JIPF (JURNAL ILMU PENDIDIKAN FISIKA)
p-ISSN: 2477-5959 | e-ISSN: 2477-8451 *Vol. 7 No. 3, September 2022, Page 299-305*

The Impact of Transportation Traffic Noise on Merauke City Road Crossing

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Received: November 24th, 2021. Revised: May 30th, 2022. Accepted: August 1st, 2022

Keywords :
Transportation; Noise; Road Crossing

ABSTRACT
Noise caused by transportation significantly exceeds the 55 dBA. The purpose of this study was to determine the level of transportation traffic noise at the Merauke city crossing and its solutions. Noise caused The lack of proper attention to the impact of noise from traffic flow at a crossroads. The Development of additional techniques for noise reduction in this area is needed. The results obtained are very important for areas with solutions at every highway intersection The results obtained are very important knowing the noise above the standard value at every highway intersection. This research develops techniques to reduce transportation traffic noise at the crossroads of Merauke city which are applied in design practice. Experimental studies in real conditions in the characteristic areas of Merauke City using sound level meter measurements. This research was carried out experimentally by taking measurements at each crossroads and theoretical solving methods. The good convergence results confirm the impact of noise on the immediate area with a slightly higher crossing than the value on a normal two-lane road. The proposed solution will allow providing additional protection against transportation noise.

INTRODUCTION

Noise that is not wanted by humans and is an environmental factor that can negatively affect human health at a certain level and period [1]. In general, noise in urban areas is generated through different sources, including construction and commercial, industrial, airport and traffic activities [2]. State Minister for the Environment No: 48 / MEN.LH / 11/96 states the specific noise quality standard for settlements is 55 dBA. which can be seen often the occurrence of congestion every rush hour with the volume of motor vehicles that concontcontinuescrease uncontrollably [3]. While many highways have reached saturation levels (v / c) exceeding capacity or exceeding 0.7 degrees of saturation in the Department of Transportation [4]. This shows the growth of vehicles that are not proportional to the increase in infrastructure such as public transportation so that people prefer to use private vehicles to meet their daily needs and causing the volume of motorized vehicles on the road to be more than

before and cause noise due to the noise of the motorized vehicles [5]. Settlement in Merauke City has the potential to experience noise pollution because it is located right beside the highway [6] [7].

With noise levels varying with time to obtain a compound of Physics: Conference Series PAPERlete picture to measure that can represent the true value, then Leq is determined by the level of statistical value based on 10 %, 50% and 90% of measurement time [7] [8] [9]. Character and co impose traffic in the zone by conducting field observations corresponding to the time necessary for data retrieval prediction are 1 or 2 hours, done by the time of 5-15 minutes [1] [3]. This study measures the noise at each Mandala crossroads and analyzes the effect of noise and noise sources. In meeting the ease of transportation facilities, as equal distribution of development in all aspects. Roads are very important for community mobility [10] [11]. The construction of the highway is also highly developed in the city of Merauke. However, the sustainable development of the highway sometimes has not considered the aspects of the effects of noise disturbance but emphasizes the effect of needs. In general continue already exists as a highway, so it could harm the occupants of the settlement, as well as awareness of the settlement and that puts any strategic effect [11]. Use values safe distance suitable for settlement and of the noise coming from the street should be considered to form a strategic value and comfort, so in the long-term design of the development of governance, recommendation occurs in some cases to carry out measures noise protection refers to a zone located along the straight part of the transportation route. For those at the crossroads of the area, development is needed as an additional form of design. In this zone, the process of spreading sound from sources is more complex. This paper, study of traffic noise in the area directly adjacent to a city crossroads. Additional noise reduction needed to be developed for protection from traffic noise has been carried out [12]. This study aims to determine the level of transportation traffic noise at the Merauke city crossing and its solutions.

