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Research paper

Traffic noise pollution at residential area

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Abstract

Most people are unaware of noise pollution occurring around them due to the characteristic of the pollution itself. This pollution is not visible to people's sense and affects people based on their sound level acceptance. Since people who have high sound level acceptance are familiar with noise, thus noise pollution will not directly annoy them. This study was conducted to determine the traffic noise level at Seksyen 7, Shah Alam and its correlation with traffic volume. Since noise level will affect people in terms of annoyance and lead to health effect, the study area were chosen at intersections nearby residential area. The data of traffic noise level and traffic volume were collected representing weekday and weekend for each intersection. Three (3) data collection session were conducted for each day, which is in the morning (0730-0830), in the afternoon (1230-1330) and in the evening (1700-1800). The collected data were then being analysed and compared with the standard limit set by the Department of Environment Malaysia (DOE) to check whether the noise level at the study area comply with the limit recommended.

Keywords: *Noise Pollution, Traffic Noise,*

1. Introduction

In general, noise can be defined as sound which is loud, harsh and cause disturbance to the environment around. Noise will also reduce the quality of the environment in the impact area and lead to health problem to people around [1]. According to Davis and Cornwell, exposure of noise on people will lead to auditory effect such as hearing loss and speech interference [2]. Besides, it will also lead to psychological effect such as disturbance in sleep and decrease in performance. There are many sources of noise pollution, one of it is pollution due to traffic noise [3].

To date, several research pertaining to noise pollution in Malaysia have been conducted. The most common research is noise pollution due to traffic. Based on several previous researches, the noise level at the study area had exceeded the standard from the Department of Environmental Malaysia (DOE) [4]. These situations proved that traffic noise pollution is significant in Malaysia. However, the traffic noise level is expected to have higher value as the Road Transport Department Malaysia (JPJ) has reported that the number of registered vehicle has increased by 30.28% in 2015 compared to 2010. The increment of the number of the registered vehicle has increase by 4.78% in 2015 compared to 2014 and the pattern will be similar in 2016 and upcoming years [5].

Shah Alam is the capital city of Selangor. Based on the Survey Report for Selangor Structure Plan in 2014, the Shah Alam City Council has reported that the population of resident in Shah Alam in year 2010 is 558 308 people. The value is expected to be higher in the present year. The population of Shah Alam due to the facilities and job opportunities offered. The complete facilities in Shah Alam such as comfortable housing area, good roadways and connections, recreational park, good access of public transports, markets and shopping mall are among the main attraction that attracts people to migrate to Shah Alam. On the other hand, the government centres which operate in the city of Shah Alam have offered job opportunities to job seeker. Besides, there are several popular high education centre based in Shah Alam such as Universiti Teknologi Mara (UiTM), University of Selangor (UniSEL) and Multimedia and Science University (MSU). These education centres also contribute to a high population in Shah Alam because it offers job opportunities and also attract students to migrate to Shah Alam.

Due to the increasing population in Shah Alam, the number of vehicles would also keep increasing proportion. Since most of the residential area in Shah Alam is easy to be accessed and located nearby roads, the increase in number of vehicles will lead to traffic noise that will cause disturbance to the residential area. According to Darvis and Cornwell, the exposure of noise with 89 dBA for 60 minutes in 24 hours is unacceptable for human hearing [2]. Continuous noise will cause sleeping disorder and other diseases such as heart disease and high blood pressure. Thus, the study was conducted to determine the traffic noise pollution, whether the traffic causes noise pollution or the noise is still within the acceptable range.

