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NOISE POLLUTION IN MANDALAY CITY

Departmental Research Paper

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Abstract

'Noise' is any unwanted sound which tends to disrupt the environmental balance. It is responded to noise is subjective and can vary individually according to loudness, frequency, and time pattern; the amount of background noise. Noise pollution comes from several sources, including street traffic, aircraft, railroads, industry, construction, consumer products, and other sources. In this paper, the levels of noise pollution which is related to the types and number of vehicles as well as location of the residents are measured around Mandalay City. As a result, it is found that motorcycles are the major source of environment noise and dense population caused noise pollution in the residential area.

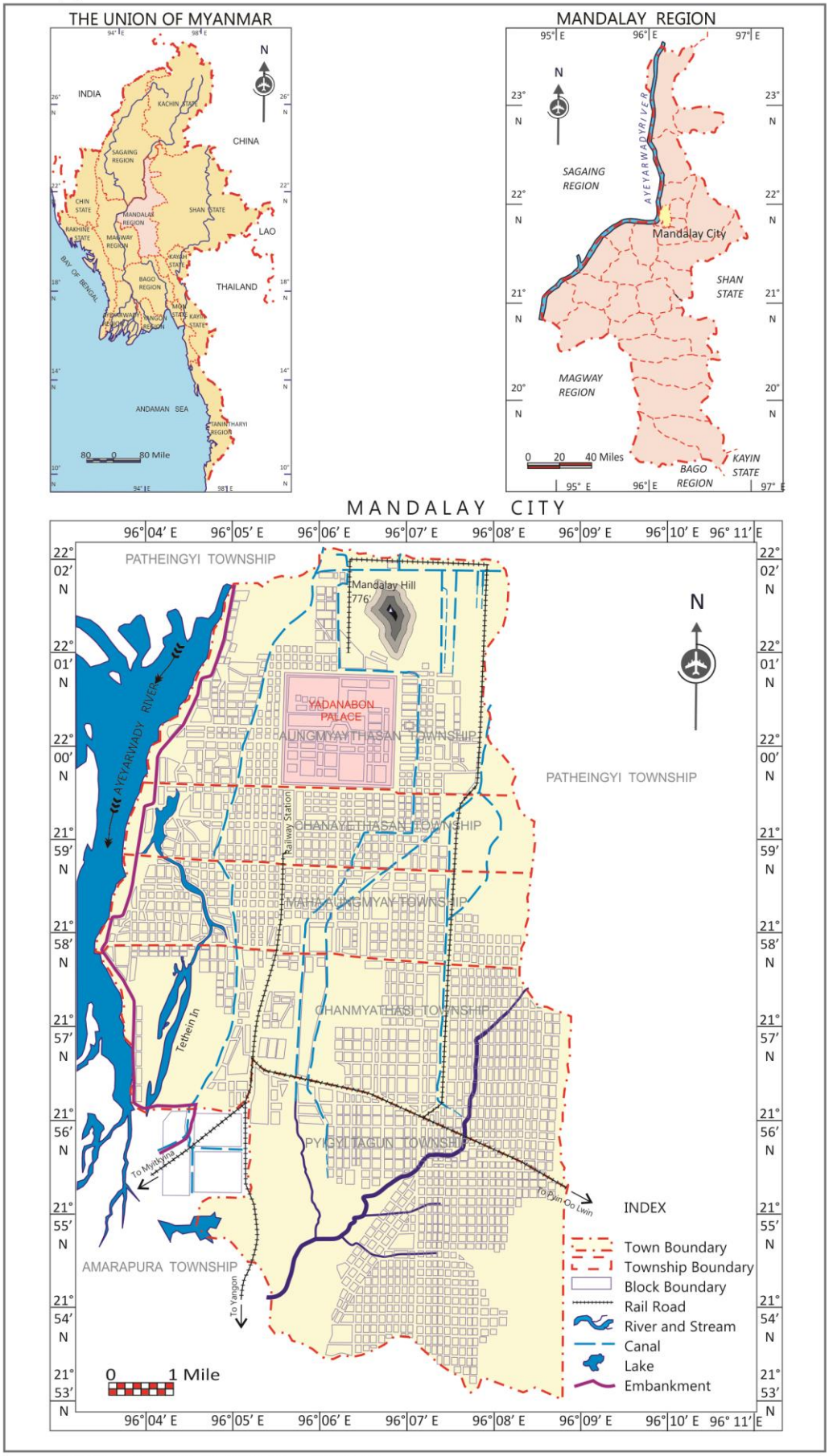
Introduction Generically, the term 'noise' is used to refer to any unwanted sound. Noise pollution is defined as displeasing sound created by humans, animals or machines, which tends to disrupt the environmental balance. Noise is annoying for everybody. Human response to noise is subjective and can vary greatly from person to person. Factors that can influence individual response include the loudness, frequency, and time pattern; the amount of background noise present before an intruding noise; and the nature of the activity (e.g., sleeping) that the noise affects. Noise pollution derives from several sources, including street traffic, aircraft, railroads, industry, construction, consumer products, and other sources. Aim in order to better understand noise pollution; it is first important to understand where it comes from and where it is made sounder. Upon doing so, it can be carefully considered that its impacts on humans and more effectively investigate methods for reducing noise and preventing its negative consequences.

