Journal of Environmental Impact and Management Policy
ISSN: 2799-113X
Vol: 02, No. 03, April-May 2022
http://journal.hmjournals.com/index.php/JEIMP
DOI: https://doi.org/10.55529/jeimp.23.29.36

Exposure Assessment of the Traffic Aides and Street Sweepers of Taganito Mining Corporation (TMC) to Noise Pollution

Queenny C. Fijo[1*], Janie Mae T. Lorejo[2], Maryjane C. Nogalo[3], Rica Faye C. Plaza[4], Medielyn M. Odtojan[5]

[1,2,3,4,5]Surigao State College of Technology, Narciso St., Surigao City, 8400 Caraga, Philippines*

Email: [2]jlorejo@ssct.edu.ph, [3]rplaza3@ssct.edu.ph, [4]mnogalo@ssct.edu.ph, [5]modtojan@ssct.edu.ph
Corresponding Email: [1]qjifo@ssct.edu.ph*

Received: 04 December 2021 **Accepted:** 28 February 2022 **Published:** 30 March 2022

Abstract: ***Noise pollution is an issue for the environment in fast-growing and expanding countries. It is commonly created within many industrial buildings, but it can also be found in traffic on highways, trains, and airplanes. Road workers, such as traffic aids and street sweepers, are highly exposed to noise levels that endanger their hearing. This research project aimed to assess the level of noise pollution exposure among TMC traffic aids and street sweepers, as well as the effects on their physical, mental, and emotional well-being. The time range set by National Pollution Control Commission (NPCC) included morning, daytime, evening, and night time where were adapted in measuring the noise level. Designated Two (2) sampling locations within Taganito Mining Corporation (TMC) where traffic aids and street sweepers are primarily stationed. Based on the results, when compared to Department Administrative Order 2000-98 (DAO 2000-98) or the Mine Safety and Health Standards, all the noise levels measured in the 2 stations were all below 90 dB. Thus, traffic aides and street sweepers of TMC within 8 hours' exposure are within the permissible limit. Unwanted noise mainly from heavy equipment such as bulldozer trucks, dump trucks, loaders, excavators, water trucks, and garbage trucks, as well as public transportation vehicles such as ambulances, buses, vans, and motorbikes are observable. Thus, it is recommended that further research to the community area will be carried out.***

Keywords: Noise Pollution, Noise Assessment, Taganito

Journal of Environmental Impact and Management Policy
ISSN: 2799-113X
Vol: 02, No. 03, April-May 2022
http://journal.hmjournals.com/index.php/JEIMP
DOI: https://doi.org/10.55529/jeimp.23.29.36

1. INTRODUCTION

Noise pollution and its impact on human health and welfare have recently been recognized as a critical and essential topic, prompting scientists and industry participants all over the world, including the World Health Organization (WHO), to research its levels and negative impacts. Traffic noise is a prevalent and growing environmental hazard, owing to continued urbanization and the transportation sector's expansion. The most common source of noise is automobile traffic, followed by railway and aircraft noise [1]. Traffic noise has a wide range of health impacts, including aggravation, sleep problems, and changes in stress hormone levels, as well as negative effects on the cardiovascular system [2]. Noise pollution is a problem for the environment in countries that are rapidly growing and expanding. Due to deficient city planning of the metropolis in the past, traffic noise has become a serious problem in recent years. The problem has been exacerbated by a rise in visitor quantities (heavy cars and other vehicles) that is far exceeding the expectations of early city planners [3]. This worrisome growth in the number of visitors is directly proportional to the degradation of the environment. Sound strain is a fundamental degree of the air vibrations that make up the sound, and because the range of sounds that human listeners can encounter is so diverse, those tiers are quantified on a logarithmic scale with decibel meters (dB) [2]. It is typically produced within many industrial facilities, but it also comes from outside activities such as highway, train, and aviation traffic. For many years, noise has been considered a problem in the mining industry, and the sluggish expansion in mechanization over the previous century has resulted in lower noise levels in many areas [4]. Indeed, it's estimated that 80 percent of US miners work in environments where the time

