

Analysis of Noise Level in Soekarno Hatta International Airport Area

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ABSTRACT: One of the environmental impacts in the operation of an airport is noise, which originates from aircraft activities. Soekarno-Hatta International Airport is a public service airport located in Tangerang. This study aims to determine the noise levels around Soekarno-Hatta International Airport. The research results indicate that the noise levels of aircraft around Soekarno-Hatta International Airport in the northern part were collected using a sound level meter and then analyzed using the Weighted Equivalent Continuous Perceived Noise Level (WECPNL) method from aircraft landing activities. The results show that the noise intensity is categorized within the Weighted Equivalent Continuous Noise Level (WECPNL) range from ≥ 75 to ≥ 80 dBA. The researchers suggest that the airport authorities conduct regular noise measurements to monitor and control noise levels following the established noise standards and regulations to prevent direct impacts on the surrounding communities of Soekarno-Hatta International Airport.

KEYWORDS: noise level, airport area, WECPNL, Soekarno Hatta Airport

INTRODUCTION

The transportation system has a major influence on the development and change of a city's socio-economic activity system, while socio-economic changes in a city will also affect the existing transportation system. The transportation system itself functions to coordinate the process of human and goods movement in a city by regulating its components (Ferial et al., 2016).

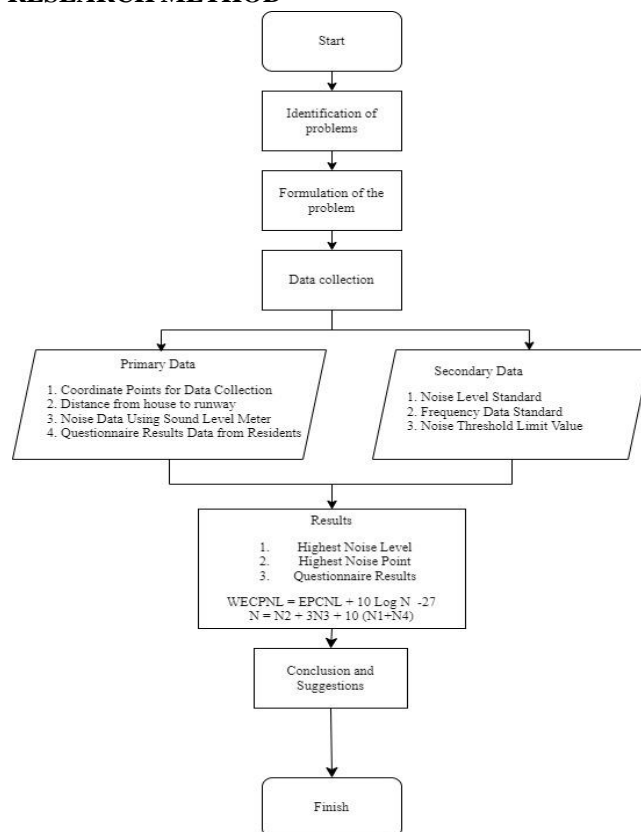
Environmental noise, especially in airport environments, is starting to appear in various places in the world. The intensity of noise caused by aircraft, especially jet, turbojet and turbofan engines, is a major problem for the environment both inside and outside the airport area. In fact, environmental noise caused by aircraft is due to the number of aircraft operating, which is calculated cumulatively for 24 hours with all its activities (Suma, n.d.). In general, human hearing is 20Hz - 20,000 Hz and the safe limit for human hearing is below 85Hz for a maximum duration of 8 hours.

Noise is one of the physical factors that has a negative impact on occupational health and safety, namely noise, which can be in the form of sound. Noise not only causes hearing damage, but can also cause psychological and emotional disorders, as well as heart and circulatory disorders. Emotional-psychological disorders, namely in the form of work comfort disorders, irritability, irritability. The hormone adrenaline is produced through hormonal mechanisms. This can increase your heart rate and increase your blood pressure. Of these, among them are cardiovascular diseases (Adetama & Elvina, 2022).

