NOISE ASSESSMENT IN STUDENT CENTRES OF UNIVERSITI MALAYSIA SABAH MAIN CAMPUS

Bolong N., Ramli R., and Saad I.

Faculty of Engineering, Universiti Malaysia Sabah, 88400 Kota Kinabalu Sabah

nurmin@ums.edu.my,rdeana2002@gmail.com, ismailsaad07@gmail.com

ABSTRACT

Knowing and unknowingly, noise pollution has its own negative impact on the quality of our everyday life. Assessment of noise during peak time in the main campus of Universiti Malaysia Sabah (UMS) located in Kota Kinabaluwas highlighted in this paper. This assessment was conducted in several locations inside the campus between September to November 2013 where students are commonlypresent to study and gather. The location included are the university library, lecture hall and several students' centres in Faculty of Engineering as it is one of the largest faculty in the campus. It was shown that most of the locations have average sound pressure level exceeds 35dBA as recommended by World Health Organisation (WHO) for good studying and teaching environments. Outdoor building of UMS Main library as the highest equivalent continuous sound level, Leq of 86.54 dBA while the indoor building of main library has the lowest with 32.74 dBA. Even in the lecture halls (DKP7,8 and 9), the average sound pressure level was between 68±1 dBA. This has shown that the noise level in the main campus is quite high. Precaution steps should be taken by both the university and students in reducing the noise especially in areas close to lecture halls and tutorial rooms. This is because without prevention and precaution of the unwanted sounds could disturb the concentration of students and thus reduce their study quality as well as giving negative psychology health impact.

Keywords: noise pollution, campus environment, noise level meter, equivalent continuous sound level, $L_{eq.}$

1. INTRODUCTION

Sound is defined as any pressure variation that the human ear can detect ranging from the weakest sounds to sounds which can damage hearing (20kHz to 20000kHz). Unwanted sounds which defined also as noise are considered as sound pollution as it may interrupt activity where quiet is desirable, distract concentration, reduce the quality of communication, and contribute to the stress of individuals (Berglund and Lindvall, 1995; WHO, 2000).

The word 'noise' is derived from the Latin word 'nausea' meaning seasickness. Aziz (2008) stated that noise can be taken as pollution because it causes disruption. According to Kumar *et al.* (2004), noise pollution can be defined as unwanted or offensive sounds that reasonably intrude daily activities. Banerjee (2013) defined noise pollution as unwanted and too much

noise that may interrupt the balance in our daily activities and affects animal life. Noise pollution is also categorised into two types of distinct sources which are; (1)natural sources for example thunder or volcanic eruption and (2)anthropogenic sources which includes industry and machinery, transportation, domestic noise, construction activities and community activities.

Nevertheless, noise pollution does not usually get special attention, unlike air and water pollution as because the nature of noise cannot be seen as well as the presence of them usually disappear within a short period of time. Furthermore, not all sound and acoustical inputs are disturbing or have harmful effects and there are scientific reports that a completely silent world can also cause harmful effects, because of sensory deprivation (Berglund *et al.*, 1999).

According to World Health Organisation (WHO) guidelines, it is recommended that less than 35 dBA (A-weighted decibels) in classrooms to allow good teaching and learning conditions. Al-Zahrani*et al.* (2007) stated that noise may cause change in the morphology and physiology of an organism that results in impairment of functional capacity, or an impairment of capacity to compensate for additional stress, or increases the susceptibility of an organism to the harmful effects of other environmental influences. According to Kumar *et al*. (2004), the impacts from noise are productivity losses due to poor concentration, communication difficulties or fatigue due to insufficient rest; health care costs to rectify loss of sleep, hearing problems or stress; lowered property values and loss of psychological well being. More on the health effects toward the exposure of noise limit guidelines by WHO are tabulated in appendix 1.

University campus is where university students and staffs gather for learning and work. The main campus of Universiti Malaysia Sabah (UMS) in Kota Kinabalu, Sabah has the area of 999-acre (4 km square) with seven faculties, three research institutes, six centres and three in-campus residential colleges (hostel) as well as the main library. The phenomenon of crowds of people especially students discussing and chattering ended up making the area to be noisy.

