UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ASSESSMENT OF ENVIRONMENTAL NOISE POLLUTION FROM AYER KEROH INDUSTRIAL ESTATE MELAKA USING STATISTICAL APPROACH

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Engineering Technology (Maintenenace Technology) (Hons.)

by

HAFZAN BIN SYAFRIZON

B071310163

910131-14-5625

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Engineering Technology (Maintenance Technology) (Hons.). The member of the supervisory is as follow:

(Muhamad Azwar Bin Azhari)

ABSTRAK

Kewujudan bunyi bising di persekitaran seperti bunyi bising industri dan bunyi bising jalan raya boleh menyebabkan banyak kesan kesihatan yang negatif kepada rakyat sekitar Ayer Keroh. Pencemaran bunyi ini juga boleh membawa beberapa kebahayaan kepada alam sekitar dan seterusnya memudaratkan kepada manusia, haiwan dan badan-badan tumbuhan. Untuk mengatasi masalah ini, penilaian bunyi yang baik diperlukan. Dalam kajian ini, penilaian pencemaran bunyi alam sekitar dari kawasan perindustrian Ayer Keroh, Melaka akan dijalankan dengan menggunakan pendekatan statistik. Sebuah peta bunyi akan dibangunkan kepada tiga zon yang berdasarkan tahap pelepasan bunyi, jenis pengeluaran loji dan jenis berat pengeluaran. Peta ini akan melihatkan rantau dengan tahap pelepasan tekanan bunyi di kawasan tersebut dan setiap zon dicirikan oleh warna-warna dan kontur yang berbeza. Untuk membangunkan peta bunyi, data telah diambil dari 50 titik lokasi dengan tempoh satu hingga dua minggu pada 8pagi hingga 5petang dan dengan menggunakan meter paras bunyi. Seterusnya, data yang dikumpul telah disusun semula, dijadual dan dicirikan dengan menggunakan Microsoft Excel sebelum membentukkan peta bunyi. Berdasarkan data, paras bunyi tertinggi yang terhasil ialah 78.1 dB(A) yang terletak di industri makanan dan yang terendah ialah 53.2 dB(A) yang terletak di industri plastik. Punca pengeluaran bunyi dikategorikan kepada 6 kategori iaitu pembuatan, plastik, pejabat, makanan, lain-lain dan pembinaan. Majoriti daripada lokasi dapat dikategorikan sebagai tahap pelepasan bunyi yang kebiasaannya diterima. Kesimpulannya, dapat disimpulkan bahawa penilaian pencemaran bunyi alam sekitar di kawasan perindustrian Ayer Keroh Melaka menggunakan kaedah pendekatan statistik telah berjaya dijalankan.

ABSTRACT

The existence of environmental noise such as industrial noise and road noise can cause adverse negative health effect to the surrounding citizens of Ayer Keroh. This noise pollution also can bring several environmental hazards and subsequently harmful to human, animal and plant bodies. To overcome this problem, a good noise assessment is required. In this research, assessment of environmental noise pollution from Ayer Keroh industrial estate Melaka were conducted by using statistical approach. A noise maps will be developed into three zones which are based on the noise level emission, types of plant production and types of production heaviness. This maps will presented the region with level of sound pressure emission on the area and the characterized zones by different colours and contours. To develop the noise maps, the data were taken from 50 located points with a period from one to two weeks at 8 a.m. to 5 p.m. and by using sound level meter. Then, data collected were rearranged, tabulated and characterized by using Microsoft Excel before developing a noise maps. Based on the results, the highest noise level produced is 78.1 dB(A) situated in food industries and the lowest is 53.2 dB(A) situated in plastic industries. The sources of noise is categorized in 6 categories which are manufacturing, plastics, offices, foods, others and lastly construction. Majority of the locations are categorized as normally acceptable sound emission level. Hence, it can be concluded that the assessment of environmental noise pollution from Ayer Keroh Industrial Estate Melaka using statistical approach is successfully done.

DEDICATION

This report is dedicated to my family and friends who have mentally and physically supported me to finish this project. Not to forget to the future generation that will need to use the idea of this project for the next studies or research.