The relationship between airports and the environment is ideal if airport planning not only considers the function of flight facilities, but also the management of impacts such as noise. Noise levels that exceed the standards set by KMHLH

No. 48 of 1996 have the potential to cause noise health in the community around the airport (Adetama & Elvina, 2022). to create good conditions that support the functioning of the airport and its surroundings. Continuous noise can damage your hearing because it can interfere with the function of hair cells in your hearing system.

RESEARCH METHOD



“Analysis of Noise Level in Soekarno Hatta International Airport Area”

The method used in this study is the WECPNL (Weighted Equivalent Continuous Perceived Noise Level) method. This study is a quantitative descriptive study with a cross-sectional approach conducted at Soekarno Hatta International Airport on May 1, 2024. The research was carried out by collecting primary and secondary data.

The method that will be used in collecting primary data is collecting primary data in the form of direct sampling using a noise measuring instrument or commonly called a sound level meter against the noise generated by all airport operational activities. Sampling is carried out with the aim of collecting information related to fluctuations in the amount of noise generated during operating hours.

RESULT AND DISCUSSION

The position of Soekarno Hatta International Airport is surrounded by densely populated settlements, especially in the north. The southern part is also surrounded by densely populated settlements. Based on this, the point of aircraft noise data collection is in the north.

Table 1. Research location and coordinate points

No	Data Collection Location	Coordinate
1	SD Rawarengas 2	6°06'34"S106°38'57"E
2	Jl. Perimeter Utara	6°06'35"S106°39'02"E
3	jl. Rawa Rengas	6°06'32"S106°39'08"E
4	Musholla As - Sakinah	6°06'19"S106°39'26"E
5	Jl. Rawa Burung	6°06'13"S106°39'51"E
6	masjid Jami Al – Ishlah	6°06'07"S106°40'01"E

The location was chosen because it is a densely populated residential area and is in a landing position. At 6 points, the distance taken was different. evening rush hour (15:30) from Poll A at the Ikea stop to Poll B at the Alun-Alun Bandung stop.

Table 2. Respondent Characteristics Table

Character	Sub character	frequency	percent %
Gender	Man	33	33.30%
	Woman	66	66.70%
Age	< 20 years	7	7%
	20 - 30 years	26	26%
	30 - 40 years	32	32%
	40 - 50 years	20	20%
	> 50 years	15	15%
Work	Studenty	17	17%
	Private	13	13%
	Others	65	65%

This study aims to determine the gender, age and occupation of respondents and to find out how many respondents there are in terms of age and occupation.

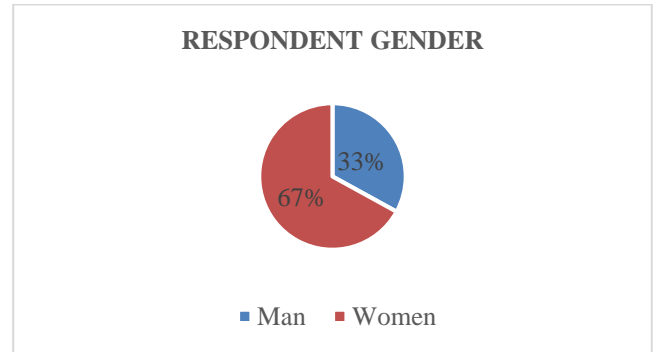


Figure 1. Respondent Gender

From the results of field research, the gender of female respondents is more than the gender of male respondents. Because this research was conducted on weekdays.

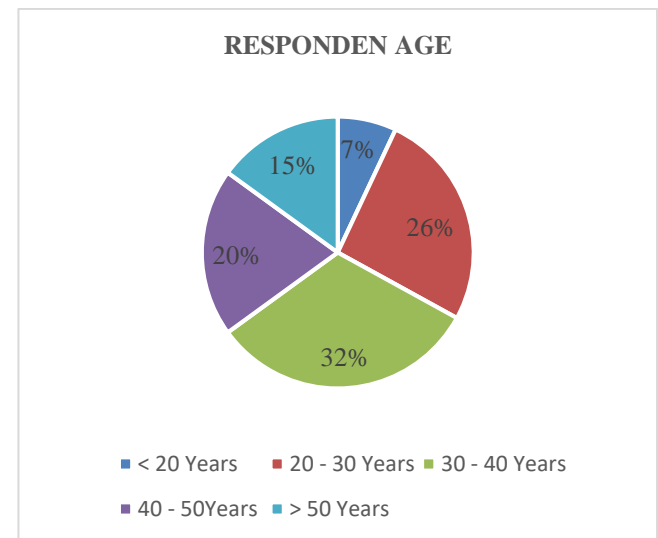


Figure 2. Respondent Age

From the results of this study, the majority of respondents were in the productive age of 30-40 years, which may influence preferences regarding aircraft noise.