weighted noise average surpasses 85 decibels and that 25 percent of those workers are exposed to noise levels of 90 decibels or greater [5]. Scrapers, bulldozers, drills, shovels, front-end loaders, trucks, cranes, draglines, and other surface mining equipment are among the most prominent sources of noise-induced hearing loss [6]. Loud noise exposure can result in high blood pressure, heart disease, sleep difficulties, and stress. A sound that is louder over 90 dB, or the size of the loudness or force of sound vibration, can cause serious damage to the internal ear, especially if it lasts for a long time [7]. Reference [8] shows that excessive occupational noise levels and exposure to such noise cause occupational noise-induced hearing loss (ONIHL), tinnitus, speech verbal interchange impairment, and increased accident risks. Cars' significant contribution to overall traffic noise levels (about 80% of all road traffic) resulted in hearing loss, high blood pressure, and other problems. Reference [9] discovered that traffic enforcers working shifts are not exposed to noise levels that exceed the Philippine Occupational Safety and Health Standards in selected streets in Manila City.

Road workers including traffic aids and street sweepers are highly exposed to noise levels that put their hearing at risk information concerning how the traffic aid and street sweepers in Taganito Mining Corporation (TMC) find ways to prevent or minimize their exposure to noise pollution. The purpose of this research is to assess and provide awareness to road workers of TMC in the exposure to noise pollution.

Journal of Environmental Impact and Management Policy
ISSN: 2799-113X
Vol: 02, No. 03, April-May 2022
http://journal.hmjournals.com/index.php/JEIMP
DOI: https://doi.org/10.55529/jeimp.23.29.36

2. METHODOLOGY

A sound level meter (Model: UT353 Decibel Digital Noise Mini Sound Level Meter Detector Uni T) was used to measure the noise level. The range and sensitivity of the instrument are from 30-130 dBA with accuracy [+ or - 1.5 dB]. The researchers divided themselves into two to measure the level of noise in both Station 1 and Station 2. The stations were traffic-prone sites in TMC where the traffic aides and street sweepers were positioned and noise levels were measured by the two researchers in each station. Station 1 focused on the highway noise and TMC mobile sources, while Station 2 focused both on highway noises and roads constructed by TMC that connected to the mountains which is the entrance and exit where the different mobile sources of TMC passed by that used for extracting and delivering minerals. The researchers followed the time frame of NPCC measured morning, daytime, evening, and nighttime. The instrument was positioned within the hearing zone of the traffic aides and street sweepers which is around 2 feet diameter surrounding the head of the workers and 1.5 meters from the ground (Menlo Park Municipal Code Ordinance 1074). And the measure of the street workers away from the source of pollution is 30 centimeters according to Land Transportation Office. One member of the group did the actual noise measurement while the other one have taken note of the readings.

The participants were first briefed about the study and the content of the informed consent form at their outposts before the start of their shift and the actual data collection The readings were taken within 1 hour in every time frame of NPCC for 1 minute at 9-minute interval for every shift hence, the number of measurements was 6 recordings per shift. The collection of data in each station is done in three weeks with 1 day during weekdays and 1 day during weekends, thus there are a total of 6 monitoring days [9]. Furthermore, the results of measuring the noise level were compared to the DENR Administrative Order No. 2000-98 the Mine Safety and Health Standards.

For each hour of recording the minimum and maximum readings were taken. The mean exposure levels were compared to Philippine OSH standards to account variations in the duration of the noise measurement. The researchers used Microsoft excel to generate graphs to present the sound pressure levels of the stations for each day. All the values that were obtained for each shift of a specific station for each day of measurement were utilized to compute for the mean, standard deviation, and range of the noise level to which traffic enforcers were exposed to. Furthermore, the mean levels were compared to the Philippine OSH Standards.

3. RESULTS AND DISCUSSION

Noise Level

Taganito Mining Corporation (TMC) traffic aids and street sweepers were largely stationed in two (2) regions designated as study sites. During the investigation, the researchers discovered that heavy equipment such as bulldozer trucks, dump trucks, loaders, excavators, water trucks,

Journal of Environmental Impact and Management Policy
ISSN: 2799-113X
Vol: 02, No. 03, April-May 2022
http://journal.hmjournals.com/index.php/JEIMP
DOI: https://doi.org/10.55529/jeimp.23.29.36

and garbage trucks, as well as public transportation vehicles such as ambulances, buses, vans, and motorcycles, are the main causes of noise. For some reason, the area where the sites were located largely received noise from public vehicles, which is far beyond the national highway area and is prone to noise, although the traffic aides at Station two (2) received a limited range of noise. Results of the monitoring in the station 1 of the traffic aides is shown in Figure 1.