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LIST OF SYMBOLS AND ABBREVIATIONS

dB(A)	=	decibel units for A-weighting
dB	=	decibel
DNL	=	sound pressure for day and night
GIS	=	Geographical information system
GPS	=	Global Positioning system
Hz	=	Hertz
HUD	=	US Department of Housing and Urban Development
ISO	=	International Standard Organization
km	=	kilometre
Leq	=	steady equivalent sound pressure
Loi	=	average noise emission level for vehicles type i
Lpa	=	sound pressure for A-weightings
m	=	metre
MPHTJ		Majlis Perbandaran Hang Tuah Jaya
NGO	=	Non-Government Organization
Ni	=	traffic volume of vehicles type i
NIHL	=	Noise Induced Hearing Loss
OSHA	=	Occupational Safety and Health Administration
Pa	=	Pascal
Pref	=	References pressure
POEO	=	The Protection of the Environment Operations Act
r	=	radius
sec	=	second
SPL	=	Sound Pressure Lvel
T	=	Calculation Time
UTeM	=	Universiti Teknikal Malaysia Melaka
Vi	=	speed of vehicles type i

WHO	=	World Health Organization

CHAPTER 1

INTRODUCTION

1.1 Background

Environmental noise is usually relates to unwanted sound and vibration that can distracts the human being in terms of physically and physiologically and effect environmental pollution by extinguishing environmental assets. Noise also can be categorized as a pollution from road transportation system which can lead to weakening in performance (Alimohammadi et al., 2013). Basically, the expression for the noise levels is expressed in English, metric, or both conventions, reliant to the geographic area or the policies of the controlling agency. According to the National Institute for Occupational Safety and Health (NIOSH), the sound level that exceeds the time-weighted average of 85 dB(A) can be classified as a harmful noise.

Nowadays, noise pollution is categorized as one of the main problems of urban populations that has several harmful effects on the environment (Martin et al., 2006). High level of noise level can lead to stress on human health like hearing loss, insomnia, auditory system and the worst is limiting the life of human being. A study by Pramendra, (2011) stated that noise can bring a negative impact on the quality of life and health ailments that induces the depressive tendencies. Besides, animals and plants also can be affected by environmental noise. Noise pollution will harm the nervous system of animals that make them become uncontrolled and wild as their habitat is being threatened. The poor quality of crops even in a pleasant atmosphere due to noise pollution bring harmful to the plants.

The environmental pollution is created from many sources, among them are from road, construction work, aircraft, industrial factory, as well as some other outdoor activities. Furthermore, it can be classified to different characteristics such as

continuous, intermittent, broadband (fairly even tone content), and tonal noise (dominant tone(s)). A study by Gangwar, (2006) convey that the main sources of noise pollution might be from musical instruments, human activities, high number of vehicles and urbanization.

A workers in industrial factory can be greatly exposed to noise. As research by Al-Dosky (2014) stated that noise from industrial can be a noise pollution that annoys and disturb the daily activities of the workers. This is due to machinery and manufacturing process that take place in the factories. Many number of devices and machines from industries can be considered as a source of noise. This case including rotors, cutting machines, motors, compressors, electrical machines, drilling, fans and transportation. The emitted of noise level is related with the type of the noise source such as the type of machines, working environment and the distance of the source of the noise to the surrounding peoples. Therefore, majority of the workers of hand tool industrial are constantly exposed to the noise levels that is exceed the permissible limits. Exposure of high level of noise to the workers is not only affects the communication among the workers, but also cause the other psychological and physiological effects on the workers.

1.2 Problem Statement

An environmental noise assessment is an inspection of the nature and characteristics of a noise. It can involve the verifying of auditory factor such a noise's audibility, time of occurrence, duration or offensiveness. Protection of the Environment Operations Act 1997 (the POEO Act) and the Protection of the Environment Operations (Noise Control) Regulation 2008 (the Noise Control Regulation) can be applied in noise assessment. Depending on the conditions, the Noise Control Regulation may require an assessment of a noise's audibility, time of occurrence, duration or offensiveness.