This study was conducted in areas that have been observed to have the high traffic volume, in order to determine the noise level and the correlation between noise and traffic volume. The noise level at the chosen location was collected at certain period of time along with the number of vehicle that passes the location in the same period of time. The sampling time were chosen to be in the morning, in the afternoon and in the evening. This study was conducted at two (2) intersections in Seksyen 7, Shah Alam (Fig 1 and Fig. 2). The first intersection is located at Persiaran Bestari and Jalan Plumbum 7/99 and the second intersection is at Persiaran Masjid and Persiaran Kayangan. Both intersections are having the same characteristics which are located nearby residential area. The differences between the two study area is that the category of the

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road. Intersection A is categorized as Collector road, while Intersection B as Arterial road.
Technically, the noise level at Intersection B will tend to be higher because arterial road carries a large traffic volume [6]. The study was conducted during weekends and weekdays, in which each day having three (3) sessions of observations. The chosen observation times are during peak hours, whereby the volumes of the traffic tend to be higher. The data from the study were being analyzed and compared with the Maximum Permissible Sound Level (LAeq) of Receiving Land Use for Planning and New Development. The standards are based on the Environmental Quality Report 2009 which implies the value from The Planning Guideline for Environmental Noise Limit and Control in 2004.
Therefore, this study is being conducted to establish the profile of both traffic volume and noise level at the study area, whether the noise produce is tolerable to surrounding condition.

2. Method

The location selected for the study is at intersection located nearby residential area. The study locations were selected based on the rough observation of traffic volume at particular intersection and the classification of road at particular intersection. Both study areas are located in Seksyen 7, Shah Alam. Seksyen 7 is chosen as study area due to the facilities located there. Two (2) well known universities are located in Seksyen 7 which is Universiti Teknologi Mara (UiTM) and University of Selangor (UniSEL). Besides, the commercialized areas located in Seksyen 7, in which are comprise of many restaurant and boutiques that will attract people to come to Seksyen 7. On the other hand, the general hospital of Shah Alam is also located in Seksyen 7. These factors contribute to traffic noise pollution in Shah Alam.

The first study location is located in Seksyen 7, Shah Alam (3° 04’ 19.6” N 101° 29’ 02.4” E), which connects Persiaran Bestari and Jalan Plumbum 7/99. The intersection leads to 51 blocks of apartment, each block having 5 levels and each level will have 8 units of houses. Besides, the intersection also leads to schools, shop lots and food court. Technically, the intersection can be classified as Collector road. The second study location also located in Section 7, Shah Alam (3° 04’ 43.0” N 101° 29’ 41.4” E), which connects Persiaran Masjid and Persiaran Kayangan. Since the intersection consists of Arterial roads, therefore it will lead to several residential areas, schools, universities, shops and petrol station. Both sampling location are having the same characteristic which located nearby residential area. Therefore, noise pollution will cause disturbance to the resident and will lead to other problem and disease cause by noise.
The data collection at each study area was collected on one day representing weekdays and one day representing weekends for each intersection. The duration of the data collection was in three phases. It is in the morning (0730-0830) whereby people tend to leave their house for work and sending their children to school, in the afternoon (1230-1330) whereby people are on their lunch break and picking up their children from school, and in the evening (1700-1800) whereby people are on their journey back from work. These chosen time phase are considered as peak hour whereby the numbers of vehicle are expected to be higher compared to the other time of the day. During the study period, the noise level and the traffic volume were collected for the whole one hour. On another session, interviews were conducted to obtain the data on the traffic noise impact to the residents.
The data of the noise level were collected using the sound level meter Type 2, model 407764 from Extech Instruments. The sound level meter can measure the range of noise from 30 dB to 130 dB. The sound was measured by using the A-weighting, environmental noise have to be measured using A-weighting instead of C-weighting [7]. The noise data will be collected in every subsequent 30 seconds for one hour. Only the maximum noise value will be taken into account for every 30 seconds.