Sources The sources of noise pollution can be broadly categorized into indoor sources and outdoor sources. While the indoor sources include loud music and the noise created by various electrical appliances and tools, the outdoor sources predominantly include the noise

created by vehicles and industrial machinery. The outdoor sources of noise have a larger share compared to their indoor sources when it comes to polluting the environment. This paper is attempted to highlight the noise pollution of the environment around Mandalay City, only the sound levels from outdoor sources are emphasized.

The sensitivity of the human ear to sounds of different frequencies is measured by the A-weighted decibel scale (dBA). A 10-dBA change in noise levels is judged by most people as a doubling of sound level. The smallest change in noise level that a human ear can perceive is about 3-dBA. Increases of 5-dBA or more are clearly noticeable. For example conversation ranges between 44 and 65 dBA when the people speaking are 3 to 6 feet apart.

MAP (1) LOCATION OF MANDALAY CITY



Source: UTM Map No. 2195_13, 2196_01 and 2296_04.

Data and Method For the study of noise pollution in Mandalay city, the necessary data are collected for two times by field survey. Firstly, the sound level in the city was considered at the junctions of main street (Map 1) (i.e. mostly at traffic lights) assuming that most of the noises come from the different type of vehicle. The number of vehicles which passed through each traffic light was counted by classifying into 5 categories as follow:

1. Motor cycle and Trishaw
2. Private car (saloon)
3. Cargo truck (small and medium)
4. Bus (passenger car)
5. Others (ambulance, train, emergency vehicles)

The project members assembled at each point for two hours (8:00 to 9:00 a.m. and 5:00 to 6:00 p.m.). The number of vehicles will be multiplied by the respective rate of dBA which is defined by Beranek (1988) and EPA (1971) (Table-1). This method of data collection has both good and weak points. The average dBA level can be calculated for every minute. Then, it can be understood that the maximum noise level could be acquired within the peak hours. So, it is assumed that the peak of sound level is the highest for that particular point.

The disadvantage of this method is consumed both time and man power. Because, for each point, at least two persons were ready to count the number of vehicles according to their types for an hour in the morning and that in the evening. Therefore the data for only (12) sample sites could be collected and those acquired data are not covered for the entire study area. Those data are tabulated as shown in Table (2), with their respective location and the highest level of sound (i.e. mentioned by the number of times which is intolerable for the hearing of a person).

