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# AIRCRAFT TRAFFIC NOISE ANALYSIS AT KUALANAMU INTERNATIONAL AIRPORT MEDAN

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## ABSTRACT

This study was conducted to analyze and evaluate the noise generated by aircraft traffic at Kualanamu airport. Data collection was carried out by conducting a survey directly in the field by asking airport officials about the flight frequency at Kualanamu airport and measuring ground handling noise with a sound level meter. Furthermore, the data obtained were analyzed using Excel software. From the results of data processing, it is known what variables most affect ground handling noise at Kualanamu airport. Noise measurements were taken by PT. Angkasa Pura II (Persero) in an open area at Kualanamu airport, the noise that occurs is below the specified quality standard value, which is <80 dB based on the Minister of Transportation Decree No. 17 of 2005 (Sultan Syarif Kasim International Airport, while for Kualanamu International Airport there has not been a Ministry of Transportation Decree. Because both airports are international class and are located in the coastal area of Sumatra Island, it can be assumed that they have the same noise quality standards). Furthermore, noise measurements were taken by PT. Angkasa Pura II (Persero) in the domestic and international waiting room area that the noise that occurs is above the specified quality standard value, namely (45-55) dB Zone B, according to the regulation of the minister of health 718 of 1987.

**Keywords**: noise, aircraft traffic, Kualanamu airport

## INTRODUCTION

Kualanamu Airport as the only international airport in Sumatera Utara is a replacement airport for Polonia International Airport which is located in the center of Medan city. Kualanamu Airport is located in Deli Serdang Regency with an area of 1,365 Ha and only operated on July 25, 2013. This airport was built to support the increase in the number of flight frequencies both domestically and internationally [1, 2]. As a center for aviation activities, airports are not only supported by facilities and infrastructure but also workers who play an important role in supporting time efficiency, comfort, and security for flight service users [3- 4].

The high activity of transportation facilities can cause high sound pressure or noise [5]. The noise intensity at the airport is determined by the number of aircraft operating cumulatively for 24 hours with all their activities, including landing, take-off, movement to the runway, engine testing, as well as the type of engine used by the aircraft [2, 6- 9].

To control the effectiveness of performance, it is necessary to conduct a survey or identify noise problems in the airport area. So that it can be known the noise level (intensity level or TI) received by employees and passengers. Based on the Decree of the Minister of Manpower Number: KEP-51/MEN/1999, concerning the Threshold Value (NAV) of noise in the workplace, especially at train stations [10], ports, traffic, terminals as well as airports [11], it has been determined that the intensity level value has a limit. a maximum of 85 dBA. The threshold value for noise in the workplace is the highest intensity and is the average value that can still be received by workers without causing permanent hearing loss, for continuous working time (Indonesia 1999). This study discusses and analyzes noise at the Kualanamu-Medan airport, in-ground handling, open areas, residential areas around the airport by measuring the sound intensity level using a Sound Level Meter (SLM).

## METHOD

In general, SLM & Noise Dosimeters are aimed at the sound source, at ear level, to capture the noise created. To measure noise in a workspace, the recording is carried out in one full work shift with several recordings from the SLM. Settings and equipment set-up for noise data collection at Kualanamu airport are shown in FIGURE 1.

**FIGURE 1.** Set up and use of noise meter

Noise measurement is contained in KMNLH No. 48 (1996) can be done in two ways, namely:

1. The simple way is with a Sound Level Meter usually the sound pressure level is measured in dB (A) for 10 minutes for each measurement. Readings are taken every 5 seconds.
2. The direct method is using an Integrating Sound Level Meter which has a measurement facility with a measuring time every 5 seconds, measurements are carried out for 10 minutes (life 1996).

Furthermore, the retrieval of weather data in real-time on the BMKG website at the Kualanamu airport branch, related to wind speed and direction, temperature, and humidity.

## RESULT AND DISCUSSION

### Noise Measurement

Noise measurement at Kualanamu International Airport in several areas, including:

*The Parking Area of A (N: 03o38'05.5"/ E: 098o 52'38.0")*

The Parking area of A with coordinates (N: 03o38'05.5"/ E: 098o 52'38.0") can be shown in FIGURE 2, This figure was taken from google maps.