Therefore, having too much noise in the campus might affect the campus residents specifically students on the risk of concentration-hearing loss, noise pollution could also lead to stress-related illnesses, high blood pressure and speech interference.

The objective of this paper is to evaluate the noise level within one-hour of peak time in the selected campus prime area. This study assessed the noise level in university public spots during everyday activities by the students and staffs, where it covered indoor and outdoor conditions. The assessment were conducted at lecture halls, student's foyer/parking in Faculty of Engineering (which is nearby to tutorial rooms in the Faculty's building) and at the common library.

2. METHODOLOGY

The noise level test was conducted using a 01dB-Stell SIP95 sound level meter in A-weighted decibels (dBA).Sound level readings were recorded for interval of 5 minutes for one hour (60 minutes) during peak time around 10 am to 1 pm. Conducted between September to November 2013, students and staffs were mostly around the areas of study (approximate people at the

area exceed 20 numbers). The sound pressure level (L_p) were recorded. Thereafter, the equivalent continuous sound levels, L_{eq} were tabulated and calculated using equation 1 (Davis and Cornwell, 2008) as followed:

$$L_{eq} = 10\log\left[\frac{1}{t_2 - t_1}\int_{t_1}^{t_2}\frac{p(t)^2}{p_0^{\,2}}dt\right] \qquad \text{.....Equation (1)}$$

Where $P(t)$ is the time varying sound pressure, P_0 is the reference pressure taken as 20 μPa and t_2 and t_1 time as duration of 1-hour.

For this study, locations or spots inside the main campus of Universiti Malaysia Sabah (UMS) were chosen. These locations were selected for its close proximity to students' learning activities. Selected areas of study were shown as in Figure 1 stated as point A to F accordingly.

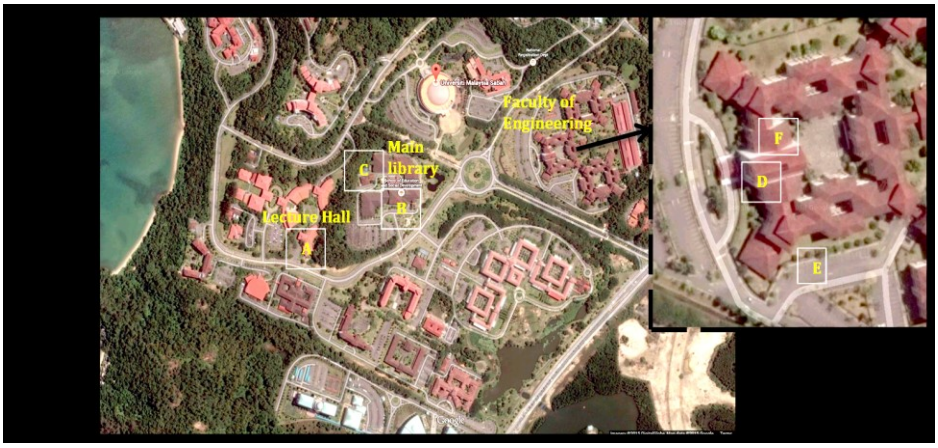

Fig. 1: Location of noise pollution assessment at UMS (courtesy of Google map); A)Lecture halls, B)Main library, C)Library Cafeteria, D) student Foyer at Faculty of Engineering, E) parking area at Faculty of Engineering and F)Multimedia Library at Faculty of Engineering

3. RESULT AND DISCUSSION

The equivalent continuous sound level, L_{eq} for the assessed locations were calculated based on recorded sound level, L_p values and this is given in Figure 2.