METHOD

The impact of noise uses an experimental method for the main method in actual conditions by carrying out as a basis for the proof of regulation as the main condition. Data collection at each intersection of the main road of the Mandala highway, at the intersection of Jl. Ahmad Yani, Jl. Parakomando, Jl. Aru, Jl. Noari, Jl. Trikora, Jl.Brawijaya. Measurement tests in the zone near the intersection with the distance of the building closest to the intersection of the highway, the noise character is obtained reliably to determine the noise level, calculation of the description of the transport current noise, and the data used to determine the design to minimize the noise in settlements and those close to the intersection theoretically as protection from traffic noise [13].

Research Location

Measurements were made at 6 points at the intersection, at each intersection of the main road Mandala, at the intersection of Jl. Ahmad Yani, Jl.Parakomando, Jl.Aru, Jl.Noari, Jl.Trikora, Jl.Brawijaya. presented in figure 1, to determine the description of noise from transportation using a sound level meter but the measurement of noise is very influential close to the surface of the earth and the distance of the road to the sound level meter. This calculation method allows the design to reduce the impact of noise closest to the crossroads.

Fig 1. *Location of Roads Mandala Roads*

Research time

Measurement of the character and composition of traffic by observing and measuring the field according to the time of data collection is needed according to predictions that are 1 or 2 hours, done with a time of 5-15 minutes in the morning and evening. With the composition of the closest distance to the closest residential intersection of the highway according to the rules for building permits in Merauke regency building Number 12 of 2014. Can be seen in Figure 2 presented a road scheme, a), traffic lane, b) shoulder, c) edge channel , d) safety threshold, e) x = b + a + b. fence boundaries and the initial wall boundary of the building [14] [15] [16].

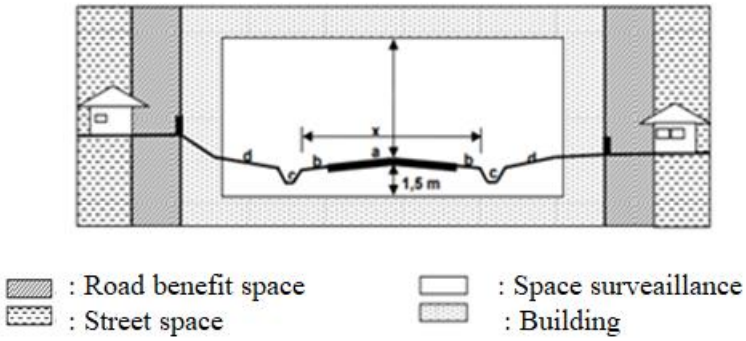

Fig 2. *Schematic of building and highway distances*

RESULTS AND DISCUSSIONS

Noise, noise mode and sound level equivalent to Laeq, dBA, and maximum sound levels are Laeq, dBA, also allows vehicle noise when stopping public transport vehicles -58 dBA and Lamax -65 dBA, while private transport vehicles -55 dBA, and Lamax - 63 dBA during testing. The method used as the main method is experimental. Done right in real conditions or s e verily Study by following with the basic regulatory documents as required [17] [18].

Tests were carried out in zones where pitch lies at the intewheretion of the road. The object under study is in the building zone close to the intersection of the highway and the building area. In the future devfuturement, it allows built to using protection from the noise as well as a place to stay. Model parameter environment settings in the settlement are designed and provided for the protection of noise [13] [19].

The object of sound generated as the main source of noise in the air is the main road that has signs along the Mandala highway at 6 intersections, having 2 lanes on the road. Noise as the background is affected to estimate the actual noise mode, the noise characteristics of the non-constant noise used are equivalent sound levels are LAeq, dBA and the maximum sound level is LAeq, dBA. Noise character of a passing vehicle and stops when the traffic light when the red light is on. For passenger car LAeq - 58 dBA, and LAmax - 65 dBA. For diesel engines, respectively: LAeq - 66 dBA, and LAmax - 76 dBA. During testing, the method and document requirements were observed [17] [18]. Experimental measurements according to the noise level in the zone. So it is necessary to determine the noise level in the zone that is close directly to the building. For the definition of sound level, the acquisition of initial data is used for further research as preliminary data to design noise protection from transportation.

