

DETERMINATION OF TRAFFIC INDUCED NOISE POLLUTION AND ITS IMPACT ON THE CITIZENS IN THE ZAKHO CITY AREA

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The current paper deals with determining the level of noise pollution in the area of the Zakho city and its regions Impact on city residents. In this study, noise levels were measured with a digital sound level meter in seven different places in Zakho from 9:00 AM to 8:00 PM during working days. The time-weighted average noise level was measured on the roadside. The data collected was analyzed to calculate the average, maximum, and minimum noise level in decibels (dB) with respect to traffic volume. It was observed from the study that the highest roadside noise level in Zakho city was 96.1 dB found in the traffic (A) at the evening, which exceeded the acceptable limit of 60 dB set by the Government of Iraqi region and the minimum sound level of 51.5 dB was recorded in Traffic (D) area at the morning. The highest mean value is 88.63dB found in traffic (A) at the evening and the lowest median value is 66.5dB found in the Traffic (D) at the morning. During the study and according to Questionnaire survey, Noise health effects are the health consequences that high levels of noise have on health. It causes hearing loss, high blood pressure, and decreased blood flow to the heart, bowel movements, sleep disturbance, and an increase in work accident rates.

KEYWORDS: Noise pollution, health hazard, noise level, environmental problem.**1. INTRODUCTION**

The undesired sound that is emitted into the environment is referred to as noise pollution. It causes a person discomfort and has a bad impact on his mental and psychological health (Edna & Eoin, 2014).

Zakho, the second largest city in Duhok province, is located 50 kilometers northwest of Duhok and 8 kilometers west of the Ibrahim Khalil border crossing with Turkey. As one of the country's busiest commercial centers, motorized traffic is one of the main sources of noise in Zakho. Noise induces social and behavioral effects, notably annoyance and sleep disturbance; the effects of noise on human health are hearing impairment, speech intelligibility, physiological dysfunctions, mental illness, performance reduction, and cardiovascular diseases (WHO, 2011).

When people hear about the damages of pollution, the first thing that comes to their mind is thick smoke or sewage water and plastic waste scattered everywhere, but what many do not know is that noise pollution is no less dangerous than other forms of pollution. Noise pollution ranks second in cities, right after water pollution (Pelumi, et. al., 2019).

Noise or audio pollution it means excessive or mixture of unwanted continuity sounds usually due to crowding and industrial progress, which may affect human health and the quality of the environment, and the intensity of the noise is measured in decibels. Noise pollution is related to industrial development, construction activities, and means of transportation, such as: planes, trains, and others [Stephen, & Mark, 2003. and Noel, 2017).

When the streets are crowded with cars, especially during the school year, the citizens are more exposed to the dangers of car exhaust. The health dangers of traffic congestion affect pedestrians, transport and transportation riders, and residents in nearby areas. Waiting at traffic lights means congestion in a narrow space, which is more harmful than walking on a crowded street. Traffic congestion causes inhalation of more harmful gases emitted in vehicle exhaust, such as sulfur dioxide, nitrogen oxides, carbon monoxide, carbon dioxide asphyxiating gas, and diesel emissions, which cause an increase in the severity and duration of asthma attacks. Diesel exhaust emits 40 toxic substances, in addition to diesel fine particles (Ioannis, et. al. 2020).

According to the World Health Organization, transportation noise affects one in three people in Europe. One in five Europeans are regularly exposed to nocturnal sound levels that may cause them significant harm. (WHO, 2021). The noise pollution in industrial factories in Zakho region is very extensive during study the effects of occupational noise exposure on cardiovascular system and hearing threshold for workers in Zakho factories (Ali, 2014). Evaluation of Noise Pollution Levels in Hospitals and its Effects on Staff Health in AL - Najaf City in Iraq was studied by Ahmed Abdel et al. They showed that the average measured A-weighted equivalent continuous level (L_{Aeq}) in all hospitals and in different shifts was more than recommended level (20–35 dB) of World Health Organization (WHO) about hospitals (Hamoud1 & AL-Hakkak1, 2020).