To compensate that error of data collection, decibel sound meter is also used to collect dBA again throughout the City. The advantage of this method is that the sound level of any location could be collected within very less time span and with only one person. But, its weak points are there the specific time for data collection could not be fixed and it was also measured for very short period of time. For example, the researcher could be at a point for 10 minutes and the range of dBA and its maximum dBA could be collected during that short period. Hence, it could not be considered as maximum dBA of that particular point. Therefore, by using this implement, the data are collected with the priority of resident areas. (i.e., away from the main roads).

Levels of dBA throughout the City

1. Within the study area, for the point of Virginia factory, average value of decibel was 78.66.The highest level of sound was produced by motor cycle and the second highest was by truck which carried construction materials. It is clearly seen that motor cycle is very convenient and easily accessible, so that many city people used that two-wheeler.

2. At the junction of 78th and Takhuntaing traffic light, the average value of decibel was 78.44.The noise produce by private vehicles was the second highest and these vehicles used to pass through this point and continue to Sagaing road. Apart from that the private vehicles which have been come from Naypyitaw and Yangon to Mandalay have to pass through this point. It is no doubt that the sound produced by cycle and trishaw was the highest because of their convenience to use.

3. For the selected point of 30th and 78th streets junction, average decibel value was 77.44. Here also, the same source of the nosiest sound was caused by cycle and trishaw. As the point is located in the heart of the city, it is also sure that the sound produced from the private saloon car was the 2nd highest.

4. At the junction of the streets of 35th and 80th, the average sound level showed 76.45 dBA. The same sources of the highest and second highest sound were cycle, trishaw and private saloon car, respectively. Since this junction is also located in the center of the city, those are really sound produced sources.

5. The next selected point was at the junction of 62nd street and Theikpan road. The average sound level was 77.76 dBA and the maximum sound was produced by motor cycle. The second highest caused was by saloon private cars. There is no intersection of road and railway. So, the siren from rail could not be recorded.

6. At the point of 62th street and Manawhari road, the highest sound level was produced by private cars and it was followed by that of motor cycle. While, the sound made by truck and bus were rather low. The average dBA value at this point was 75.18.

7. The average sound level of 76.87 dBA was noted at the traffic light of 35th and 78th streets. This point is one of the busiest traffic lights in the city. It locates almost center of Mandalay. The highest value of sound was caused by motor cycle and the second highest was by private cars.

8. On the main road of the study area (i.e. 84th street), the sample point was selected at the junction with 35th street. It also lies in the traffic congested area. Its average sound level during the study period was noted as 77.17 dBA. Here was also no doubt that motorcycle was

the major contributor to be the highest sound level. It was followed by the sound made of private cars.

9. Another sample point is at the entrance of Mandalay city from Naypyitaw and Yangon (i.e. at the junction of 78th street and Mandalay-Pyin Oo Lwin railways. At this point the highest sound level was caused by motor cycle and it was followed by that of private cars. The average sound level was 77.77 dBA.

10. The average sound level of 78.44 dBA was noted at the junction of City Circular Road and 35th street, that is the jetty of Gawwain. It is no doubt that motor cycle was the greatest contributor to be the highest sound level. Being located on the city circular road, most of the cargo truck passed this point, so that the second highest sound level was caused by cargo.

11. At the entrance of Amarapura Township, there is the junction of railways and road to Sagaing and western part of the Ayeyarwady. This is also at a part of city circular road. As a consequence, the sound made by cargo truck was the highest except that of motor cycle. The noted dBA value at this point was 78.41 in average.

12. At the traffic light of 62nd street and Tharawadi road, the average sound level was 77.96. The highest sound level at this point was caused by motor cycle and the second highest was due to private cars.