**FIGURE 2.** Noise measurement in Parking area of A with coordinates (N: 03º38'05.5"/ E: 098º 52'38.0")

*Runway area of 05-14 (N: 03º37' 35.6" / E:098º51'26.6")*

The Runway area of 05-14 with coordinate (N: 03º37' 35.6" / E:098º51'26.6") can be seen in FIGURE 3 below. This figure was taken from google maps.

**FIGURE 3**. Noise measurement in a residential area with the coordinate of 03º39’15,1” N 098º53’37,3” E and the distance to run-way 2-3 1.47 km (4.820,77 foot)

*Residential Area*

Residential area, football area Pasar IV street with coordinates 03º36’12.8” N 098º51’38.4” E can be shown in FIGURE 4.

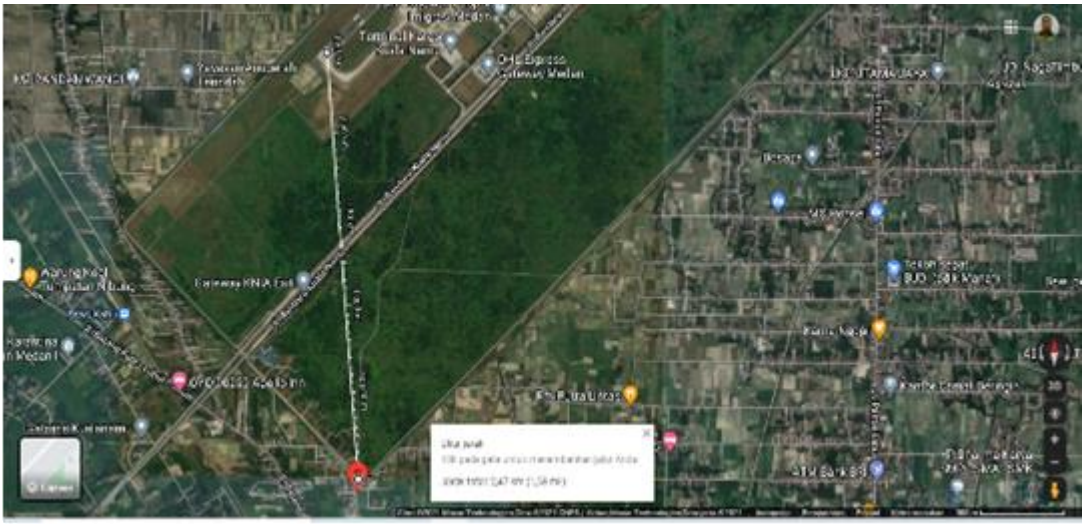

**FIGURE 4**. The residential area, football area Pasar IV street with coordinates 03º36’12.8” N 098º51’38.4” E. Football distance Pasar VI street to runway 05 is 2.47 km (1.54 mil)

From the results of annual noise measurements conducted by PT. Angkasa Pura II through PT. Sucfindo obtained data that is displayed in graphical form as in FIGURE 5.