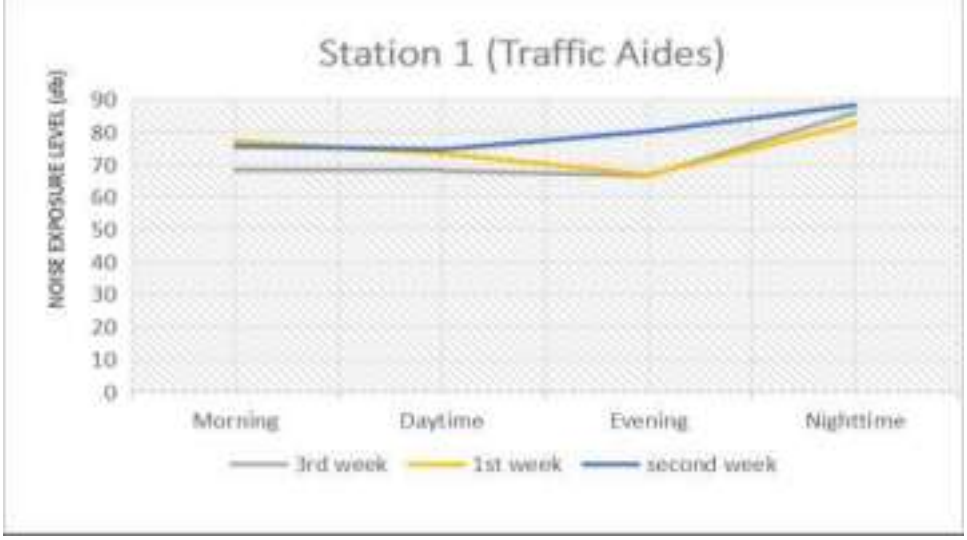

Fig.1 Noise exposure levels of Station 1 (Traffic Aides)

The reading surged from daytime to nighttime in three weeks of trial for the traffic aides in station 1 which is almost 90dB. This was due to the heavy equipment working the night shift while the ambient environment is quiet during those times. In station 2 (Figure 2), it can be noticed that the reading noise level is inconsistent.

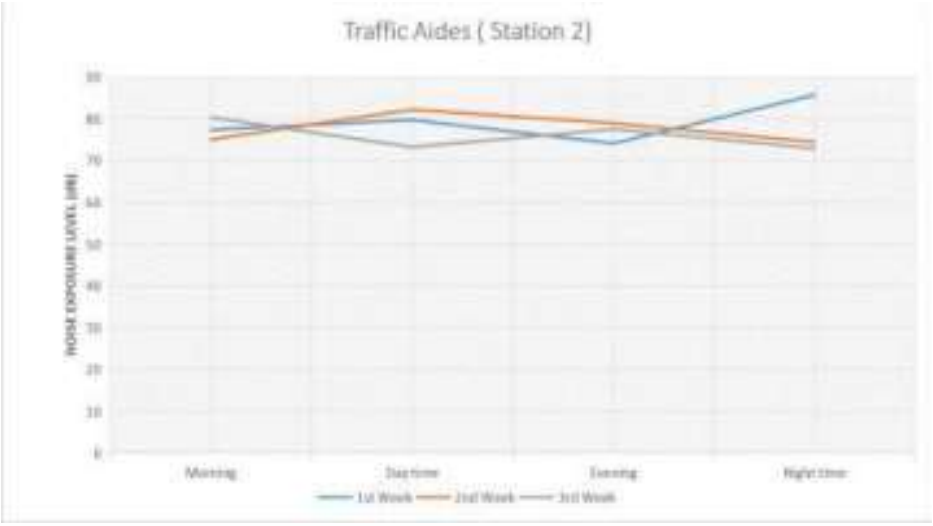

Figure. 2 Noise exposure levels of Station 2 (Traffic Aides)

Journal of Environmental Impact and Management Policy
ISSN: 2799-113X
Vol: 02, No. 03, April-May 2022
http://journal.hmjournals.com/index.php/JEIMP
DOI: https://doi.org/10.55529/jeimp.23.29.36

Shown in figure 2 above is the noise received by the Traffic Aides Station 2 in decibel in 24 hours. The level of noise starting in the morning until daytime showed that the level of noise is less than 80 dB to receive a high level of noise which is less than 85 dB but not greater than 90 dB compared to evening and night time. Researchers found out that other mobile sources like public transportation (buses, motorcycles, ambulances) affected and contributed to the level of noise received by traffic aides in station 2 during three consecutive weeks of monitoring.