Disadvantage on the biasness of the first method, spatial distribution of sound levels around the city are collected again. The sample sites are plotted on map (2).Total 237 points had been selected for detecting sound level around the city. With the help of the Digital Sound Level Meter (sl-814), various dBA of the residential quarters are collected and the different values are categorized into 3 classes. According to Beranek (1988) and EPA (1971), decibel level at 50 is defined as quiet. In this paper, the lowest sound level was marked at 60 because the sound data were collected during day time throughout the city. The decibel level of 70 or 80 is assumed as moderately loud. Hence, dBA between 70 and 80 is categorized as loud and more than 80 is classed as very loud. Out of 225 sounds, only 12 sites could be regarded as quiet area, whereas 156 places were measured by dBA between 60 and 70. Between 70 and 80, there were 19 sample sites and more than 80 dBA, there were 90 places. From those dBA levels, it can be noted that about 69% of the sample sites had been found as loud level for the residents. The second highest percentage was found at dBA of more than 80 (i.e., 22%) and could be considered as very loud level of sound. Among those points, only one place was remarkable at dBA of 98 that is the place on 78th main road and number of vehicles passing through that point even up to right 11:00 p.m.

Discussion By comparing the sound levels which produced by different types of vehicle in the study day at each particular point, it can be noticed that the highest dBA was mainly caused by motor cycle except the point of 62nd street and Manawhari road. Being a plain area, such two wheelers is the most suitable vehicle for roaming around the city. The cargo trucks are strongly prohibited to enter the city, so that the second highest sound was made up by private cars. It can be assumed that at present, the city dwellers can consume the private vehicle rather than those days of the past. The bus transport servicing is not quite reliable for the public. That may be one of the reasons to increase such great number of private saloon vehicle.

Among the selected sample points, there were four places which had the highest average sound level (i.e. more than 78 dBA). Those points are actually passed through by cargo trucks which carried heavy loads to the western side of Ayeyarwady River, especially to Sagaing-Monywa area. Out of these four points, three places (namely: junctions of Virginia Factory; City circular road and 35th street; railways and road at Amarapura) have been used by other vehicles like ambulance, rails, etc. This may be also another reason to be the highest sound level. Another highest level of sound could be noticed at the traffic light of 62nd street and Thayawadi-Mingyi road. This is the point where cargo trucks have to pass through to carry their commodities.

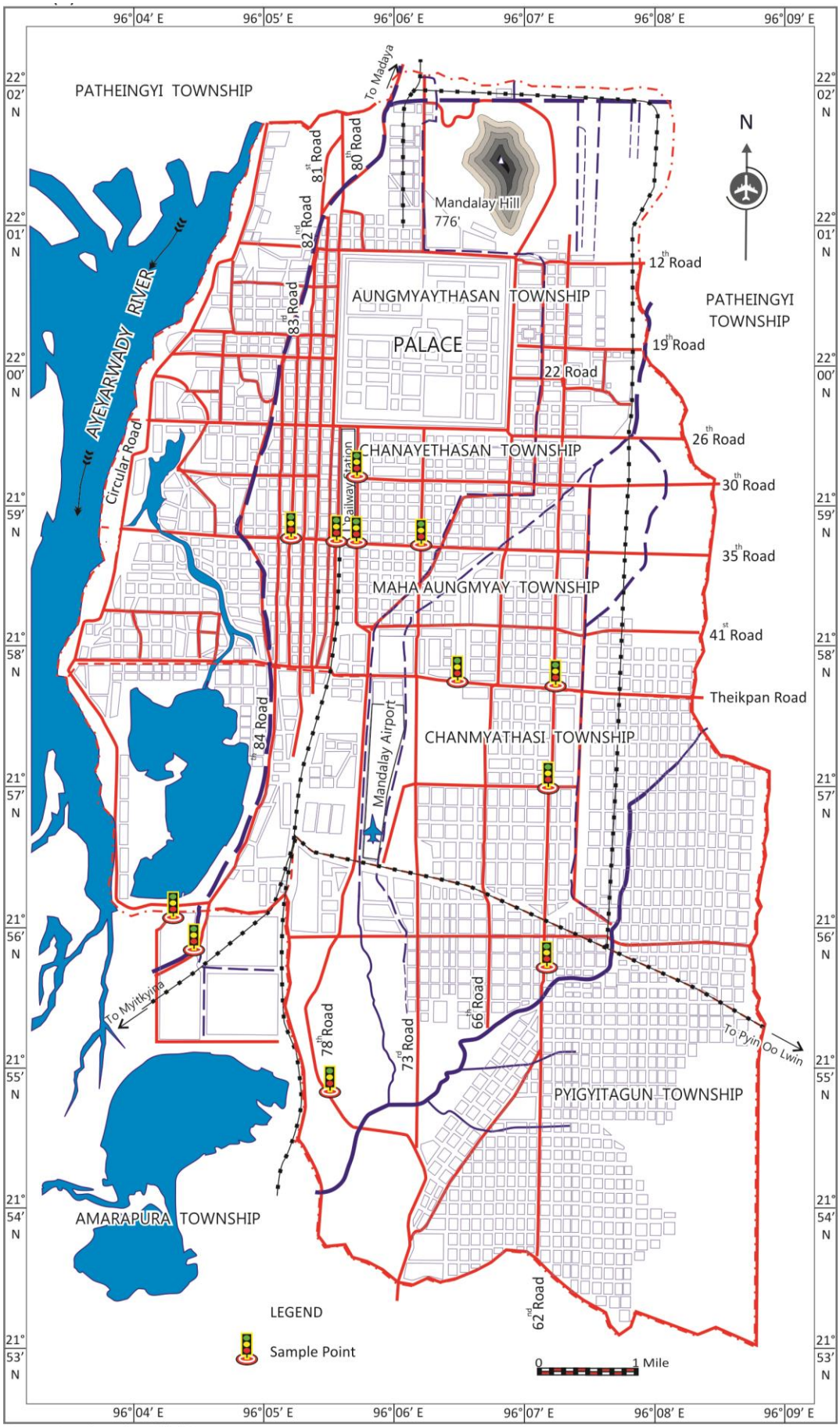
Out of remaining 7, 4 places had average sound level with more than 77 dBA. It is sure that 3 places are located in the center of the city and both motor cycle and private vehicle mostly used to pass through these points. These points are especially busy during the peak hours of a day.