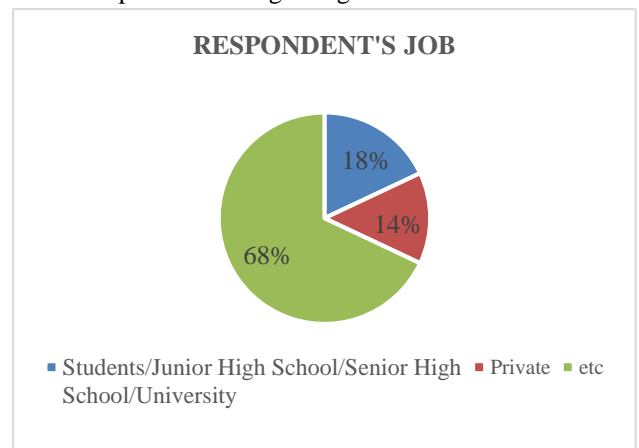


Figure 3. Respondent's Job

In this study, the respondents' occupations were unknown or other, namely 68%, while respondents who worked as self-employed were 14% and respondents who were still students/junior high school/high school/university were 18%.

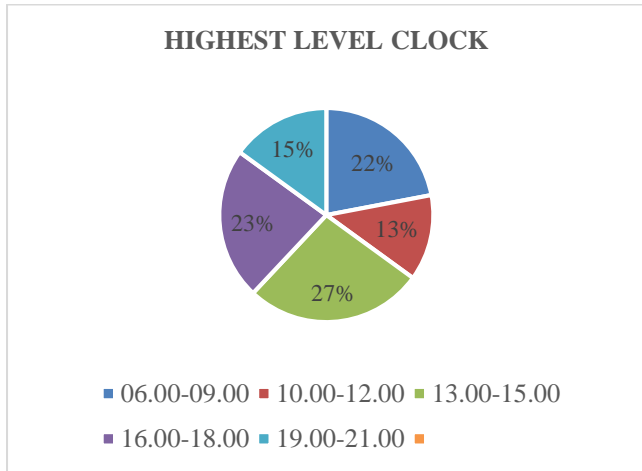


Figure 4. highest level clock

on the graph above is divided into several parts that indicate the time. From the results of this study, the highest level of hours is at 13.00 - 15.00 WIB with a value of 27% which means that the highest aircraft noise occurs during the day - afternoon. At 16.00 - 18.00 WIB shows a significant noise level but not as much as at 13.00 - 15.00 WIB with a value of 23%. At 10.00 - 12.00 the aircraft noise level is 13% and at 19.00 - 21.00 with a value of 15% shows that aircraft noise is not too high. At 06.00 - 09.00 the aircraft noise level is 22%.

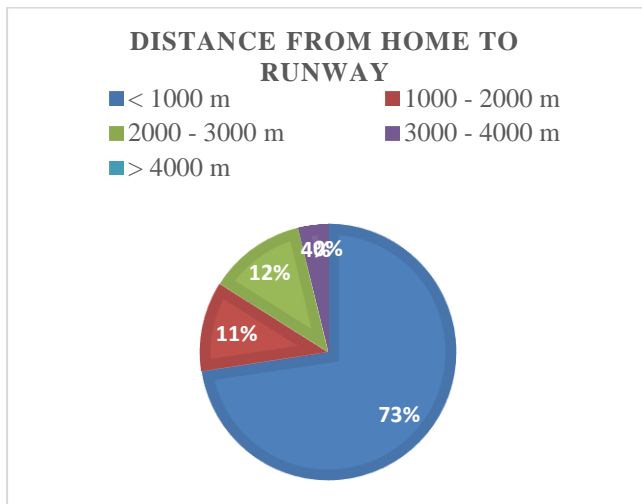


Figure 5. Distance From Home To Runway

This graph explains the distance from the house to the runway, based on the distance it can be concluded that houses that are <1000 m away are most susceptible to aircraft noise. Houses that are 1000 - 2000 m away and 2000 - 3000 m away still experience noise but not as intense as in a radius of <1000 m. houses that are 2000 - 3000 m away, 3000 - 4000 m away and >4000 m away have lower noise.