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2. OBJECTIVE OF THE STUDY

- An investigation of noise pollution in the city of Zakho and its impact on the city's inhabitants are the main objectives of this study.
- To Determine and analyze the dangers of noise pollution's level in certain traffic area of Zakho region.
- Ensure that noise pollution does not have an adverse effect on the environment.
- Making recommendations for effective noise pollution management techniques throughout the city.

3. MATERIAL AND METHODS

Measurements were performed in Zakho city, one of the crowded commercial cities in Country about 190,000 inhabitants. In the current Study, measurements of traffic light noise levels were collected from seven locations in different regions of the city as shown in table 1.

Table 1. Seven Locations in Different Regions of Zakho city

No.	Station Symbol	Station name
1-	Traffic (A)	City center junction
2-	Traffic (B)	Shaabaniye junction
3-	Traffic (C)	Saa Street
4-	Traffic (D)	Ashchamy junction
5-	Traffic (E)	Mahkeme Street
6-	Traffic (F)	Badirkhan Street
7-	Traffic (G)	Tilkeber junction

The noise levels on the streets were monitored three times during the day: first in the morning (9:00am-11:00am), then in the afternoon (1:00pm-3:00pm), and finally in the evening (6:00-8:00 pm.). The data was collected during July and August of 2021, and the sound levels were assessed, using a Digital Hand-held sound level meter according to ANSI S1.4 Type 2A, IEC 651 Type2, and BS 5969 Type 2. Was used for measuring sound level.

This equipment has technical data for sound level meter specification are maximum sound level is 121dB, Minimum Sound Level 30 dB with Resolution 0.1dB as shown in figure 1



Figure 1. The digital sound levels

4. RESULT AND DISCUSSION

From the results as the noise level recorded, it was noted that there is a random increase in the average noise level in seven different traffic areas of Zakho city (8:00am to 9:00pm). as shown in Figure (2), In Traffic (A) area highest and lowest noise level is 96.133dB and 67.233dB respectively. It has been exposed that highest noise level observed in this and always above the accepted level during the time interval that used to record data. The maximum value was observed at (6:00-8:00 Pm) and minimum value was observed at (6:00am-11:00am). The highest noise level of traffic (B) area is 91.8dB during (8:00am -11:00am) and lowest noise level is 73.14 dB during (12:00pm-3:00pm), this traffic is crowded section area where there are shopping markets, government departments and an emergency hospital. In Traffic (C) area the highest noise level. Is 85.366dB during (6:00pm-8:00pm) and lowest noise 71.755 dB during (1:00pm-3:00pm). It has been also noticed that noise level of this area is always above from accepted level. The data for the area of traffic (D) represent the maximum (highest) noise level is 89.62 dB during (6:00pm-8:00pm) and minimum (lowest) noise level 51.53dB during (9:00am-11:00am). This area is busy at evening and afternoon because several shopping markets, coffee, super store, intercity bus station situated.

In Mahakam Street which is Traffic (E) area it is a residential area and there are several government departments, office and markets that are visited by many people, the maximum value 85.77 dB was noticed at (8:00am-11:00am) and minimum value 70.988dB was noticed at (6:00pm-8:00pm). It has been also shown that noise level of this area is always above the accepted level during (9:00am-11:00am). The maximum noise level of traffic (F) area is 84.75 dB within (1:00pm-3:00pm) and minimum noise level 70.93 dB found at during (6:00pm-8:00pm). Finally, Noise level (8:00am-9:00pm) of Tilkeber junction area has been found that the highest noise level is 90.86 dB during (6:00pm- 8:00pm) and lowest noise level is 70.9dB during (9:00am-11:00am). This area is another mixed zone area where many auto repair shops are located and many tourists cross it to the picturesque tourist places that are located on the Iraqi-Turkish border.