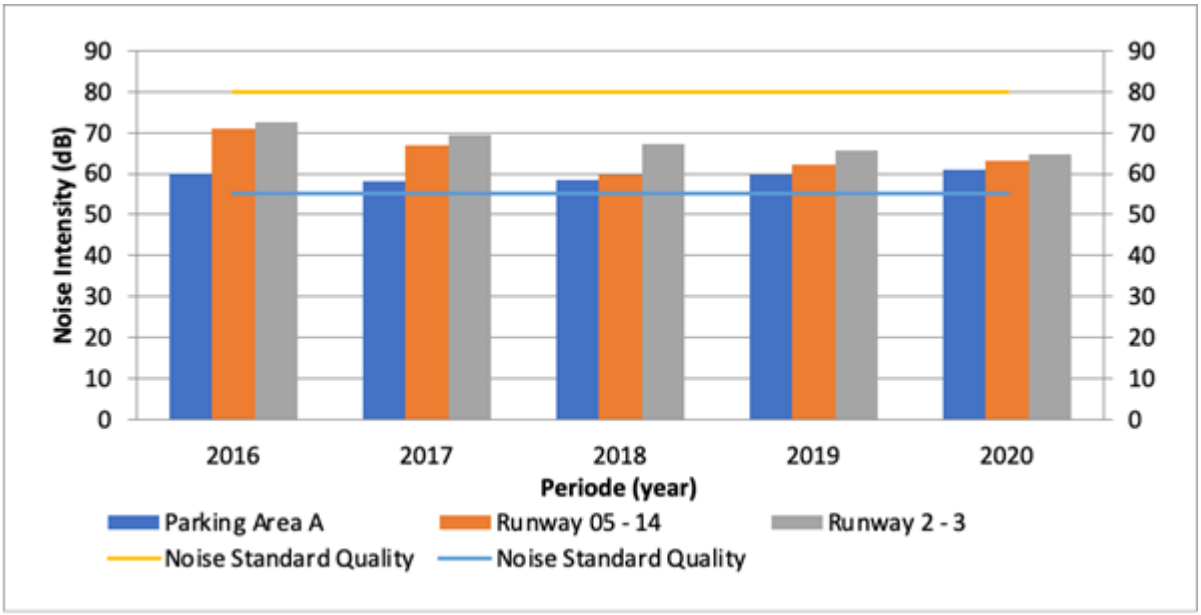


**FIGURE 5**. Noise intensity for an open area on the Kualanamu airport each year

The noise intensity in open areas at Kualanamu airport per year in FIGURE 5 shows that the noise in the runway areas 05-14 and 2-3 is below the noise quality standard threshold, which is < 80 dB following the decision of the Minister of Transportation KM no 17. For parking area A, namely the vehicle parking area outside the airport, it has exceeded the quality standard threshold according to the Ministerial Decree, Decree of the Minister of Environment No. 48 of 1996, which is a maximum intensity of 55 dB. In the noise graph of residential areas around Kualanamu airport as shown in FIGURE 6 can be explained that the measurements of noise at 2 different locations as shown in FIGURE 5 and FIGURE 6 show that the noise that occurred in 2016 and 2017 was still above the noise quality standard threshold, namely > 55 dB, but in 2018 and beyond the noise that occurs is already below the maximum quality standard threshold. The decrease of noise intensity in a residential area is due to improvements in the sensor-based measurement system and a decrease in sound output [12].

Based on the Minister of Health Regulation No. 178 of 1987, which divides the area into 4 zones, namely: zone A, zone B, zone C, and zone D, provided that:

1. Zone A is a zone designated for research places, hospitals, health or social care places, and the like; (35-45 dB)
2. Zone B is a zone designated for housing, education, recreation, and the like; (45-55 dB)
3. Zone C is a zone designated for offices, shops, trade, markets, and the like; (50-60 dB)
4. Zone D is a zone designated for industries, factories, train stations, bus terminals, and the like; (60-70 dB)