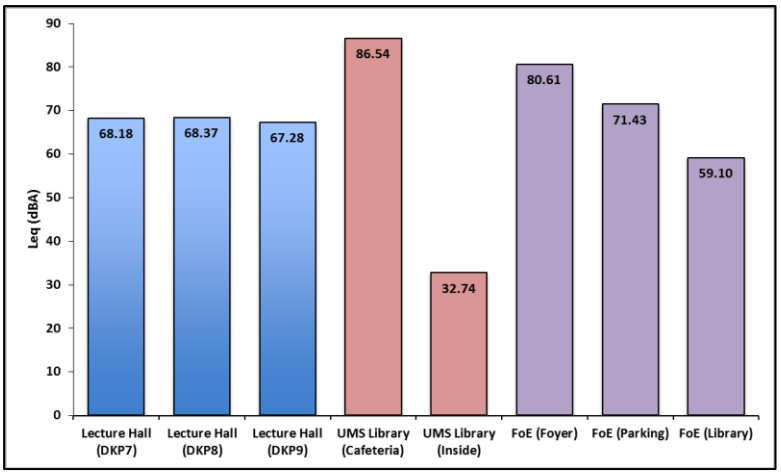

Fig.2: Equivalent continuous sound level, L_{eq}in UMS Main Campus study areas at 1-h duration

It can be seen that amongst all the selected locations, outside the Main Library has the highest value of $L_{eq}$with 86.54dBAwhile the inside of UMS Main Library has the lowest value with 32.74 dBA. The outdoor Library building includes cafeteria, causing the noise level measured up to 80dB. The cafeteria can accommodate up to 200 dining seats while there are also people who would be queueing to buy fast food in few food stalls in the cafeteria. It is also a preferable spot since it has more food stall choices compared to other faculties and residential colleges. Furthermore, the main library is situated in the center of the campus where it is nearby faculties, lecture halls and other learning center. In comparison within the Main Library itself, the noise level inside and outside the building has major difference of 53.80 dBA. The inner side of main library building has the lowest L_{eq}value. This may be due to the 'keep quiet' policy enforced in all libraries. Moreover there are more students goes to the library for individual studying as well.

Obviously, there is no 'keep quiet' policy outside the library compound and students and staffs gather in the cafeteria mostly for lunch break. Furthermore, the assessment where conducted around 11 am to 1 pm where the cafeteria is usually packed with people. Such finding is worrisome for cafeteria operatives who works in the cafeteria from morning to evening because person who expose at exceed value of 70dB long term in 24hrs duration, may result in hearing impairment risks (WHO,2000).

In assessing the lecture halls, it was found that the lecture halls have L_{eq}values ranging from 65 to 69dBA. This is almost double the recommended value for 'good teaching and studying environment' (Kumar *et al.* (2004)), however it is also might due to the effect of microphone used during lecturing that increase the noise level instrument. During the measurement, the lecture hall accommodate up to 400 students at a time. The noises were also contributed from nearby lecture halls. There were noises from outside of the lecture hall when students from other classes (lecture hall) came in and out at different time from any of the nearby lecture hall. The effects of noise pollution to students include difficulty to hear the lecture, difficult to concentrate and the outside noise will disturb their learning capacity.

Focusing in the Faculty of Engineering (FoE), its foyer has the highest L_{eq} value compared to parking area and faculty library. However, the difference of L_{eq} value for foyer and parking area is not that much. The small difference might due to the fact that there are noises from cars and pedestrian passing by. This is alarming since the parking area is situated nearby the side of faculty's building where most of tutorial rooms are. Therefore, it can be said that noise from the parking area during any lecture or tutorial classes could disturb the teaching session somehow. Examples of noises from the parking area are such as car alarm goes off randomly and persistently and noises of people gathering at the parking area.

Between the two libraries assessed, as expected both of the libraries have the lowest L_{eq} values which are 32.7dBA and 59.1 dBA respectively for main and the FoE libraries. However, FoE library exceeds 35dBA which may annoy or disturb student to focus in their study. The size of FoE library is smaller compared to the main library might the reason on the higher value of noise level. The Main Library is larger in space and thus students or staffs are scattered around the library minding their own business. Besides, the seminar and discussion rooms in the main library are mostly situated at the corners while in FoE library, the seminar and discussion rooms are just next to the general study area.

It has been discussed earlier that noise pollution does not only affect a person's physical health but also his/her psychological health. Exposing to too much noise at longer duration in the campus could bring negative impact to the students and even the university itself. Slater (1986) proved that the noise will not only affect the performance of student in school but also will disturbed the teachers who are teaching and the students who are learning. It was also found in the same study that the boys are highly affected to the high level noises and may tend to aggressiveness in behaviour.