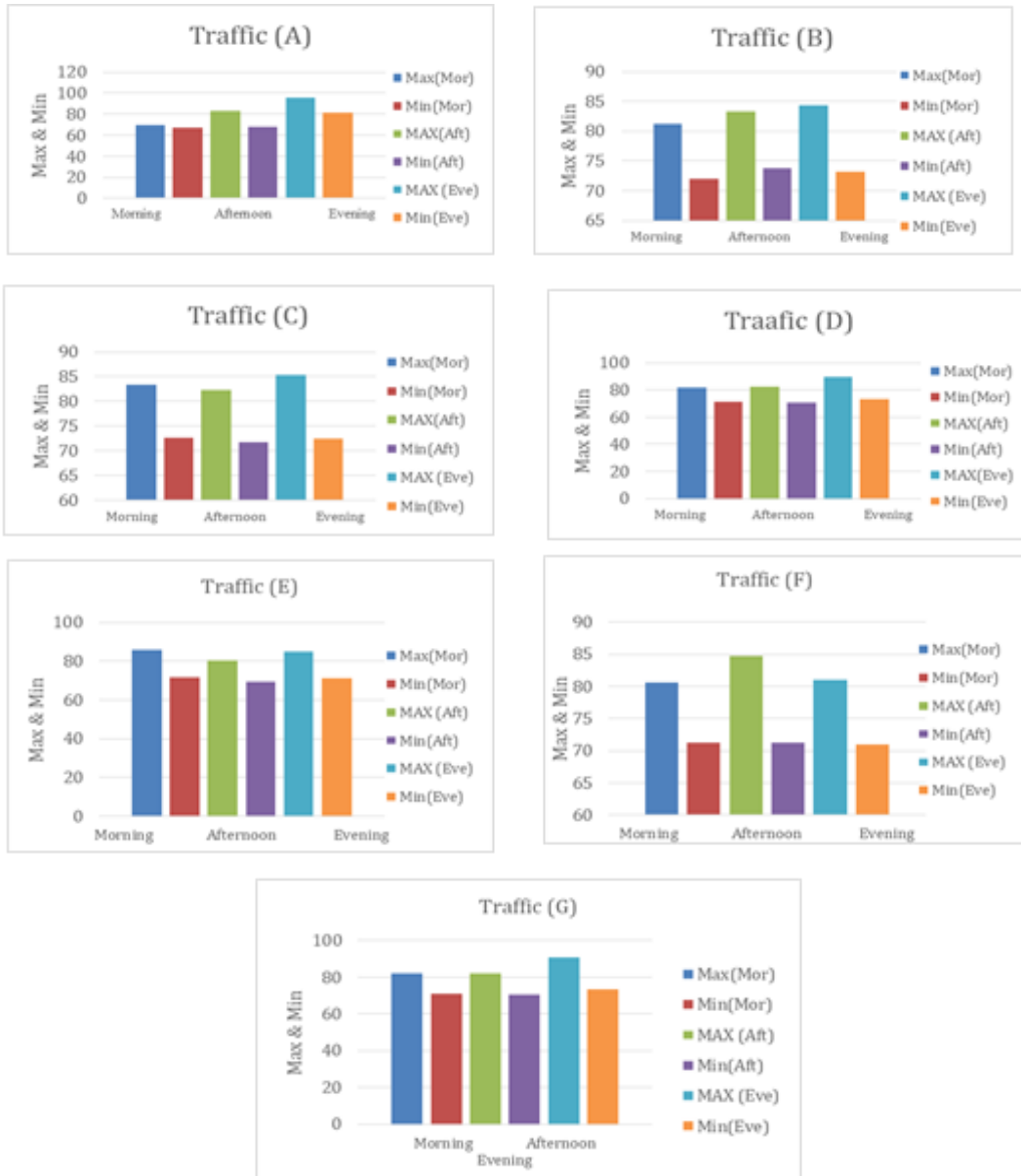


Figure 2. Noise level variation in Different Traffic areas during (9:00am-8:00pm).