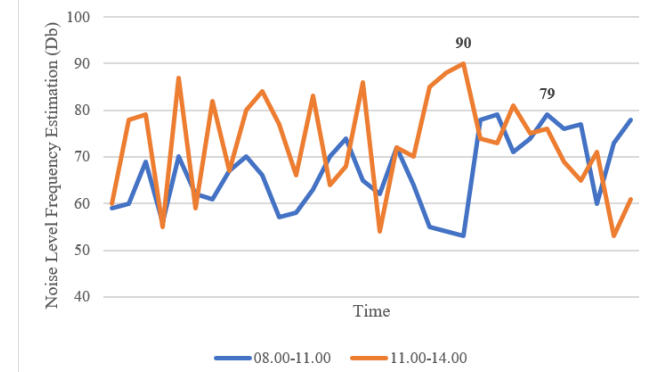
Perhitungan level kebisingan menggunakan metode WECPNL

Results of aircraft noise calculations at Rawa Rengas 2 Elementary School

$$\begin{aligned}
 N &= N_2 + 3N_3 + 10(N_1 + N_4) \\
 &= 111 + 3(132) + 10(100 + 118) \\
 &= 111 + 396 + 2180 \\
 &= 2687 \\
 \text{WECPNL} &= \text{dB(A)} + 10 \log N - 27 \\
 &= 71,7 + 10 \log 2687 - 27 \\
 &= 71,7 + 34,29 - 27 \\
 &= 78,99 \text{ dB (A)}
 \end{aligned}$$

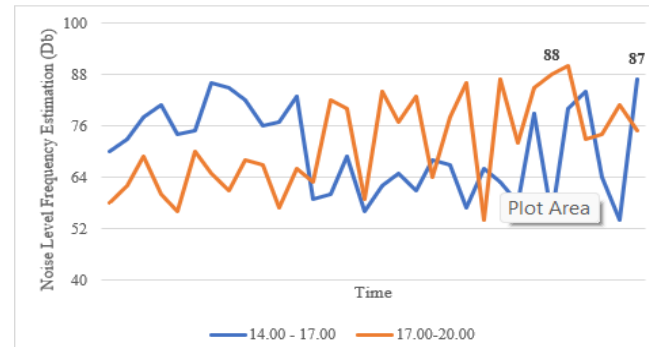
So the maximum noise result was obtained at point 1 at SD Rawarengas 02, namely 90.2 dB (A), so the WECPNL value was obtained as 78.99 dB (A).

Chart 1. Noise Level at Rawa Rengas 2 Elementary School 08.00-11.00 and 11.00-14.00



Based on the graph above, it can be seen at 08.00 – 11.00 WIB that the highest noise occurs at the peak hours of Soekarno Hatta International Airport at SD Rawa Rengas 2, which is 79 dB (A) on Batik Air aircraft. at 11.00 – 14.00 WIB the highest noise is 90 dB (A) on Lion Air aircraft.

Chart 2. Aircraft Noise Level at Rawa Rengas Elementary School 2 hours 14.00-17.00 and 17.00-20.00



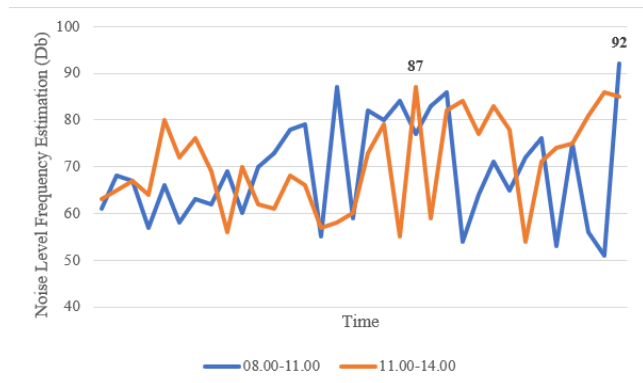
based on the graph above, it can be seen at 14.00 – 17.00 WIB that the highest noise occurs at the peak hours of Soekarno Hatta International Airport at SD Rawa Rengas 2 with a value of 87 dB (A) on Batik Air aircraft. at 17.00 – 20.00 WIB the highest noise with a value of 88 dB (A) on Garuda Indonesia aircraft.