During the data collection, the measuring method that is used is Handheld Quick Assessment. The sound level meter is being helpd at arm’s length to the side. The microphone has to face the noise source to minimize the sound that is reflected from the body [7]. The traffic volume was counted by using Mechanical Hand Telly counter. Vehicles that are passing through the intersection will be counted manually according to their classification. The classification comprises of car and taxi, small van and utility, medium lorry and large van, large lorry, bus and motorcycle. The data is recorded based on the volume of vehicle passing the junction at a specific hour.
The data collected from the study were being to the standardisation from the Department of Environment Malaysia (DOE). The comparison was done to determine whether the noise level at the study area is within the acceptable range or not.

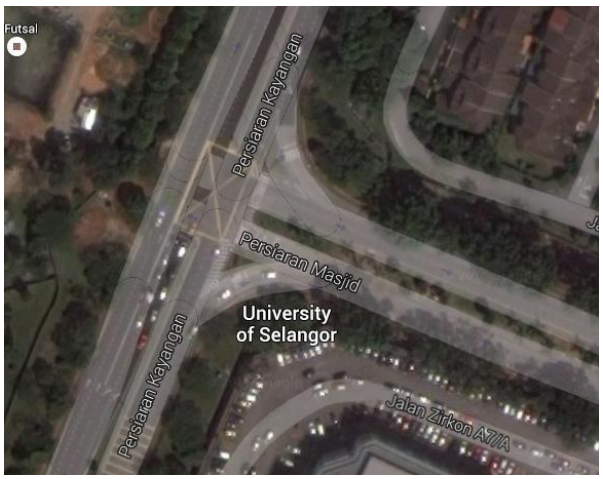


Fig. 1: : Sampling Location at Intersection A

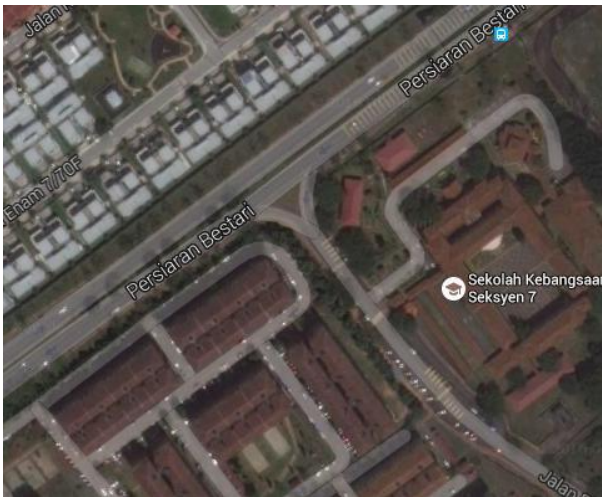


Fig. 2: : Sampling Location at Intersection B

3. Results and Discussion

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3.1. Traffic Noise Profile at Intersection A

Fig.3 shows the graph of traffic volume and traffic noise level at Intersection A during weekday, whereas Fig.4 shows the graph of traffic volume and traffic noise level at Intersection A during weekend. In both cases, it is observed that the total number of

vehicles is most likely to be the lowest during the afternoon compared to morning and evening. One of the factors that contribute to traffic volume is working hours. Common working hours of Malaysian starts from 8.00 am to 9.00 am, and end at 5.00 pm to 6.00 pm depending on the company policies. Therefore, the traffic volume is relatively high during morning and evening. On the other hand, the traffic volume in the afternoon is less than the volume in the morning and evening because most of the working residents tend to stay within the office area during lunch hour instead of going back home. However, there are also other factors contributing to the volume of the traffic, such as visitors, resident sending and picking up their kids to and from school and also students from the nearby universities travel to and back from class.

Based on the line graph on both figures, the noise level at the study area has exceeded the noise level set by The Planning Guideline for Environmental Noise Limit and Control by Department of Environment Malaysia in 2004 which is 60 dBA for Urban Residential (High Density) Areas and Designated Mixed Development Areas (Residential – Commercial) represented by green line.

