

Measuring and Assessment the Noise Level in Different Regions in Baghdad City And Compare it with The Allowable Levels

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Abstract:

This study includes measurement of the noise level of four regions in the city of Baghdad (industrial region, commercial region, residential region and quiet region) and compare the value of noise in each region with the World Health Organization (WHO) allowable limits, and the effect of noise on human health was explained.

The "sound level meter (SLM)" instrument measuring the noise value in the four regions, three measurement per month through one year was recorded (one measurement every ten days) from 1/1/2015 to 30/12/2015.

The noise level of the industrial region (75dB) compared with the World Health Organization level allowable limit (65dB), while the commercial region (76.28dB) versus (55dB) and the residential region (74.94dB) versus (50dB) and the quiet region was (62.36dB) versus (40dB) of the (WHO) allowable limit.

Keywords: Noise, NIHL, Decibel, Sound Level Meter.

الخلاصة

تتضمن الدراسة قياس مستوى الضوضاء لأربعة مناطق في مدينة بغداد (منطقة صناعية ، منطقة تجارية ، منطقة سكنية ، ومنطقة هادئة) ومقارنة هذه المستويات مع المحددات المسموحة من قبل منظمة الصحة العالمية وكذلك تم التطرق لأضرار ارتفاع مستوى الضوضاء على صحة الانسان.

تم استخدام جهاز قياس مستوى الضوضاء لمعرفة مستوى الضوضاء للمناطق الأربعة وبمعدل ثلاث قراءات شهريا وطوال سنة واحدة (قياس كل عشرة ايام) للفترة من 2015/1/1 ولغاية 2015/12/30.

كان معدل مستوى الضوضاء للمنطقة الصناعية (75dB) مقارنة مع المحدد المسموح من قبل منظمة الصحة العالمية (65dB) ، بينما كان للمنطقة التجارية (76.28dB) مقابل (55dB) وللمنطقة السكنية (74.94dB) مقابل (50dB) وللمنطقة الهادئة كان (62.36dB) مقابل (40dB) المحدد المسموح من قبل منظمة الصحة العالمية.

كلمات المفتاحية: الضوضاء ، فقدان السمع الناجم عن الضوضاء ، ديسيبيل ، جهاز قياس مستوى الصوت.

Introduction

One form of pollution is the noise and it is effect on the life " air, soil and water". Its effects directly on the human. This kind of pollution is due to the urban life and depends on industry which increase the population (Gerges, 1992).

So the noise pollution is harmful to human, therefor it's important to reduce the exposure to noise in order to protect the human health.

The negative effects of this kind of pollution is very dangerous on the ear health and the psychological (Manwani *et.al.*, 2000).

The noise pollution as an environmental problem importance of recognize the ill effects on human health in addition to the environment in each day.

Noise sources

Noise can come from many places: Industrial Sources, Transport Vehicles, Household, Agricultural Machines, and Equipment.

Industrial devices which generate noise "air turbulence and vortices", especially at high velocities of air. Due to the moving or rotating solid object, so turbulence can be generated such as "the blade tip of a ventilator fan", which is cause changing in pressure between the fluid and atmospheric pressure, such as introducing an obstacle into a high speed of fluid flow or by cleaning air jet (Fredel, 2000).

Noise produced from electrical equipment such as "motors and generators" is generally low frequency, imposed on a broadband cooling system noise. Electrical motors convert electrical energy to magnetic energy then to the mechanical energy with the useful torque output of the motor shaft. Part of the transformation energy is converted to heat energy, that is cause a rise in rotors, then casing temperature; therefore an electric motor should be supplied with a cooling system (Pfeiffer, 2007).

Inefficient maintenance air conditioner can generate loud noise. Industrial and commercial air conditioner can be noisy due to their location and size, near the residential buildings. These loud noise which exceeds the allowable noise levels are produced from the air conditioners and other types of devices. (VDI 3740, 2006 ; VDI 3767, 2007) .

Each day thousands vehicles move through streets. The noise coming from vehicles, including motorcycles, produce excessive sounds.

Noise is a common occupational hazard in a workplaces such as the industries of steel and iron , crushing mills , foundries , saw mills , airports and aircraft maintenance workshops , textile mills , among many others . In many countries, one of the most prevalent occupational diseases due to noise is hearing loss (Rohde & Poddar 2004).

Noise-induced hearing loss

The sounds generated in the environment from household appliances, radio and television, and road traffic, these kinds sounds are don't damage our hearing so they are at safe levels. But some kinds of sounds may be too harmful specially if they are very treble, even for a short period of time, or when they are both treble and for long exposure period of time. These level of sounds can damage the inner ear specially the sensitive structures in it and may cause "noise-induced hearing loss (NIHL)" (Berger *et.al.*, 1986).