The zone close to the highway that is in design if the level of sound expected exceeds the level of the size of the sound of noise by following the equivalent sound level in dBA [20]. The calculation makes it possible, for a description of the right noise transport vehicle motor, to take into account the reduction of noise from several factors. In this study, there are a few design points are taken, to make

it possible for character impact road transport highway in the design phase of the building so that there is protection against noise [21]. Assessment of noise near the surface of the earth will differ significantly with altitude. The calculation is done at several levels, taking into account several factors. The number of permanent buildings is still large, while permanent buildings use cement and brick materials with too significant differences. the design becomes the main basis for the protection of sound interference from the effects of transportation [22]. The position of the fence at each settlement as the initial place of data collection and the initial wall of the settlement with the design of the building leads to the position of the noise source. Calculation of noise reduction needed to match or equal the expected sound level at the calculated point. Noise reduction is needed for settlements.

Experimental measurements can show the actual situation which characterizes the noise from the main source of the noise [23]. The results of transportation traffic noise character measurements are presented in Table 1. The comparative value of the measured noise character is done with normal values, the noise from the traffic flow on the mandala highway significantly exceeds the standard. The reliability of the research carried out, is confirmed by calculations [24]. The data obtained makes it possible to predict changes in the environment in the following year, as well as can design noise protection from traffic. Values are calculated from the expected noise level in front upfront building designed, part of the building the initial level of the lowest noise is 60 dBA [18].

Table 1. Noise level data on the measurement

Location			**Normalized**		**Measured**	
The name of the road at each intersection	**Code**	**Zona**	**Equivalent Level, LAaq.,[dBA]**	**Maximum Level, LAmax.,[dBA]**	**Equivalent Level, LAaq.,[dBA]**	**Maximum Level, LAmax.,[dBA]**
Jl.Ahmad Yani	1	Fence	50	65	70	78
		House weel	46	55	60	68
Jl. Parakomando	2	Fence	50	66	72	80
		House weel	45	56	62	69
Jl. Aru	3	Fence	52	65	72	81
		House weel	46	56	62	68
Jl. Nouri	4	Fence	51	71	73	80
		House weel	46	56	66	72
Jl.Trikora	5	Fence	53	72	74	80
		House weel	46	57	64	73
Jl.Brawijaya	6	Fence	53	72	74	85
		House weel	46	56	65	75

The calculation of the level of sound noise in the initial limit part residential buildings indicate that the sound level of noise in a zone that is computed d I fence building at the intersection of street theatre to the streets Ahmad Yani sound level of noise top 78 dBA, while the walls of the early part of the house, the sound level of the noise equivalent is 68 dBA. On the fence of the building at the intersection of the street theatre to the street Parakomando level the sound of the highest noise of 80 dBA, while on the initial wall of the house, the sound level of the noise is equivalent is 69 dBA. In the zone which is calculated on the fence of the building at a crossroads mandala Aru road to level the sound of the highest noise 81 dBA, while the initial wall of the house, the sound level of the noise equivalent is 68 dBA. In the zone which is calculated on the fence of the building at the crossroads mandala to the Noari level noise highs of 80 dBA, while the initial wall of the house, the sound level of the noise equivalent is 72 dBA. Zones calculated on the fence of the building at the crossroads mandala to the Trikora level the sound of the highest noise of 80 dBA, while on the initial wall of the house, the sound level of the noise equivalent is 73 dBA. In the zone calculated at the fence of the building at the junction of the Mandala to Brawijaya road the noise level rises to 85 dBA, while on the initial wall of the house, the equivalent noise level is 75 dBA. Sound highest by calculation, are on the fence first building closest to the road. On the walls of the beginning of the building, the sound level of the

noise is lower. At the front of the housing facing the street, the sound level of noise has a higher character [25].