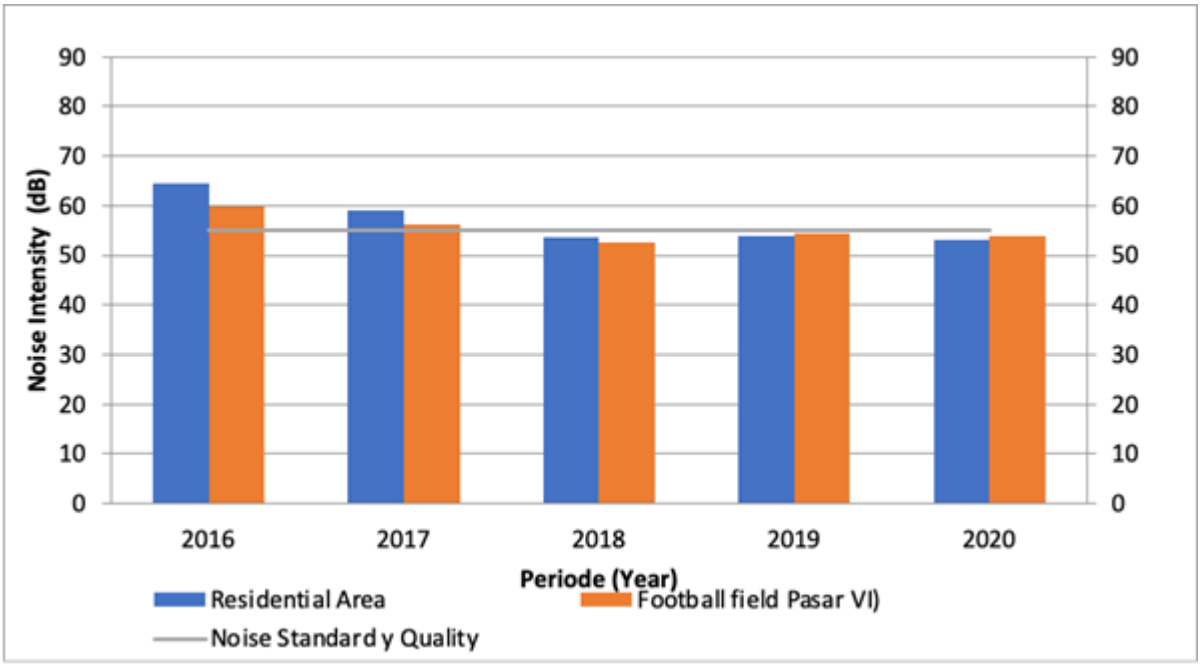


**FIGURE 6**. Area noise of residential around Kualanamu airport

The graph of the annual domestic and international waiting room noise at Kualanamu airport is shown in FIGURE 7 below. From this figure known that the noise in the waiting room is above the noise quality standard threshold according to the Ministerial Decree of the Minister of Environment Decree no. 48 of 1996, which is a maximum of 55 dB.

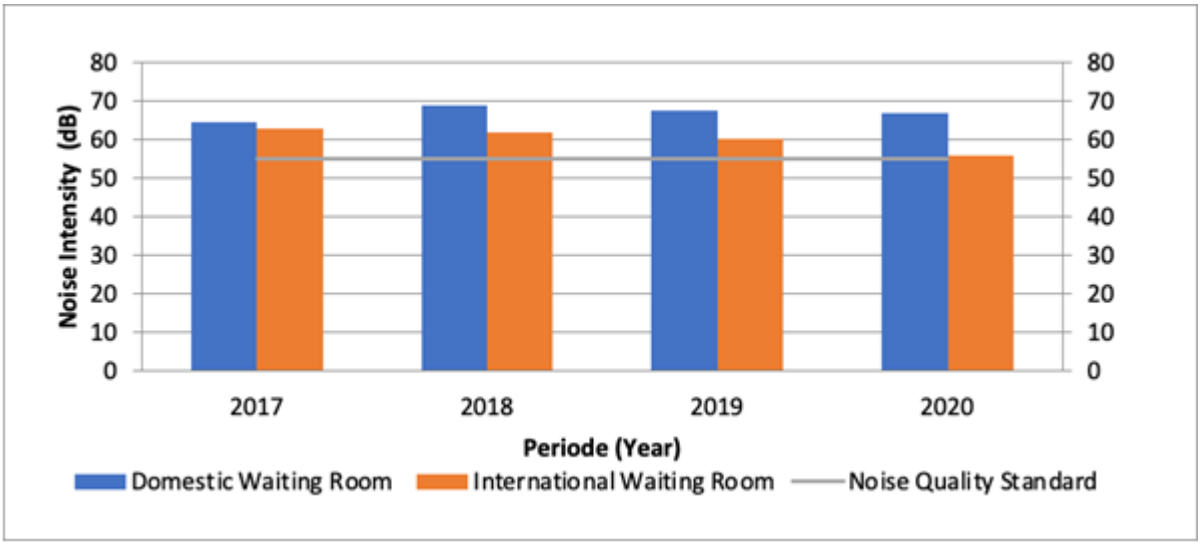


**FIGURE 7**. The noise intensity in the waiting room of Kualanamu International airport

## Weather Measurements

Measurement of air temperature and humidity, the trend of wind direction in the Kualanamu International Airport area is carried out by the Meteorology, Climatology and Geophysics Agency (BMKG) of Kualanamu International Airport in real-time. The measurement results