"NIHL" can be happening immediately or may be happening after a long period of time. It can be permanent or temporary , and it can affect both ears or one ear (Hassibi *et.al.*, 2004) , and can damaging hearing, you may have trouble hearing after a period of time, so the recipient is unable to hearing the people talk in a noisy room or on the phone. One thing which is very certain is: it is possible to prevent noise-induced hearing loss (Graham, 1991).

Noise pollution may cause harmful to health which may happen at any people age.

Unit of noise

Unit of sound measurement is decibel (dB) it is the universal and is measured with a meter that records sound pressure and transfer these readings on a sound level scale. Decibels are a logarithmic unit, that is means if a noise measuring 30 decibels is in fact 10 times more than a noise recording at 20 decibels (Bies and Hansen ;1996). There is one challenge of measuring sound in the city is that: there is a high level of background noise, or ambient sound in an area.

If the sounds are less than 75 decibels, they are cause hearing loss even after long time of exposure. Therefore, any repeated exposure to the sounds or long time of exposure at or above 85 decibels level of sound may cause hearing loss (Pekkarinen and Starck; 2001). The more treble sound, even at shorter period of time "NIHL" may be happen (EEC Council, 1989 ; EC Council,1998).

Table (1) shows the "average decibel ratings of some familiar sounds".

Table (1) "Average decibel ratings of some sounds "(Damberg and Foss 1982)

Source of sound	Rate (decibels)
"The humming of a refrigerator"	45
"Normal conversation"	67
"Noise from heavy city traffic"	85
"Motorcycles"	95
"An MP3 player at maximum volume"	105
"Sirens"	120

Distance from the noise source is effect on the sound levels. Table (2) shows "some frequently heard sounds and their approximate decibel levels" at the same distances from the noise source. Which designated as (dB) scale to simulate human hearing (Vaseghi, 2006).

Table (2) "Some frequently heard sounds and their approximate decibel levels" (BMA 1999).

Sound	Level (dB)
"Whisper"	30
"Normal Conversation/Laughter"	50 – 65
"Vacuum Cleaner at 10 feet"	70
"Washing Machine/Dishwasher"	78
"Midtown Manhattan Traffic Noise"	70 – 85
"Motorcycle "	88
"Lawnmower"	85 – 90
"Train "	100
"Jackhammer/Power Saw"	110
"Thunderclap "	120
"Stereo/Boom "	110 – 120
"Nearby Jet Takeoff"	130

Instruments

1. Sound Level Meter (SLM) (Svan 955) from polish Svantek company.
2. Calibration device.
3. Microphone.
4. Amplifier.
5. Metallic stand.
6. GPS – Germen.

Method:

In order to assess the noise level in Baghdad, four regions were chosen in this study (industrial region, commercial region, residential region, and quiet region). The noise were measured in these regions three times in a month through one year from 1/1/2015 to 30/12/2015, table (3) shows the locations, maximum and minimum levels of these regions.

Table (3) Locations, maximum and minimum levels, dates, and the allowable noise limit according to WHO.

Regions	Max. level of noise	Measuring date	Min. level of noise	Measuring date	Average value	Allowable value
Industrial region (Al-Riyadh)	83	01/07/2015	68	10/10/2015	75.0	65
Commercial region (Al-Karada)	88	20/04/2015	62	10/06/2015	76.3	55
Residential region (New Baghdad)	82	20/07/2015	67	01/08/2015	74.9	50
Quiet region (Hospital)	75	01/09/2015	53	20/11/2015	62.4	40

For measuring the noise in the selected regions , according to the parameters of (ISO World) the following conditions should be applied:

1. Height of the microphone above the ground (120 cm).
2. The distance of the microphone from the noise source within (7 m).
3. Measurement period of the equivalent sound level (L_{eq}) is (15 min) for each measuring test.
4. Cover the microphone to protect the effect of wind
5. The device record (L_{eq}) as an equivalent number of (9000) readings.
6. The period of time between each two readings is (0.1 sec).

"Sound level meter (SLM)"

The SLM (figure 1) formed from:

- 1- Microphone.
- 2- Electronic circuits.
- 3- Readout display.

The microphone detects the difference of air pressure associated with sound then converts them into electrical signs (Vaseghi, 2006). These signs are transfer by an electronic circuit of the device. The readout demonstrates the sound level in decibels. The SLM takes the sound level immediately in a precise location.

To find the noise level, the "SLM – device" is carried at hand with the height of the ear for those who exposed to the noise. With most SLMs devices it does not important where is the direction of the microphone in order to measure the sounds level (Rohde *et.al.*, 2005; Graham, 1992).