Noise calculation results on Jl. North Perimeter

$$\begin{aligned}
 N &= N_2 + 3N_3 + 10(N_1 + N_4) \\
 &= 113 + 3(128) + 10(94 + 115) \\
 &= 113 + 384 + 2090 \\
 &= 2587 \\
 \text{WECPNL} &= \text{dB(A)} + 10\log N - 27 \\
 &= 71,4 + 10 \log 2587 - 27 \\
 &= 71,4 + 34,12 - 27 \\
 &= 78,52\text{dB(A)}
 \end{aligned}$$

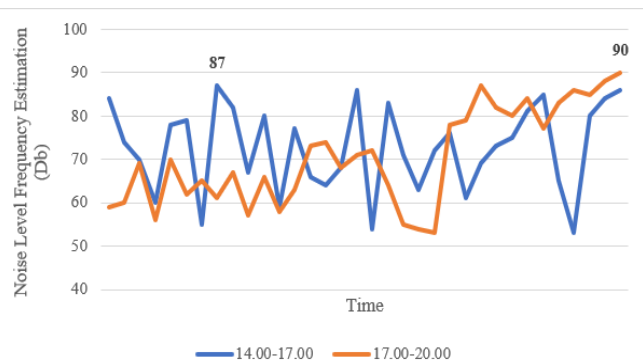
So the maximum noise result is obtained at point 2 on Jl. North Perimeter which is 92.4 dB (A), then the WECPNL value is obtained which is 78.52 dB (A).

Chart 3. Aircraft Noise Level on Jl. North Perimeter at 08.00 – 11.00 and 11.00 – 14.00



based on the graph above, it can be seen at 08.00 – 11.00 WIB that the highest noise occurs at the peak hours of Soekarno Hatta International Airport on Jl. Soekarno Hatta with a value of 92 dB (A) on Philippines Airlines aircraft. at 11.00 – 14.00 WIB the highest noise with a value of 87 dB (A) on Lion Air aircraft.

Chart 4. Aircraft Noise Level on Jl. North Perimeter at 14.00 – 17.00 and 17.00-20.00



based on the graph above, it can be seen at 14.00 – 17.00 WIB that the highest noise occurs at the peak hours of Soekarno Hatta International Airport on Jl. Soekarno Hatta with a value of 87 dB (A) on the Super Air Jet aircraft. at 17.00 – 20.00 WIB the highest noise with a value of 90 dB (A) Batik Air.

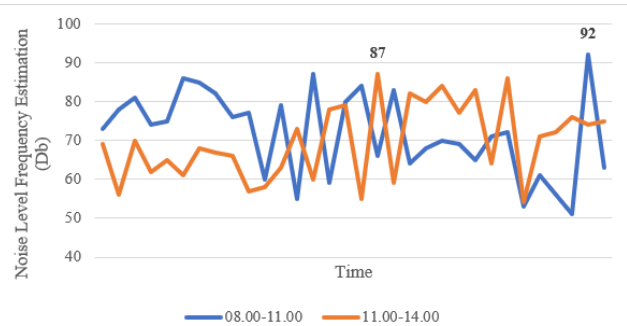
Noise calculation results of Jl. Rawa Rengas

$$N = N_2 + 3N_3 + 10(N_1 + N_4)$$

$$\begin{aligned}
 &= 111 + 3(84) + 10(103 + 123) \\
 &= 111 + 252 + 2260 \\
 &= 2623 \\
 \text{WECPNL} &= \text{dB(A)} + 10\log N - 27 \\
 &= 72,1 + 10 \log 2623 - 27 \\
 &= 72,1 + 34,18 - 27 \\
 &= 79,28 \text{ dB (A)}.
 \end{aligned}$$