Table 2. Min, Max., and Mean Noise Level in Different Traffic Area Were Taken in the City of Zakho

Places	9:00-11:00 Am			1:00-3:00 Pm			6:00-8:00 Pm		
	L(dBA)			L(dBA)			L(dBA)		
	Min	Max.	Mean	Min	Max	Mean	Min	Max	Mean
Traffic (A)	67.2	70.0	68.6	68.8	83.2	76.0	81.1	96.1	88.6
Traffic (B)	91.9	81.2	86.6	73.8	83.2	78.5	73.1	84.2	78.7
Traffic (C)	72.5	83.3	77.9	71.7	82.3	77.0	72.5	85.3	78.9
Traffic (D)	51.5	81.6	66.5	70.9	82.5	76.7	73.3	89.6	81.5
Traffic (E)	71.8	85.7	78.7	69.4	80.3	74.8	70.9	84.8	77.9
Traffic (F)	71.2	80.5	75.9	71.2	84.7	77.9	70.9	81.0	76.0
Traffic (G)	70.9	82.0	76.4	70.2	82.1	76.2	73.5	90.8	82.2
Mean	71.0	80.6	75.8	70.8	82.6	76.7	73.6	87.5	80.6

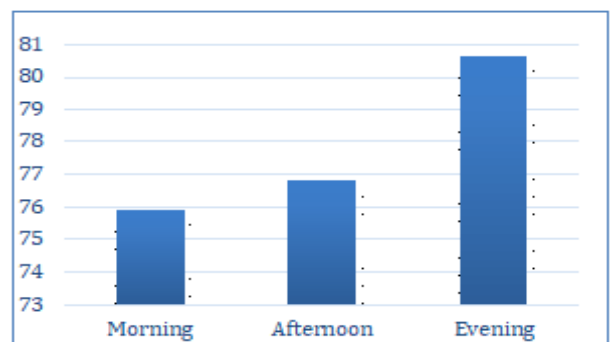


Figure 3. Mean Noise Level Variation with Time Interval in Zakho City.

It was found through this research that traffic noise increases when moving from a stop at a traffic light or in curves, and the echo phenomenon that forms in streets surrounded by high buildings should not be forgotten, as this physical phenomenon leads to a doubling of the amount of exposure to noise, and also this study discovered that the various forms of transportation are among the most important sources of noise exposure, and the traffic flow, the speed of passing cars, the proportion of heavy cars and trucks, and the nature of the street floor are among the factors that can affect the amount of noise generated by the forms of transportation in any street (Ahmed, et.al., 2021).

Finally, in order to reduce the negative effects of traffic, must reduce the echo phenomenon that forms in streets surrounded by high buildings which leads to a doubling of the amount of exposure to noise through the physical isolation it provides between the traffic track and the residential shops. And also, the government should find alternative solutions for small vehicles, for example, the construction of railways and a metro, and work on the cost of gasoline and increase taxes on cars to reduce the frequent use of cars in the market and near hospitals and residential areas.

5. CONCLUSION

From the result presented it can be concluded that the highest roadside noise level in Zakho city was 96.1 dB found in the traffic (A) at the evening, which exceeded the acceptable limit of 70 dB set by the Who Guideline values for community noise in specific environments and the minimum sound level of 51.5 dB was recorded in Traffic (D) area at the morning. The highest mean value is 88.63dB found in traffic (A) at the evening and the lowest median value is 66.5 dB found in the Traffic (D) at the morning.

The results regarding the effect of time (morning, afternoon and evening), it was observed the average values noise in the

mornings, afternoons and evening exceeded 60 dB, which could make people feel quite disturbed according to the WHO outdoor environmental noise exposure guidelines.

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