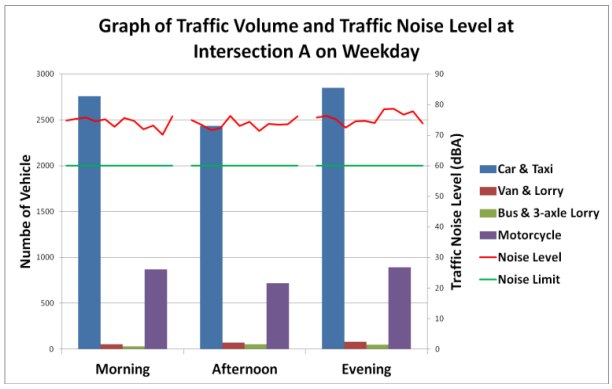


Fig. 3: Traffic Volume and Noise Level at Intersection A on Weekday

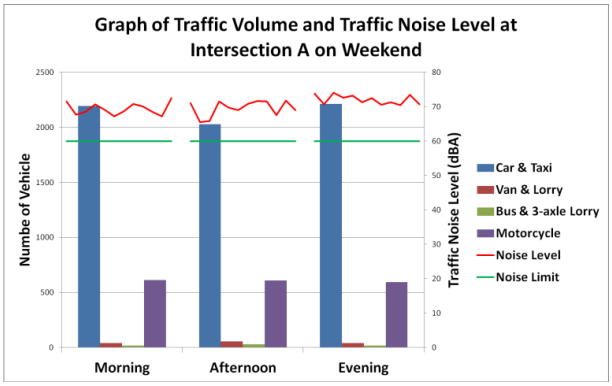


Fig. 4: Traffic Volume and Noise Level at Intersection A on Weekend

From the study, the total volume of vehicle passing the intersection every weekday session were 3621 vehicles and during weekend session were 2817 vehicles. On the other hand, maximum recorded sound pressure Intersection dDuring a weekday was 94.1 dBA, and 90.5 dBA during weekends. Relating both traffic volume and traffic noise level, for Intersection A, it can be concluded that the noise level in the afternoon is lower than the noise level in the morning and evening due to the traffic volume. Since the number of vehicle passing through Intersection A in the afternoon is lesser than the number of vehicle passing through Intersection A in the morning and evening, the noise level during the afternoon period is also less. Similar to the above case, the traffic volume at Intersection A is less during weekend compared to the traffic volume during weekday effects the noise level at the study area.

3.2. Traffic Noise Profile at Intersection B

From the study, the total volume of vehicle passing the intersection during every weekday session were 3621 vehicles and during weekend session were 2817 vehicles. On the other hand, maximum recorded sound pressure Intersection A during weekday was 94.1 dBA, and 90.5 dBA during weekend. Relating both traffic volume and traffic noise level, for Intersection A, it can be concluded that the noise level in the afternoon is lower than the noise level in the morning and evening due to the traffic volume. Since the number of vehicle passing through Intersection A in the afternoon is less than the number of vehicle passing through Intersection A in the morning and evening, the noise level during the afternoon period is also less. Similar to the above case, the traffic volume at Intersection A is less during weekend compared to the traffic volume during weekday effects the noise level at the study area.