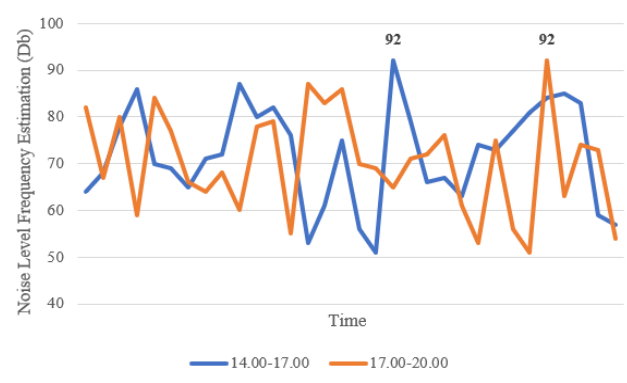
So the results of the calculation of maximum noise at point 3 on Jl. Rawa Rengas are 92.8 dB (A), then the WECPNL value is 79.28 dB (A).

Chart 5. Aircraft Noise Level on Jl. Rawa Rengas at 08.00 – 11.00 and 11.00 – 14.00



based on the graph above, it can be seen at 08.00 – 11.00 WIB that the highest noise occurs at the peak hours of Soekarno Hatta International Airport on Jl. Rawa Rengas with a value of 92 dB (A) on Lion Air aircraft. at 11.00 – 14.00 WIB the highest noise with a value of 87 dB (A) Garuda Indonesia.

Chart 6. Aircraft Noise Level on Jl. Rawa Rengas at 14.00 – 17.00 and 17.00 – 20.00



based on the graph above, it can be seen at 14.00 – 17.00 WIB that the highest noise occurs at the peak hours of Soekarno Hatta International Airport on Jl. Rawa Rengas with a value of 92 dB (A) Etihad Airways. at 17.00 – 20.00 WIB the highest noise with a value of 92 dB (A) Citilink aircraft.

Noise calculation results at the As-Sakinah prayer room

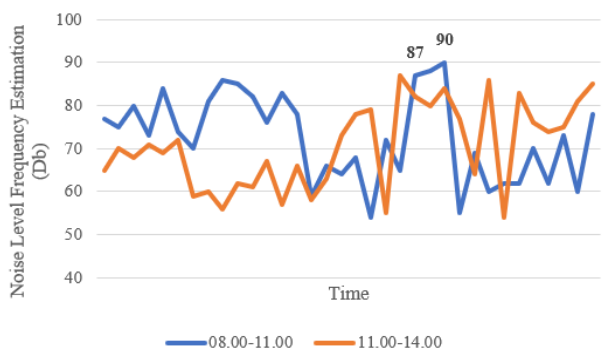
$$\begin{aligned}
 N &= N_2 + 3N_3 + 10(N_1 + N_4) \\
 &= 122 + 3(148) + 10(104 + 84) \\
 &= 122 + 444 + 1880 \\
 &= 2446 \\
 \text{WECPNL} &= \text{dB(A)} + 10\log N - 27 \\
 &= 72,6 + 10 \log 2446 - 27
 \end{aligned}$$

$$= 72,6 + 33,88 - 27$$

$$= 79,48 \text{ dB (A)}$$

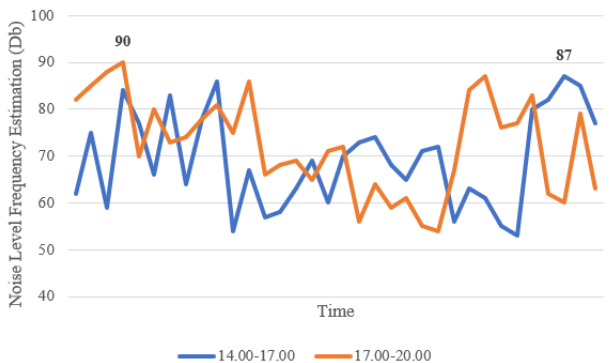
So the maximum noise calculation result at point 4 on Jl. Rawa Burung 1 is 90.4 dB (A), then the WECPNL value is 78.48 dB (A).