It is very important to calibrate the device before and after each measurement. (Samir *et.al.*, 2002).



Fig. (1) (Sound Level Meter) SLM – device (svan 955)

Results and Discussion

From the results that have been obtained from the measurement, it was noted the high values of noise in the industrial region were recorded which are between (83 dB) to (68 dB) with the average of (75 dB) while the WHO allowable limit in industrial region is (65 dB), that is due to the noise produced from the machines, pumps , compressors, vehicles , and other devices and tools that are using in industry. The result of the noise value in the industrial region is shown in Figure (2).

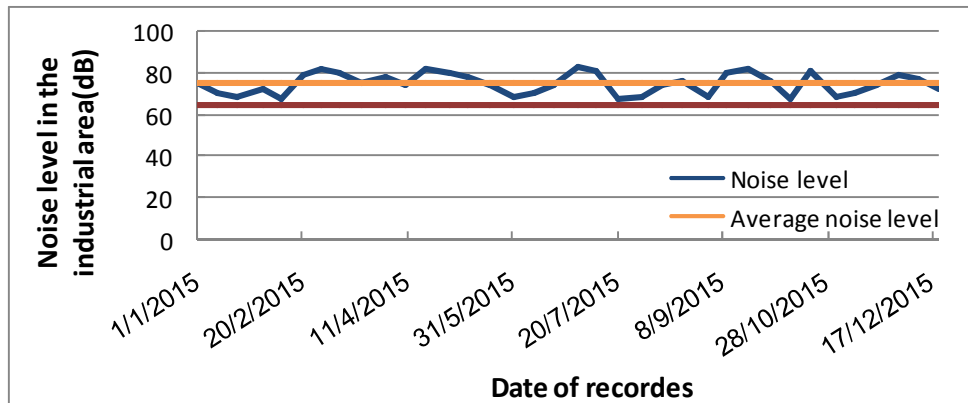


Figure (2) The result of the noise in the industrial region

While the values of noise in the commercial region are between (88 dB) to (62 dB) with the average of (76.3 dB) while the WHO allowable limit in commercial region is (55 dB), the noise in the commercial region is due to the sound produced from stores, Automobiles , and Traffic. The result of the noise value in the commercial region is shown in Figure (3).

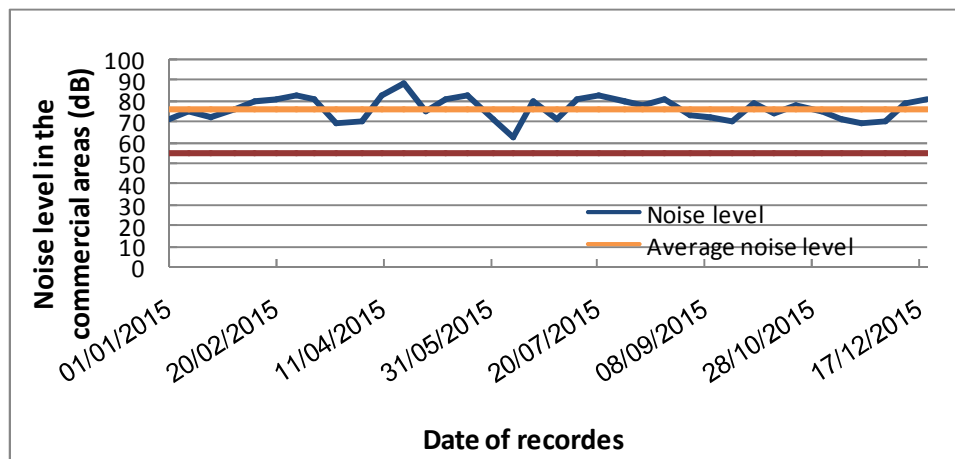


Figure (3) The result of the noise in the commercial region

The values of noise in the residential region are between (82 dB) to (67 dB) with the average of (74.9 dB) while the WHO allowable limit in the residential region is (50 dB), that is due to the sound of people , animals, traffic , and other noise. The result of the noise value in the residential region is shown in Figure (4).