For noise level monitoring results in station 1 of street sweepers is shown in Figure 3. The level of noise or morning to daytime was less than 80 dBA to get a high level of noise that was less than 88 dBA but not evening and night time. Same with the stations established for traffic aides, the sources of the noise are mostly mobile vehicles such as public transit (buses, motorcycles and ambulances).

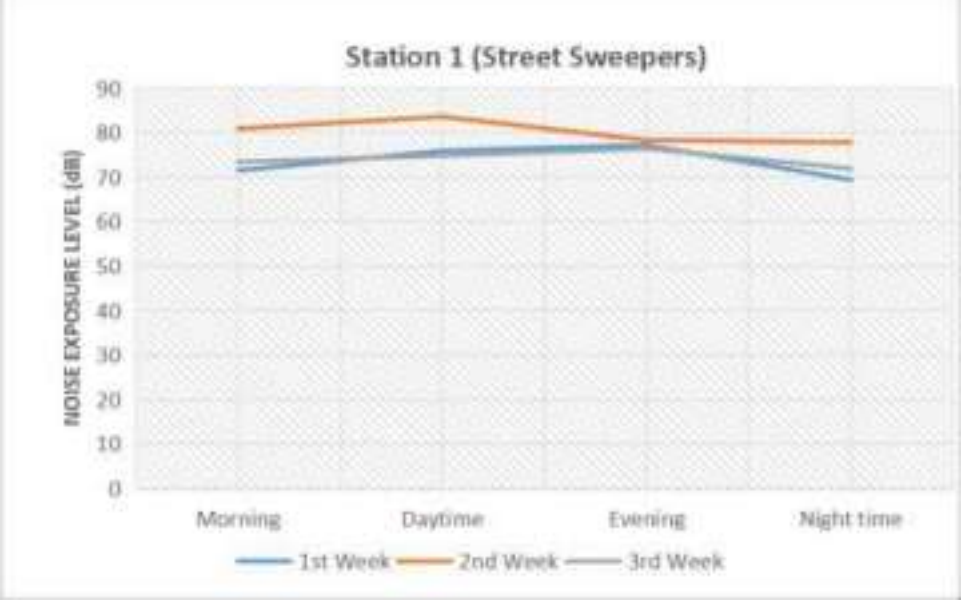

Fig. 3 Noise exposure levels of Station 1 (Street Sweepers)

The second week had the high level or noise reported at night time as indicated in figure 3. One of the factors contributed to this result was the weather in which strong winds appeared during the time of the monitoring.

While the level of noise received in decibels by street sweepers in station 2 is presented in Figure 4 below. The line graph shows high and low frequency of noise. The red line represents the 1st weeks level of noise, yellow is the 2nd week, and green is the 3rd week of monitoring.

Journal of Environmental Impact and Management Policy
ISSN: 2799-113X
Vol: 02, No. 03, April-May 2022
http://journal.hmjournals.com/index.php/JEIMP
DOI: https://doi.org/10.55529/jeimp.23.29.36