Chart 7. Aircraft Noise Level at AS-Sakinah Prayer Room 1 hour 08.00 – 11.00 and 11.00 – 14.00



berdasarkan grafik di atas maka dapat di lihat pada pukul 08.00 – 11.00 WIB bahwa kebisingan tertinggi terjadi pada jam puncak kesibukan bandar udara Internasional Soekarno Hatta di Jl. Rawa Burung dengan nilai 90 dB (A) pada pesawat Batik Air. pada pukul 11.00 – 14.00 WIB kebisingan tertinggi dengan nilai 87 dB (A) Lion Air.

Chart 8. Aircraft Noise Levels at As-Sakinah Prayer Room at 14.00 – 17.00 and 17.00 – 20.00



based on the graph above, it can be seen at 14.00 – 17.00 WIB that the highest noise occurs at the peak hours of Soekarno Hatta International Airport on Jl. Rawa Burung with a value of 87 dB (A) Lion Air. at 17.00 – 20.00 WIB the highest noise with a value of 90 dB (A) Garuda Indonesia.

Noise calculation results on Jl. Rawa Burung

$$N = N2 + 3N3 + 10(N1 + N4)$$

$$= 114 + 3(132) + 10(104 + 84)$$

$$= 114 + 396 + 1880$$

$$= 2390$$

$$\text{WECPNL} = \text{dB(A)} + 10\log N - 27$$

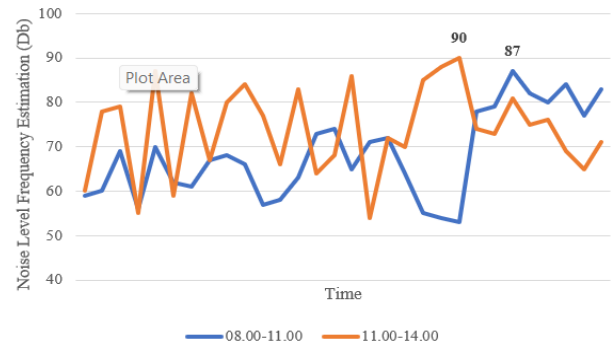
$$= 71,9 + 10 \log 2390 - 27$$

$$= 71,9 + 33,78 - 27$$

$$= 78,68\text{dB(A)}$$

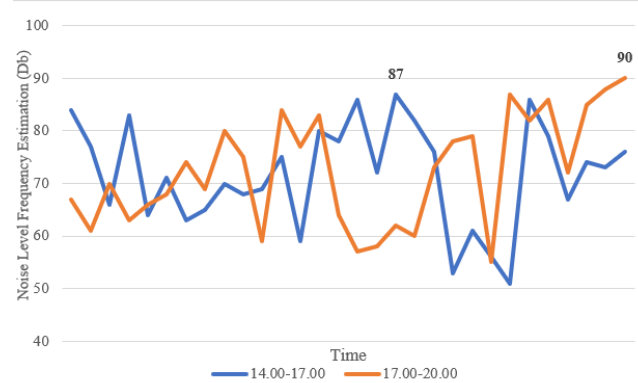
So the maximum noise calculation result at point 5 on Jl. Merdeka 1 is 92.5 dB (A), then the WECPNL value is 78.68 dB (A).

Chart 9. Tingkat Kebisingan Pesawat di Jl. Rawa Burung jam 08.00 – 11.00 dan 11.00 – 14.00



based on the graph above, it can be seen at 08.00 – 11.00 WIB that the highest noise occurs at the peak hours of Soekarno Hatta International Airport on Jl. Merdeka 1 with a value of 90 dB (A) on Malaysia Airlines aircraft. at 11.00 – 14.00 WIB the highest noise with a value of 87 dB (A) on Super Air Jet aircraft.

Chart 10. Aircraft Noise Levels at Rawa Burung at 14.00 – 17.00 and 20.00



based on the graph above, it can be seen at 14.00 – 17.00 WIB that the highest noise occurs at the peak hours of Soekarno Hatta International Airport on Jl. Rawa Burung with a value of 87 dB (A) Citilink. at 17.00 – 20.00 WIB the highest noise with a value of 90 dB (A) Super Air Jet.