can be obtained through the BMKG website through the procedures and stages determined by the BMKG. This measurement is needed to analyze its effect on noise that occurs in the Kualanamu airport area and its surroundings. The measurement results are displayed in the form of graphs and tables as can be seen below.

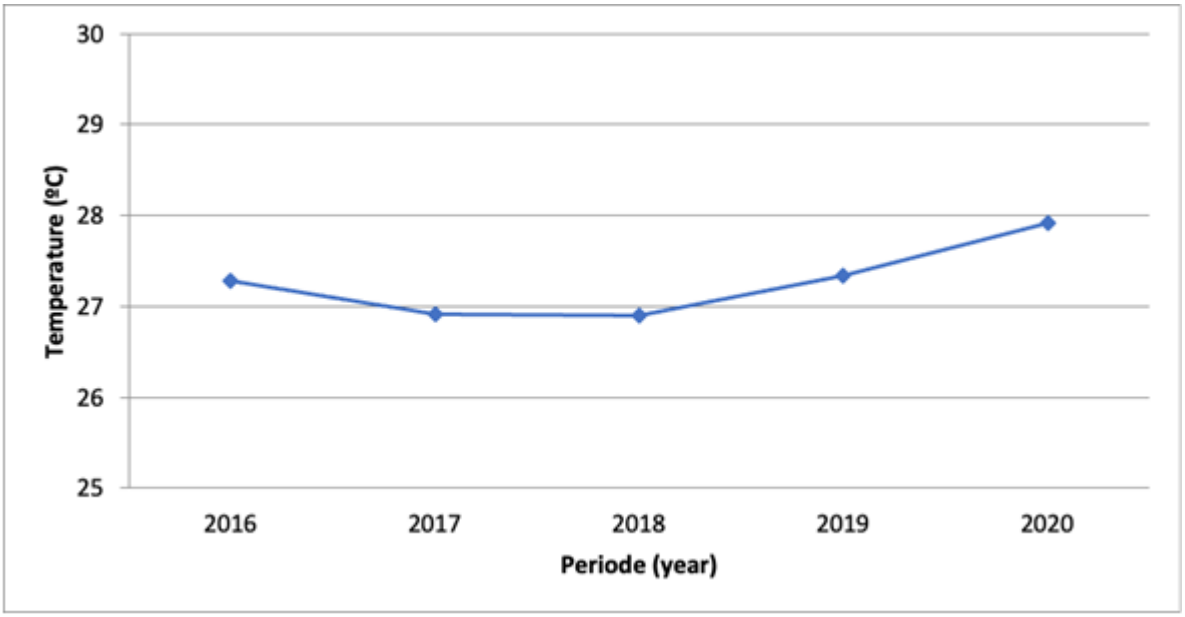


**FIGURE 8.** Air temperature trend around Kualanamu International airport

As shown in FIGURE 8 that the curve is shape valley, which is on the 2016 year obtained the average temperature is 27.3ºC, and on the 2017 and 2018 decrease be 26. 9ºC. Then there is an increase in air temperature from 2019 to 2020 to be 27.9ºC.