Calculation of the expected equivalent sound level that has the lowest level indicates the value is 60 dBA and exceeds the required value, both day and night. The maximum sound level is 85 dBA.Further calculations of the required noise reduction that penetrate the residence are made according to the highest value obtained at the beginning of the building. As a result of calculating the expected sound level produced by transportation, it was found that noise pollution in homes that were designed did not meet normal requirements [5] [11].

The acquisition of these values by ignoring the type and structure of the building is done because of the dissimilarity of the type and structure of buildings that cannot be grouped according to the size, shape, quality of the building, and age of the building it self [26]. Measurements were made at the road at each crossing of the mandala road consisting of 6 points, where arteries and collector roads are shown in Table 1. One observation location point was selected on each road. The point is chosen is by following the criteria for suitable site conditions such as no road closure and morning and evening time whiteness busy hours on the highway the distance between the sound level meter and the highway is determined by regulations which have become an absolute prerequisite for the construction of a predetermined settlement the government. Measurement of traffic volume and the vehicle speed is not a benchmark in this study in other words ignored. The measurement time is Monday-Friday from 07.00 -09.00 and 16 .00- 18:00 WIT. The impact of noise is very influential in hearing impairment, weakening communication, sleep disturbance, causes of heart or vein effects and psycho-physiology. There are two important aspects of the impact of noise according to the decision of the environment minister namely the physical aspect is the occurrence of noise threshold discomfort or increased stress and hearing loss and the Psychological aspects of emotional disturbances, confusion, lifestyle disorders or poor sleep patterns [19].

Minister of Health Regulation No. 718 of 1987 about noise on health is divided into four regional zones, namely: Zone A is a zone for places of education, hospitals, places of health or social care. The intensity of the noise level ranges from 35-45 dB. Zone B is for housing, education, and recreation. Limiting noise between 45-55 dB. Zone C includes offices, shops, trade, and markets. With noise around 50-60 dB. Zone D for industrial environments, factories, railway stations, and bus terminals. The noise level ranges from 60-to 70 dB. Disturbances from noise or form sound at a certain level can still be adapted to the physical human but the human nerve can be impaired performance, and the result can cause interference or more severe damage. Noise exposed to humans usually has a disturbing effect, such as hearing loss. Hearing loss is a change that occurs in the level of hearing which results in difficulty in living a normal life. Hearing loss usually occurs when understanding a speech gradation of hearing loss caused by the noise itself can be determined using parameters in daily conversation, which is as follows, Normal gradation as a parameter does not experience difficulty in normal conversation 6 m, Medium graduation is the difficulty parameter in daily conversations starting at a distance > 1.5 m, Medium graduation is a parameter of difficulty in loud conversations starting at a distance of > 1.5 m, Heavy graduation is a parameter of difficulty in loud conversation or shouting at a distance of > 1.5 m, Very heavy graduation is a parameter of difficulty in conversation or shouting at a distance of < 1.5 m and total deaf graduation is a parameter of hearing loss in communication. The level of noise that can be accepted by humans in terms of health depends on how long the hearing is exposed to noise. Some studies in many countries find noise levels acceptable to the public such as noise levels that can still be tolerated by humans depending on what activities are being carried out. Someone who is sick, worshipping and studying will feel disturbed by the very small noise though [6]. Therefore, some recommendations that will be suggested by the research team to overcome this are to make several policies related to limiting the number of noise sources. One of the biggest sources of noise is motorized vehicles that have non-standard mufflers. an alternative that can be implemented is to prohibit and discipline motorized vehicles that do not have mufflers. In addition, the government requires all school-age children to use public transportation as a means of transportation.