The third highest sound level of 76 dBA could be noted at junctions of 35th and 80th streets, and 35th and 78th streets. Although these points are also located in the center of the city, due to the presence of arched bridge, motorcycles are not allowed to pass it. Therefore, very less number of motor cycles made there to be less sound level.

The lowest sound level, i.e. 75 dBA was noted at the junction of 62nd street and Manawhari road. This is located at the center of new town area and only the dwellers from that area used to pass through this traffic light. Hence, the sound level was quite low.

As shown in Map (2), different sound levels were recorded for a particular day, it can be noted that tolerable sound level was mostly concentrate in the southeastern and southern parts of the city. Because, those areas are newly built up encroaching by some village tracts of Patheingyi Township. Moreover, southernmost portion of the city is occupied by Industrial

Map (2) Selected Sample Points for Noise Pollution by Vehicles in Mandalay City



Source: Data based on Field Survey.

Zone I and Zone II. The density of population, the population distribution pattern and the road condition are the main causes to appear with different sound levels.

Between $35^{th} \times 30^{th}$ streets and $73^{rd} \times 66^{th}$ streets, small patch area with sound level of less than 70 dBA was found. There has the Nawarat Avenue; it is mainly meant for residence. Hence, that small area is quite enough for the dwellers. The same case could be also found in the southern part of Mandalay and Amarapura. Another one more patch of low sound level was noticed between $35^{th} \times 30^{th}$ streets at west of 84th street.

To remaining points were with more than 70 dBA sound level on the particular days. It is no doubt that motor cycle is the major contributor to be high sound level. While detecting at a point and during the short period of sound detection, the dBA level increased about 45 up to 68 it a motor cycle through nearby. Therefore, it the road condition is quite good, more motor cycle used on that road. That's why in the new town areas, the sound level was mostly less than 60 dBA.