Several environmental hazards occur from the noise pollution and subsequently harmful to human, animal and plant bodies (Pramendra et al., 2011). All these

problems are resultant from the consequence of rapid growth of population, self-centered human mentality, fast life style, high number of vehicles, use of large number of instruments in daily life, excessive exploitation of natural resources, rapid rate of urbanization and industrialization. Besides, Alimohammadi et al., (2013) revealed that road traffic noise can disturbs the attention and concentration rather than quiet condition. Hence, noise pollution also can led to road accident. This problem can be overcome by the regular monitoring of noise pollution is applied.

Unfortunately, the environmental noise assessment in Ayer Keroh (Melaka) Industrial Estate is never exist. Thus, the relevant authority such as Majlis Perbandaran Hang Tuah Jaya (MPHTJ) do not have a proper information and guideline to determine whether a noise is audible, excessively long in duration, or offensive, as stated by the regulation. Besides, they will miss the techniques for measuring noise that is critical for support the decision-making. To overcome this problem, we have developed a noise mapping data by measure the noise level and then characterized it by using statistical approach. A study by Pandya (2003) proved that the urban areas is a suitable places for making the noise assessment used for the development of a noise mapping.

The noise maps can define spatial distributions of noise levels and contribute an efficient visualization of the noise distributions. Throughout the study, the information of the environmental noise pollution from Ayer Keroh Industrial Estate are scarce because the research is never be done before. As a result, this paper is mainly about the assessment of environmental noise pollution from Ayer Keroh industrial estate Melaka using statistical approach.

1.3 Objectives

This study embarks with the following objectives:

i. To measure noise level and develop noise mapping data at Ayer Keroh, Melaka Industrial Estate

ii. To characterize noise level by using statistical approach.

1.4 Scopes

Scope of study for this research are:

i. Measuring the environmental noise pollution at Ayer Keroh, Melaka industrial estate by using sound level meter.

ii. Producing the industrial noise pollution mapping based on the data measured and collected.

iii. Characterizing the environmental noise pollution by using statistical approach by Microsoft Excel.

CHAPTER 2

LITERATURE REVIEW

2.1 Environmental Noise

Environment can been defined as the surrounding of an individual or community that is involving both of the physical and cultural. It can be used to illustrate the condition of the environment such as environment of the deposition. Whereas, environmental noise is harmful outdoor sound that is generated by human activities and can bring a negative effect on the quality of life of the individuals (Gupta and Ghatak., 2011). Noise is classified as the third dangerous pollutant of megacities (Nasiri et al., 2009). Basically, the sound level above 50 decibel (dB) is considered to be the noise. Environmental noise pollution relates to noise produced by road, rail and airport traffic, industry, construction and some other outdoor activities. Road traffic, jet planes, garbage trucks, construction equipment, manufacturing processes, and lawn movers are some of the major sources of this unwanted sound that are routinely transmitted in to the air (Berglund & Lindvall., 1995). Noise tends to be one of the key issues when planning for increased urbanisation in central city areas. In these areas, noise emissions from different sources often exceed the typically applied noise target values. Further research is required on urban ambient noise exposure regarding the recent developments (Pujol et al., 2012).

2.1.1 Road Traffic Noise

Heavy road traffic is one of the major sources of environmental noise especially in large cities as mentioned by Jamrah and his colleague in 2006. It is also supported by Murthy in 2007; and Omidvari and Nouri in 2009. While, some earlier investigations for past few decades in several countries shown that health of people who lives close to a busy road highways were badly affected by the noise emission (Rylander et al.1976; Calixto et al. 2003; Ouis 2002). As mentioned by Rawat and his friends in 2009, in developing countries, high degree of environmental noise which affect the residency arounds the motorways were caused by the high volume, high speed and percentage of heavy vehicles on freely flowing motorways. The relationship between traffic volume and noise is variable. The level of average noise generated on a street or in an area, for example, can be decrease by reducing the number of vehicles around those areas. However, according to the street configuration, reduction in the number of vehicles will consequently cause to the increase in the speed of other remaining vehicles, which are no longer limited by the presence of as many other vehicles. Hence, to be expected that the increase in the maximum noise emission level by the other remaining vehicles will occur as the results of increase in the speed level. Therefore, the interventions on noise levels which effects in reducing traffic volume in an area or street should depends on implementation context and the volume of traffic before and after the intervention, as well as on the characteristics that driven the speed of vehicles in the affected area.