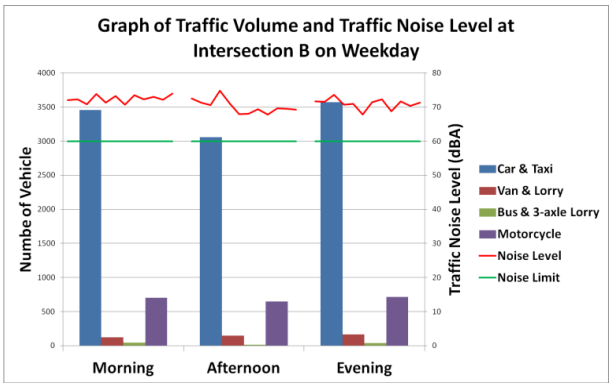


Fig. 5: Traffic Volume and Noise Level at Intersection B on Weekday

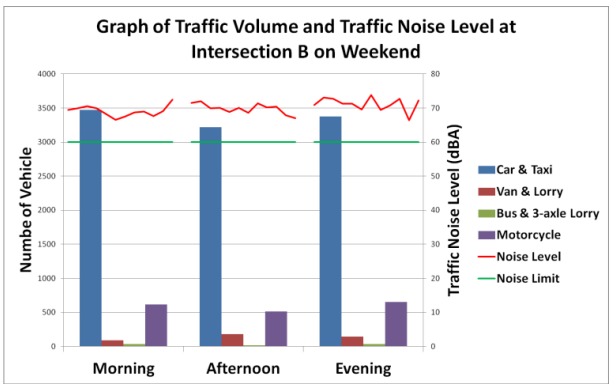


Fig. 6: Traffic Volume and Noise Level at Intersection B on Weekend

Similar to the case at Intersection A, the traffic noise at Intersection B during afternoon session can be considered the minimum from the three (3) study session. Besides, the traffic pattern is also similar for both study areas whereby the volume is less in the afternoon. However, the characteristic of the intersection is different. Intersection A connects collector roads, whereas Intersection B connects arterial roads. As expected, the traffic volume and traffic noise level at Intersection B will be higher than at Intersection due to the location of the intersection. Since Intersection B connects arterial road, therefore the traffic volume is expected to be as much as traffic volume in the expressway. The intersection is not only being used by the nearby residents, but also other unrelated road users as the arterial roads convey traffic to nearby expressway, residential area, commercialized area, hospital and also universities.

However, from the study, it shows that the noise level at Intersection B is less than Intersection A even though the traffic volume is higher. The reason to support the result is that Intersection A is a

signalized intersection, whereas Intersection B is not. Therefore, vehicles which are passing Intersection A will tend slow down or stop their vehicle. Different with situation at Intersection A, vehicle at Intersection B tend to accelerate their vehicles due to the intersection condition. Only vehicles from the secondary road will slow down or stop at the intersection.

From the data, it can be analyzed that the noise level at Intersection B has also exceeded the noise level set by The Planning Guideline for Environmental Noise Limit and Control by Department of Environment Malaysia in 2004 which is 60 dBA for Urban Residential (High Density) Areas and Designated Mixed Development Areas (Residential – Commercial) represented by green line.

From the collected data, the total number of vehicle that passed by the intersection during weekday and weekend was 4196 vehicles 4116 vehicles respectively. The maximum sound level recorded during weekday was 96.8 dBA. Conversely, the maximum sound level recorded was 86.7 dBA during weekend. Since the traffic volume is high during weekday, the sound level recorded during weekday session is also higher compared to sound level recorded during weekend session.

3.3. Analysis of the Effect of Traffic Noise Level to Nearby Residents

From the above data interpretation and analysis, it is known that the traffic noise level at both study area has exceeded the noise limit set by the Department of Environment Malaysia. Interview has been conducted to ten (10) respondents consist of residents nearby the study area. The respondents were being chosen based on the distance of their house to the intersection. Several question were asked during the interview session, relate to the noise pollution. The respondents' answers were then being interpreted using SPSS.

For Intersection A, 81.6% respondents agree that the noise pollution annoy them on their daily basis. They also agree that the noise pollution cause disturbance and headache as their daily routine were being distracted by the noise pollution. However, 18.4% respondents claim that there are no noise pollution happening in their environment, and there is no sound that annoys them.

For Intersection B, 40.8% respondents agree that there were sound that annoys them in their environment. 50% respondents claim that they are having headache due to noise pollution and the headache lead to stress. However, there was 59.2% respondents claim that they are not suffering from any noise pollution.

Based on the interview conducted, the results show that 50% of the respondents from Intersection A, and only 20% of respondent from Intersection B claim that they are affected by traffic noise pollution, whereas the other 50% and 80% of respondent from Intersection A and Intersection B respectively claim the opposite way.