To define the places of noise level around the quarters of Mandalay City, digital sound meter was used to measure various sounds especially infant of the houses. Although it is considered to notice the sound level for the urban dwellers, various noises had been recorded according to the places (locations) and particular characters of the quarters.

In the west of Pyikyaw *Zay* (local name Pauk Pauk Tan Ward), there was quite high sound level and it was mainly caused by the station of small cargo truck and wholesale centre.

In the northwestern part of the city, around the quarters of Nyaungkwe, Kywesun, Amarahtani East and West, high density of population is the main reason for noise level. Along with the residents, various small businesses were conducted. Moreover, since GTC (Government Technical College) has been set up in this area, the settlement pattern has become more concentrated. The works such as welding, lathes, painting, black smith, saw mills contributed to be much higher sound level there.

In the residential areas of east of the palace, most of the noise levels were generated from the motor cycles even on the lanes. Because, my cyclists wanted to avoid the main road and traffic light, it is the major case for noise pollution there.

In the new town area, the setting up of markets like Manawhari, Sanpya Myothit market and dense population mode to be high level of sound. Actually, this portion is allotted to the retired persons to have quiet and calm environment. But, this area is safety from the careless fire and it is the major pull to be dense populated area.

Around the quarters of Amarapura, the weaving industries, dying works, condensed milk factories are the major reasons to be high sound level. Moreover, the city circular round places through Amarapura area and heavy and light cargo trucks plug passenger buses contributed to be noise area.

Findings Motorcycles are the major source of environment noise, and they present a unique situation. Unlike cars, trucks, and buses, tire noise contributes rather insignificantly to the overall amount of noise produces by motorcycles (Sharp & Donovan, 1979). Thus, the type of engine, acceleration, and other issues those are relevant to the engine system rather than the tires become more important when considering motorcycles as a noise source. And, the rider of a motorcycle is not shielded by an enclosed compartment from the noise produced by their vehicle. Moreover, motorcycles can be particularly noisy; whereas cars generally produce noise levels in the range of 67-75 dB, but can reach levels as high as 120 dB immediately behind the cycle. (Burgliarello et al., 1976)

Conclusion Urban areas record more noise pollution as compared to the rural areas, and the reasons for this are more than obvious. No wonder it is often cited as one of the hazards of urbanization. Of all the sources of noise pollution, street traffic is the most prevalent and perhaps damaging source of noise pollution. Indeed, sharp and Donovan (1979) confirm that "more people are exposed to noise from motor vehicles than any other single source of noise". Though this claim is now 20 years old, the prevalence of street traffic has certainly grown since then, and thus the impacts of traffic noise are still a major factor in human society.

Besides cars, buses and trucks also contribute significantly to traffic noise. Though there are fewer of these vehicles in use than cars, the contribution of buses and trucks to noise pollution is significant nonetheless.

Traffic Noise Mitigation In theory, there are a number of options that can be used to reduce or mitigate traffic noise. These include traffic management, highway design, and noise barriers including earthen berms. In reality, noise mitigation is often infeasible due to space requirements, aesthetic issues and financial costs, or because the costs outweigh the benefits. Any specific mitigation measure recommended as part of a project must be feasible and have a reasonable cost in relation to the benefit. Potential mitigation measures are described below.

(i) Traffic Management: Traffic management measures include modification of speed limits and restricting or prohibiting truck traffic. Restricting truck use given

roadway would reduce noise levels at nearby receivers since trucks are louder than cars. However, displacing truck traffic from one roadway to another would only shift noise impacts from one area to another and may conflict with the planned function of the roadway (e.g., an arterial generally carries truck traffic).

(ii) Roadway Design: Roadway design measures include altering the roadway alignment and depressing roadway cut sections. Alteration of roadway alignment could decrease noise levels by moving the traffic farther away from the affected receivers.

(iii) Noise barriers: Construction of noise barriers between the roadways and the affected receivers would reduce noise levels by physically blocking the transmission of traffic-generated noise. Openings in the wall, such as for driveways and walkways can significantly reduce the barrier effectiveness.

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