2.1.2 Aircraft Noise

Aircraft noise from flight operations in the landing and takeoff phase near airports is a well-recognized environmental stressor. Compared to earlier models set out and built in 70’s and 80’s, modern airliner aircraft are quieter which affect in much smaller individual noise footprints. Despite, whenever the individual noise footprints have decreased, the number of flights are keep

increasing. As the consequences, the significant numbers of city or residency will remain exposed to the aircraft noise. Referring to a journal by Basner in 2014, an exposure of aircraft noise for a long-term or exceeds certain levels will negatively influences human health. There are lots of studies claims that children are a high-risk group vulnerable to the effects of chronic aircraft noise exposure. Lists of potential effects of noise exposure on children also been discussed in several studies. Furthermore, compare to adults, the some research suggest that children may be more sensitive towards noise. Though, there are no internationally accepted standards for children exposure to loud noise. Children enrolled at primary schools near aircraft flight paths are often exposed to noise levels which are believed to hinder teaching and learning. In addition, aircraft noise has a main direct effect on sustained attention (Hambrick-Dixon., 1986). However, it is also possible that sustained attention also acts as a mediating factor between noise exposure and cognitive impairments.

2.1.3 Neighbourhood Noises

Neighbourhood noises are sounds with high information content such as language, music or also the noise of footsteps (Neimann et al., 2006). Despite of becoming a common source of stress, the studies proved that neighbourhood noise will also leads to lower overall life satisfaction (Weinhold, 2013; Praag and Baarsma, 2005). An informative sound, even if the sound is relatively low, it will attract people attention as it is one of human nature. In comparison, the annoyance neighbourhood noise is therefore relatively high also at low noise levels and is heightened by the hearer's knowledge of the sound producer and other things causing the noise. Contrary to airport and traffic noise, loud neighbours are unexpected and generally inaccurate observable. Thus, the presence of loud neighbours may not manifest itself in the form of property values or other economic tangibles, making it difficult to indirectly impute a monetary valuation (Weinhold., 2013). Furthermore, it is also difficult to differentiate between noise pollution

and loud neighbours and that from other urban sources due to lack of theoretical reason. On the other hand, insufficient evidence is the main reason for national noise regulation to put more attention towards airport, construction, traffic and work-related exposure to noise (Hammer et al., 2014; Nelson et al., 2005). Instead of surveillance under environment health authorities, enforcement of neighbour noise law, where they exist, normally falls within the purview of local nuisance laws. The enforcement is also mostly left to local governments with varying degree of effectiveness as well as the prioritization. (Hammer et al., 2014). Nevertheless, there are good theoretical reasons to claim that neighbour noise could be an additional effect to health through channels which are not captured in studies of traffic and airports. There are three ways that distinguish loud neighbours from street noise that it is less predictable and often occur with higher informational content, even if the decibel level is similar or even lower (Niemann et al., 2006).

2.1.4 Construction Noise

Construction noise is mainly cause by several major activities taken place within the construction sites itself such as noise from vehicles (transportation/tractor), equipment, and breakers. Recent thought on noise effects and research findings related to transportation noise recommend that construction noise has negatively affects human emotion and physical, speech communication, and academic performance (Ng., 2000). Therefore, workers on site are a high-risk group which exposed to the effects from construction noise. Difficulties to measure the noise exposure level due to different working hours of each worker, variant daily operation and itinerant and seasonal nature of the job. However, it is undoubtedly that those workers are exposed to very high sound levels for certain lengths of time. Acoustical research has demonstrated construction tools and noise can be lower. However, the implementations are not widely enforced except where required by law or by a few European manufacturers. Hence, noise control