In Malaysia, restrictions on noise pollution were discussed in Laws of Malaysia Act 127 – Environmental Quality Act 1974 Part IV: Prohibition and control of pollution. However, the presence of state regulation alone won't help in emphasizing the importance of preventing noise pollution in every party. Liu and Roberts (1999) stated that noise could be control at the source by modifying the source to reduce its noise output, altering or controlling the transmission path and the environment to reduce the noise level reaching the listener, and provide the receiver with personal protective equipment. Noise source can also be controlled by design, by reducing impact forces, reducing speeds and pressures, reducing frictional resistance, reducing the radiating area, reducing noise leakage, and isolating and damping vibrating elements. Zulkepli and Hazel (2000) proposed several ways to reduce noises in community areas such as insulation system, building a high fence using concrete or wood, planting more tree, stop or remove source of noise, society awareness on noise pollution problem and implementation of a strict law on noises problems.

4. CONCLUSION

It is concluded that within a short period of one-hour peak time noise assessment in selected area of main campus of UMS Kota Kinabalu, noise was determined and shown to be exceeding the World Health Organisation (WHO) recommendation of 35dBAprimarily indoors (lecture

halls).This phenomenon if not prevented, may disturb psychological health of the campus residents especially students. Therefore, the university should promote reduction in noise pollution throughout the campus especially in conjunction with UMS being an EcoCampus. This is also to ensure healthy and harmonious environment that would enhance conducive teaching and learning productivity.

REFERENCES

Aziz H.A. (2008). *Pencemaran Bunyi – Teori, Sumber, Perundangan dan Kawalan*. Malaysia: Penerbit Universiti Sains Malaysia.

Al-Zahrani, A., Al-Hazimi, H., Menkabo, R., Al-Malki, M., Al-Mutairi, M., &Qutob, M. (2007). *Study of Noise Pollution*. Umm Al-Qura University College of Engineering & Islamic Architecture.

Banerjee P. (2013) *Four Facts about Noise Pollution* retrieved from http://www.dna2life.com/environment/4-facts-about-noise-pollution on 15th December 2013.

Berglund B., Thomas L., Dietrich H.S. (1999), Guidelines for Community Noise, Geneva©WorldHealth Organization 1999,retrieve:http://www.who.int/docstore/peh/noise/guidelines2.html

Davis, M.L. and Cornwell, D.A. (2008).Introduction to Environmental Engineering.4th Ed. McGraw-Hill.

Kumar, B., Oberoi, S. V., &Goenka, A. (2004). *A Brief Review of the Legislative Aspects of Noise Pollution*. Institute of Engineering and Technology India. 53-65

Laws of Malaysia (reprint) Act 127 : Environmental Quality; Act 1974.

Liu, D. H. F., & Roberts, H. C. (1999).*Noise Pollution*. Environmental Engineers Handbook Second Edition. Boca Raton: CRC Press LLC.

Slater, Barbara R. (1968). Effects of Noise on Pupil Performance. Journal of Educational Psychology 59:239-243.

World Health Organization, WHO, (2000).Data and statistics. [online] Available at http://www.euro.who.int/en/health-topics/environment-and-health/noise/data-and-statistics> [Accessed date: 16 November 2013]

Zulkepli, I. And Hazel, K.R. (2000) Noise Pollution at School Environment Located in Residential Area. Journal of Civil Engineering 12:47-62.

APPENDIX

Appendix 1: WHO guideline values according to specific environments. (Berglund *et al.*, 1999)

Specific environment	**Critical health effect(s)**	**LAeq [dB]**	**Time base [hours]**	**LAmax,fast [dB]**
Outdoor living area	Serious annoyance, daytime and evening Moderate annoyance, daytime and evening	55 50	16 16	- -
School class rooms and pre-schools, indoors	Speech intelligibility, disturbance of information extraction, message communication	35	during class	-
School, playground outdoor	Annoyance (external source)	55	during play	-
Industrial, commercial shopping and traffic areas, indoors and outdoors	Hearing impairment	70	24	110
Ceremonies, festivals and entertainment events	Hearing impairment (patrons:<5 times/year)	100	4	110
Public addresses, indoors and outdoors	Hearing impairment	85	1	110