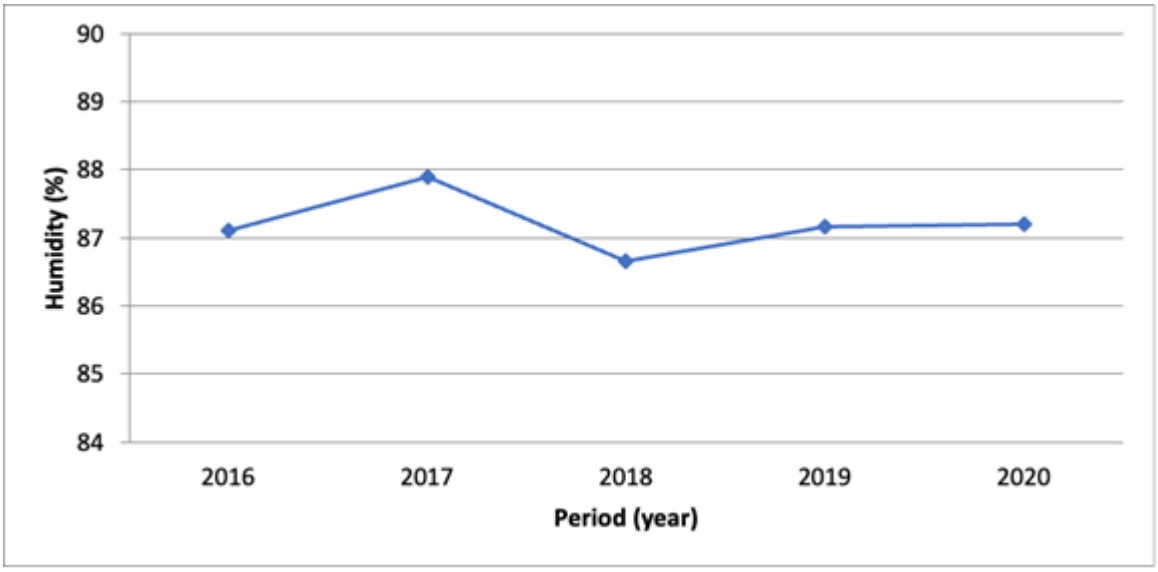


**FIGURE 9**. The humidity trend around Kualanamu International airport

FIGURE 9 shows that the air humidity is relatively stable with a relative humidity value of 86-88% RH, which means that the air around Kualanamu airport has a high waters content. The trend of wind gusts is towards the north in the area around Kualanamu airport, starting with measurements from 2016 to 2021. The daily observations in a year are recorded and written in TABLE 1 below.

**TABLE 1**. The observations results of wind gusts trend towards the north in the Kualanamu airport area

| Year<br>Month | 2016<br>(day) | 2017<br>(day) | 2018<br>(day) | 2019<br>(day) | 2020<br>(day) | 2021<br>(day) |
|---|---|---|---|---|---|---|
| January | 17 | 23 | 11 | 4 | 6 | 5 |
| February | 13 | 18 | 18 | 11 | 6 | 14 |
| March | 23 | 25 | 20 | 9 | 14 | 9 |
| April | 17 | 25 | 16 | 11 | 5 | 11 |
| Mei | 17 | 22 | 16 | 12 | 5 | 4 |
| June | 12 | 20 | 8 | 0 | 1 | - |
| July | 17 | 18 | 11 | 3 | 1 | - |
| August | 8 | 16 | 11 | 5 | 4 | - |
| September | 15 | 20 | 12 | 8 | 2 | - |
| October | 22 | 18 | 14 | 8 | 9 | - |
| November | 19 | 15 | 15 | 7 | 5 | - |
| December | 14 | 11 | 11 | 11 | 2 | - |

## CONCLUSION

Based on the results obtained in the study, conclusions can be drawn including (1) Noise measurements taken by PT. Angkasa Pura II (Persero) in an open area at Kualanamu airport has obtained that the noise level is below the specified quality standard value, which is <80 dB according to the Minister of Transportation Decree No. 17 of 2005 (Sultan Syarif Kasim International Airport, while for the International Airport There has been no decision from the Minister of Transportation for Kualanamu. Because these two airports are international class and are located in the coastal area of Sumatra Island, it can be assumed that they have the same noise quality standards. (2) The noise measurement is taken by PT. Angkasa Pura II (Persero) in the domestic and international waiting room areas, it was found that the noise that occurred was above the specified quality standard value, namely (45-55) dB Zone B, according to the regulation of the minister of health 718 of 1987.

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