CONCLUSION

Practical recommendations based on this research When designing buildings in a zone located at an intersection, experimental measurement of the noise characteristics of the main noise source needs to be measured. This will make it possible to obtain accurate values as well as for further calculations. In the lowest noise conditions, take into account building materials used that can reduce noise, such as the use of bricks or permanent buildings. Allowing the level of external noise that is permitted inside the building to increase the level ensuring the permitted level. The maximum value of sound insulation needed for a place to live must be minimal, the regular design cannot provide the sound insulation needed for a place to live. Studies of modern residential design systems have shown that when used they will provide a standard noise mode in residential areas. The implication of this research is that the results of research related to the level of transportation traffic noise at the Merauke city road crossing is one of the parameters. The noise level is the government's reference in making policies in dealing with noise that occurs.

REFERENCES

[1] Rinanti, A., Fachrul, M. F., Moerdjoko, S., Widyatmoko, W., & Siami, L. (2020). Sosialisasi Dampak dan Pengendalian Kebisingan di Permukiman. *Jurnal Abdi Masyarakat Indonesia*, *2*(1).
[2] Lapono, L. A. S., & Pingak, R. K. (2018). Design of Sound Level Meter Using Sound Sensor Based on Arduino Uno. *Jurnal Ilmu Dasar*, *19*(2): 111-116.
[3] Syaiful, S., & Wahid, N. (2020). A study of the density of motor vehicles in front of Bunda Hospital Margonda Depok against noise pollution. *The Spirit of Society Journal: International Journal of Society Development and Engagement*, *3*(2): 110-132.
[4] Jumingin, J. (2012) Kajian Variasi Jarak Antar Penghalang Suara yang Dihasilkan Oleh Sumber Suara. *Jurnal Pendidikan MIPA*, *1*.
[5] Khairunnisa, K., Nurkamilia, N., & Zuraidah, Z. (2018). Analisis Signal-To-Noise Ratio Pada Sinyal Audio Dengan Teknik Konvolusi. *Jurnal ELTIKOM: Jurnal Teknik Elektro, Teknologi Informasi dan Komputer*, *2*(2): 78-86.
[6] Azizah, N., Hustim, M., & Pasra, M. (2020). Traffic noise level handling on AP Pettarani road towards elevated toll road construction. In *IOP Conference Series: Earth and Environmental Science* (Vol. 419, No. 1, p. 012106). IOP Publishing.
[7] Bulkin, V. V., Khromulina, T. D., & Kirillov, I. N. (2019, June). Analysis of the acoustically noise situation in an urbanized area in the presence of vehicular and industrial noise. In *IOP Conference Series: Earth and Environmental Science* (Vol. 272, No. 2, p. 022237). IOP Publishing.
[8] Yultrisna, Y., & Syofyan, A. (2012). Sinusoidal Noise Cancelation dengan Menggunakan Digital Signal Processing Starter Kit TMS320C6713. *Elektron: Jurnal Ilmiah*, *4*(2): 67-74.
[9] Akbar, A., Fadlan, I., & Sukandar, I. (2018, August). Picture of Hearing Health with Exposure to Environmental Noise on Boat Ketek Riders in Region of Ancol Tanggo Rajo Jambi 2017. In *Journal of Physics: Conference Series* (Vol. 1075, No. 1, p. 012051). IOP Publishing.
[10] Hanafi, M. Z. (2019). *Implementasi Metode Sentra Dalam Pengembangan Kecerdasan Majemuk Anak Usia Dini*. Deepublish.
[11] Rahman, A. Y. (2020). Noise Reduction in RTL-SDR using Least Mean Square and Recursive Least Square. *Jurnal RESTI (Rekayasa Sistem Dan Teknologi Informasi)*, *4*(2): 286-295.
[12] Algiranto, Sarwanto, & Marzuki, A. (2019, February). The development of students worksheet based on Predict, Observe, Explain (POE) to improve students' science process skill in SMA Muhammadiyah Imogiri. In *Journal of Physics: Conference Series* (Vol. 1153, No. 1, p. 012148). IOP Publishing.
[13] Tarasova, O. G., & Taratuta, V. D. (2019, December). Impact of the city transport noise on the territory close to the streets' intersection. In *IOP Conference Series: Materials Science and Engineering* (Vol. 698, No. 2, p. 022019). IOP Publishing.

