school

Table-4 Aircraft generated noise near NKM School, Vrindavan Yojna, Lucknow

NAME	NOISE(dB)
IGO769	62.3
IGO6244	61.7
IGO243	63.7
IGO325	60.1
IGO9806	62.9
GOW306	65.3
IGO943	64.7
IGO732	65.2
IGO2424	65.7
IGO5317	66.8
IGO451	66.2

7.CONCLUSION

The noise levels at both the sites that are near hospital and school are significantly higher than those prescribed by WHO and CPCB. For 28/07/2020, L_{avg} in Omaxe City was 66.24792 dB and on 30/07/2020, L_{avg} in Omaxe City, Lucknow was 67.15897 dB. For 01/08/2020, the L_{avg} near NKM School, Vrindavan yojna is 65.77307 dB and on 02/08/2020, the L_{avg} is 64.47384 dB both are greater than 55 dB as well as 40 dB., respectively and these

values are also higher than prescribed values. So, from this study it is evident that these two locations are affected by Noise induced by airplanes.

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