There were several reasons to establish the claim. One of the factors is the degree of vulnerability to noise. Different people will have their own degree of vulnerability to noise. Some can only bear low sound pressure, whereas some can bear high sound pressure [8]. On the other hand, the respondents which claim that their area was not affected by noise pollution have live at their house for a long period of time. Therefore, they are immune to the noise around them and causing the occurring noise pollution not to affect their daily activities. Besides, the location of the house can also be considered in interpreting interview data. House that are located close to large tree will not be directly impacted by the traffic noise as tree also function as the natural sound barrier or natural sound proving device [9,10].

However, several respondents who are aware about the noise pollution occurring around them had listed several suggestions to improve the quality of the environment around them. Most respondents from the residential area at Intersection A had suggested the implementation of speed bumps and also to revise the existing speed limit to be lower than the current implemented speed limit.

On the other hand, the respondents from the residential area nearby Intersection B were not suggesting for any improvisation due to the condition of the intersection itself. Since the intersection is a signalized intersection, therefore the implementation of speed bumps and speed limit is not significant.

4. Conclusion

Results from this study clearly illustrates that the noise level at the study area has exceeded the noise level set by The Planning Guideline for Environmental Noise Limit and Control by Department of Environment Malaysia in 2004 which is 60 dBA for Urban Residential (High Density) Areas and Designated Mixed Development Areas (Residential – Commercial). The noise level at Intersection B is somehow less than noise level at Intersection A, even though the traffic volume is higher. From the interview with the community, it is surprising that the respondents are not affected by the noise level from the traffic.

Acknowledgement

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References

[1] Ismail, A.R., Tahir, M.F.M., Nor, M.J.M., Haniff, M.H.M. and Zulkifli, R. (2010). Assessment of Noise Impact: A Case Study Due to Aircraft Activities. *National Conference in Mechanical Engineering Research and Postgraduate Studies*. 2nd. Kuantan, 3-4 December 2010. Pahang: Universiti Malaysia Pahang, 176-182.

[2] Davis, M.L. and Cornwell, D.A. (2013). *Introduction to Environmental Engineering.* 5th ed. New York: Mc-Graw-Hill Education.

[3] Lamure, C. (1986). Road Traffic Noise: Generation, Propagation and Control. IN: S EN , A.L. and STEPHENS, R.W.B. (eds.) *Noise Pollution: Effects and Control.* Published on behalf of the Scientific Committee on Problems of the Environment (SCOPE) of the International Council of Scientific Unions (ICSU): John Wiley & Sons.

[4] Dept. of Environment Malaysia (2007). *The Planning Guidelines for Environmental Noise Limits and Control.* 2nd ed. Putrajaya: DOE.

[5] Dept. of Environment Malaysia (2009). *Environmental Quality Report (EQR)2009.* Putrajaya: DOE.

[6] Road Transport Department Malaysia (2015). *Jumlah Pendaftaran Kenderaan Mengikut Tahun.* Available from: **http://www.jpj.gov.my/** [Accessed 7 April 2016].

[7] Dept. of Environment and Heritage Protection Australia (2013). *Noise Measurement Manual.* Queensland: EHP.

[8] Sian, T.L., Rahman, M.Y.A. and AhmadD, J. (2012). *Basic Highway and Traffic Engineering.* Selangor: UiTM Press.

[9] Noise Help (2010). Noise Dose Chart: *Noise Exposure Limit*. Available from: **http://www.noisehelp.com** [Accessed 11 November 2016].

[10] Cook, D.I., and Haverbeke (1977). General Technical Report: *Suburban Noise Control with Plant Materials and Solid Barriers*. USA, 234-241.

[11] Shahid, M.A.K. and Bashir, H. (2013). *Psychological and Physiological Effects of Noise Pollution on The Residents of Major Cities of Punjab (Pakistan),* 1 (4), pp.52-50.