[14] Gao, Y., Zhong, R., Tang, T., Wang, L., & Liu, X. (2017). Automatic extraction of pavement markings on streets from point cloud data of mobile LiDAR. *Measurement Science and Technology*, *28*(8): 085203.
[15] Grewe, V., Matthes, S., Frömming, C., Brinkop, S., Jöckel, P., Gierens, K., ... & Shine, K. (2017). Feasibility of climate-optimized air traffic routing for trans-Atlantic flights. *Environmental Research Letters*, *12*(3): 034003.
[16] Hustim, M., Arifin, Z., Aly, S. H., Ramli, M. I., Zakaria, R., & Liputo, A. (2018, April). Road traffic noise prediction model for heterogeneous traffic based on ASJ-RTN Model 2008 with consideration of horn. In *IOP Conference Series: Earth and Environmental Science* (Vol. 140, No. 1, p. 012082). IOP Publishing.
[17] Manea, L., Manea, A., Florea, D., & Tarulescu, S. (2017, October). Road traffic noise pollution analysis for Cernavoda city. In *IOP Conference Series: Materials Science and Engineering* (Vol. 252, No. 1, p. 012057). IOP Publishing.
[18] Maksimova, S. V., & Batrakova, G. M. (2019, December). Analysis of air pollution and noise on low-speed streets. In *IOP Conference Series: Materials Science and Engineering* (Vol. 687, No. 6, p. 066035). IOP Publishing.
[19] Setiawan, B., Saidi, T., Yuliannur, A., Polom, U., Ramadhansyah, P. J., & Ali, M. I. (2020). Ambient noise analysis for characterizing sub-surface dynamic parameters. In *IOP Conference Series: Materials Science and Engineering* (Vol. 712, No. 1, p. 012012). IOP Publishing.
[20] Abdi, A. W., & Rahma, F. (2018). Tingkat Kebisingan Suara Transportasi Di Kota Banda Aceh. *Jurnal Pendidikan Geografi*, *18*(1): 10-21.
[21] Mensah, G. A., Orchini, A., Buschmann, P. E., & Grubišić, L. (2022). A subspace-accelerated method for solving nonlinear thermoacoustic eigenvalue problems. *Journal of Sound and Vibration*, *520*: 116553.
[22] Saefudin, S., & Emra, D. (2021). Usulan Pengendalian Bahaya Kebisingan Area Sub Assy Siren Di PT. Sumber Mas Autorindo. *Baut dan Manufaktur*, *3*(01): 38-46.
[23] Dewanty, R. A., & Sudarmaji, S. (2016). Impact Analysis of Noise Intensity with Hearing Loss on Laundry Worker. *Jurnal Kesehatan Lingkungan*, *8*(2): 229-237.
[24] Singkam, A. R. (2020). Kondisi Kebisingan di Gedung Perkuliahan Universitas Bengkulu. *PENDIPA Journal of Science Education*, *4*(2): 14-20.
[25] Khorzova, L. I., Sidyakin, P. A., & Klimenti, N. Y. (2018, November). Assessment of noise pollution at municipal economy objects in Pyatigorsk. In *IOP Conference Series: Materials Science and Engineering* (Vol. 451, No. 1, p. 012183). IOP Publishing.
[26] Darlani, D., & Sugiharto, S. (2017). Kebisingan Dan Gangguan Psikologis Pekerja Weaving Loom Dan Inspection Pt. Primatexco Indonesia. *JHE (Journal of Health Education)*, *2*(2): 130-137.