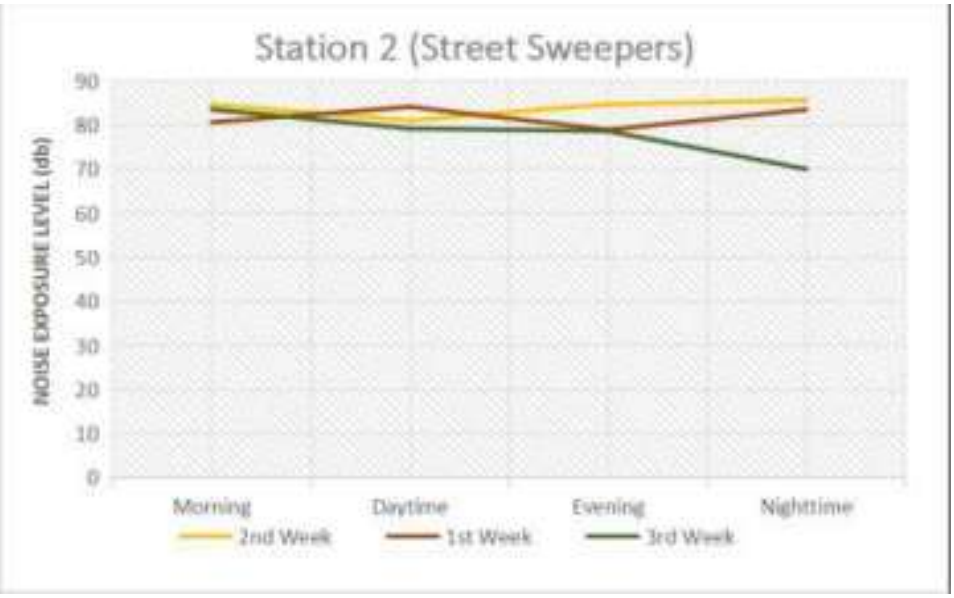

Fig. 4 Noise exposure levels of Station 2 (Street Sweepers)

The three (3) weeks monitoring in Street Sweepers (Station 2) resulted that the level of noise is within 85 dB in the morning, daytime & night time and an increase in evening which is 90 dB. In the 2nd week of monitoring, the researchers recorded the highest level of noise among all the three weeks of monitoring that ranges from 80-100 db(a).

The location of Street Sweepers (Station 2) is located in National Highway of TMC which is between the 2 routes of entrance & exit of different companies including THPAL, TMC, and Sub-contractors. Another factors that contributed to the highest level of noise recorded during the week is the unwanted events (traffics incident that happened during the conduct of the monitoring). However, in the third week of the monitoring, the reading ranges from 60-80 dB in 24hours which was noted as the lowest level of noise monitored in 3 weeks. This was due to the less traffic or few transportations in the area brought by the landfall of the Typhoon Maring that was categorized as Signal No.1.

Comparison of the monitoring results in DAO 2000-98

As stipulated in the NPCC standard, the daytime is considered to have the highest level of noise with 75 dB compared to the morning, evening, and night time. The TMC belongs to Class D or the section which primarily reserved zoned or used as a heavy industrial area. When the mean noise level is compared from the DENR Department of Administrative Order 200-98 or mine safety and health standard, both weekdays and weekends of street sweepers are within limits of 90 Dba.

Reference [10] shows that measured noise level of exposure levels in Quezon Boulevard near Qiapo Church noise range from 75.0 dB to 91.5 dB and the Recto Rizal Avenue the level range from 81.5 dB to 99.3 dB(A), the maximum and minimum values recorder in the said study the noise exposure level of traffic enforcer in Quezon Boulevard and Recto Rizal Avenue were within permissible exposure limit. Higher exposure than the

Journal of Environmental Impact and Management Policy
ISSN: 2799-113X
Vol: 02, No. 03, April-May 2022
http://journal.hmjournals.com/index.php/JEIMP
DOI: https://doi.org/10.55529/jeimp.23.29.36

traffic aides and street sweepers of TMC.

In other countries, some studies evaluated the noise exposure among traffic enforcers designated in a busy street. In the cross-sectional study of reference [2] in the Khartoum locality, the noise exposure levels among traffic police officers ranged from 74.5 dB to 86.7 dB mean. While in the study of reference [11] shows that in various traffic zones in Bangkok metropolitan Region, the noise levels measured ranged from 72.8 dB to 83.0 dB during daytime and 59.5 dB to 74.5 dB during night time. It can be noted that the maximum and minimum values of ranges in both aforementioned international studies were lower than those recorded at stations one (1) and two (2) of traffic aides in TMC.