Noise calculation results at the Jami Al – Ishlah mosque

$$N = N2 + 3N3 + 10(N1 + N4)$$

$$= 110 + 3(144) + 10(106 + 132)$$

$$= 110 + 432 + 2380$$

$$= 2922$$

$$\text{WECPNL} = \text{dB(A)} + 10\log N - 27$$

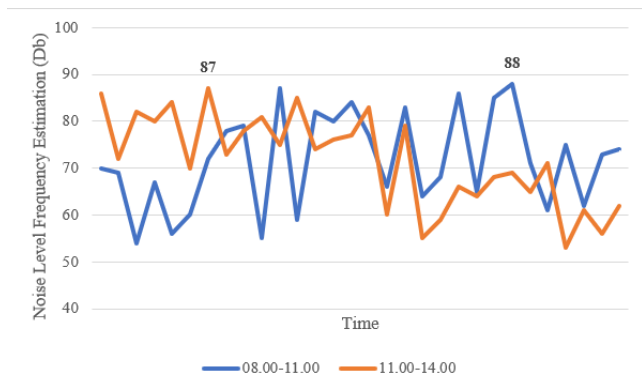
$$= 71,8 + 10 \log 2922 - 27$$

$$= 71,8 + 34,65 - 27$$

$$= 79,45\text{dB(A)}$$

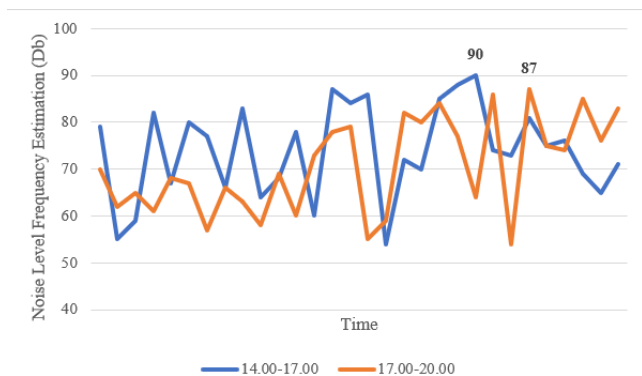
So the results of the maximum noise calculation at point 6 at the Jami Al-Ishlah mosque were 90.7 dB (A), so the WECPNL value was 79.45 dB (A).

Chart 11. Aircraft Noise Level at Al-Ishlah Grand Mosque 08.00 – 11.00 and 11.00 – 14.00



based on the graph above, it can be seen at 08.00 – 11.00 WIB that the highest noise occurs at the peak hours of Soekarno Hatta International Airport on Jl. Merdeka 1 with a value of 88 dB (A) on Citilink aircraft. at 11.00 – 14.00 WIB the highest noise with a value of 87 dB (A) Trans Nusa.

Chart 12. Aircraft noise level graph at Al-Ishlah Grand Mosque at 14.00 – 17.00 and 17.00 – 20.00



based on the graph above, it can be seen at 14.00 – 17.00 WIB that the highest noise occurs at the peak hours of Soekarno Hatta International Airport on Jl. Rawa Burung with a value of 90 dB (A) on Garuda Indonesia aircraft. at 17.00 – 20.00 WIB the highest noise with a value of 87 dB (A) Ethiopian Airlines.

Aircraft Noise Level Control

The impact of noise caused by the activities of Soekarno Hatta International Airport is very disturbing to the community around the airport environment. Therefore, the noise of this aircraft must be handled properly and correctly so that there are no problems and losses for the airport and the community. Prevention that must be done is by making trees and artificial fences.

CONCLUSION

Based on the research conducted, the following conclusions can be drawn:

- a. The results of the noise carried out on July 1 - July 6, 2024 for 6 days with 6 different points obtained the results of the noise level using WECPNL, namely: SD Rawa Rengas 2 of 78.99 dB (A), Jl. North Perimeter of 78.52 dB (A), Jl. Rawa Rengas of 79.28 dB (A), Jl. Rawa Burung 1 of 79.48 dB (A), Jl. Rawa Burung 2 of 78.68 dB (A), Al - Ishlah mosque of 79.45 dB (A).
- b. From the results of the study obtained that the highest level hours occurred at 13.00 - 15.00 WIB.
- c. So the highest point of the results of the noise level analysis around Soekarno Hatta International Airport is 79.48 dB (A) on Jl. Bird Swamp 1.

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