Moreover, upon the analysis of the result using the DAO Department of Administrative Order 200-98 or the Mine Safety and Health Standards, all the noise of exposure of traffic aides and street sweepers of TMC within 8 hours duration time are within permissible limit this based at the elevation of mean publicity range with the DAO 200-98 standards via the computation of the corresponding permissible publicity restriction of every time weighted averaged (TWA). The time weighted average of street sweepers station (2) has lapsed the standards of OSHA the exposure is at or above 85 decibels averaged over 8 working hours, which OSHA requires hearing conservation programs strive to prevent initial occupational hearing loss, preserve and protect remaining hearing, and equip workers with the knowledge and hearing protection devices necessary to safeguard themselves.

4. CONCLUSIONS

In terms of noise exposure, the traffic aids were exposed to a high level of noise during the day or between 9:00 a.m. and 6:00 p.m. The results of a three-week survey with six recordings revealed that the busiest time for traffic aides is during the day. The mean, maximum, and minimum sound pressure levels according to station and shift schedule in Taganito Mining Corporation was within the standard. In mining sites, the mean noise exposure level to the noise level requirement varied by site, shift, and day but stayed within the 90 dB limit.

Acknowledgment
The researchers wish to express their sincerest gratitude to the Taganito Mining Corporation (TMC) for allowing them to perform their research, without them this study would not have been feasible.

5. REFERENCES

1. Pyko, Andrei; Eriksson, Charlotta; Oftedal, Bente; Hilding, Agneta; Östenson, Claes-Göran; Krog, Norun Hjertager; Julin, Bettina; Aasvang, Gunn Marit; Pershagen, Göran (2015). Exposure to traffic noise and markers of obesity. Occupational and Environmental Medicine, 72(8), 594–601. doi:10.1136/oemed-2014-102516
2. Sliman A, Ibrahim O, Ahmed A. (2015) Noise exposure among traffic police officers in Khartoum Locality, Sudan. European Scientific Journal; 11(6):131-5

Journal of Environmental Impact and Management Policy
ISSN: 2799-113X
Vol: 02, No. 03, April-May 2022
http://journal.hmjournals.com/index.php/JEIMP
DOI: https://doi.org/10.55529/jeimp.23.29.36

3. Gómez, I.; Glisser, M.; Padilla, C. (2015). Influence of road traffic noise in ischemic heart disease. Introduction tothe issue in Santiago of Chile. In Proceedings of the 44th International Congress and Exposition on Noise Control Engineering, INTER-NOISE 2015, San Francisco, CA, USA, 9–12 August 2015.
4. Park, T.; Kim, M.; Jang, C.; Choung, T.; Sim, K.-A.; Seo, D.; Chang, S. (2018). The Public Health Impact of Road-Traffic Noise in a Highly-Populated City, Republic of Korea: Annoyance and Sleep Disturbance. Sustainability 2018,10, 2947
5. Ma, J.; Li, C.; Kwan, M.-P.; Kou, L.; Chai, Y. (2020). Assessing personal noise exposure and its relationship with mental health in Beijing based on individuals' space-time behavior. Environ. Int. 2020, 139, 105737.
6. Mehri, A.; Alimohammadi, I.; Ebrahimi, H.; Hajizadeh, R.; Roudbari, M. (2018). Effect of traffic noise on mental performance with regard to introversion and task complexity. Appl. Acoust. 2018, 132, 118–123
7. Tandel, B.N.; Macwan, J.E.M. (2017). Road traffic noise exposure and hearing impairment among traffic policemen in Surat, Western India. J. Inst. Eng. Ser. A 2017, 98, 101–105. [8] Lie, A., Skogstad, M., Johannessen, H. A., Tynes, T., Mehlum, I. S., Nordby, K. C., ... & Tambs, K. (2016). Occupational noise exposure and hearing: a systematic review. International archives of occupational and environmental health, 89(3), 351-372.
8. Dulay, L. E. R., Galvan, M. D. K. P., Puyaoan, R. J. M., Sison, A. A. Y., Natanauan, N. S., & Hernandez, P. M. R. (2018). Occupational noise exposure of traffic enforcers in selected streets in the city of Manila. Acta Medica Philippina, 52(3).
9. Hattis, D. (1998). Occupational noise sources and exposures in construction industries. Human and Ecological Risk Assessment, 4(6), 1417-1441.
10. Jain, R. (2015). Environmental impact of mining and mineral processing: management, monitoring, and auditing strategies. Butterworth-Heinemann. 6