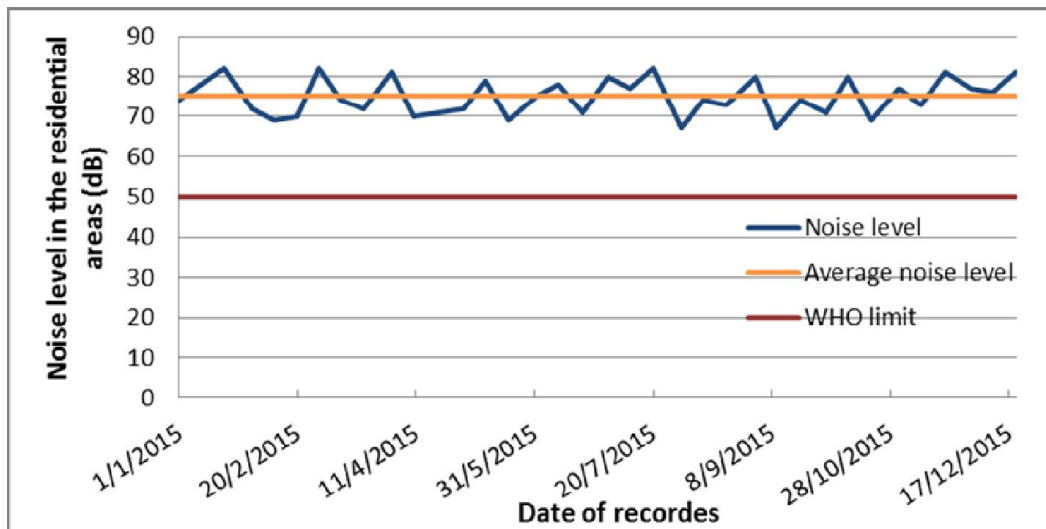


Figure (4) The result of the noise in the residential region

And the values of noise in the quiet region are between (75 dB) to (53 dB) with the average of (62.4 dB) while the WHO allowable limit in the residential region is (40 dB) , that is due to the sound of electronic alarms, telephones and conversations. The result of the noise value in the quiet region is shown in Figure (5).

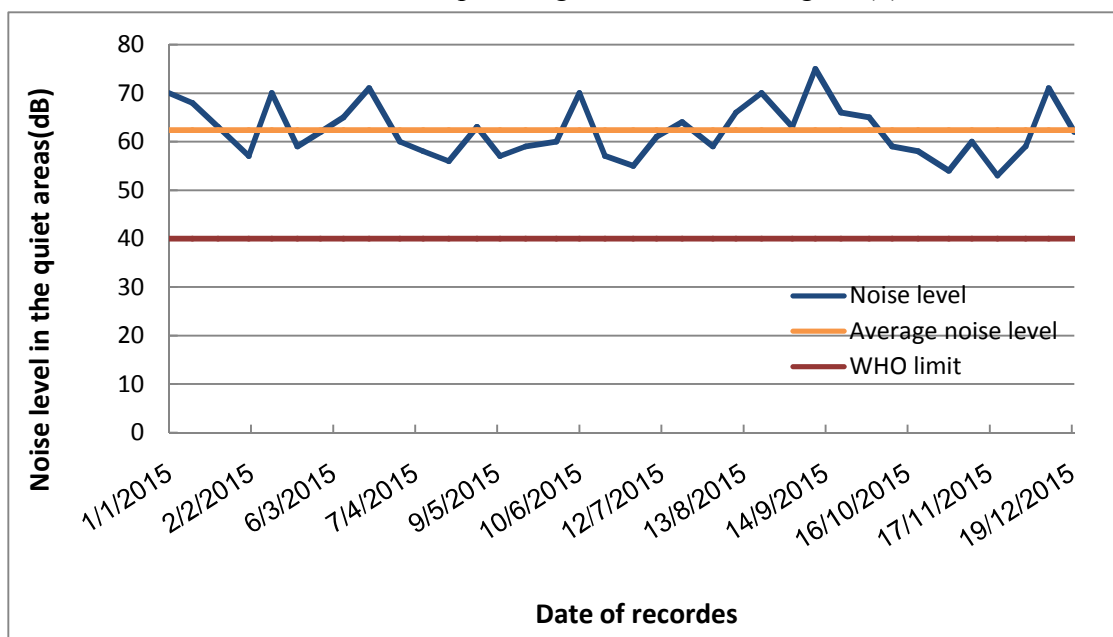


Figure (5) The result of the noise in the quiet region

Conclusion

The main conclusions that can be drawn from this research are represented by noise are produced from various sources such as: industrial sources "electrical machines, vibrating panels, rotors, fans, gears, turbulent fluid flow, stators, impact processes"; commercial sources " automobiles and stores "; residential noise sources "people , animals, and traffic"; and noise in a quiet region is due to the sound of (conversations, telephones, and electronic alarms).

Therefore noise is a specific occupational hazard in a many number of workplaces. In many countries, "noise-induced hearing loss" is one of the most popular occupational diseases

The generation of the sound pressure level depends on: The type of the noise source, the nature of the working environment, and the distance from the source to the receiver.

It's also depends on the part of the total electrical or mechanical energy which is transformed into sound energy

The important factors in protecting hearing are: The length of time exposer to the sound and the distance from the source of the sound. A best rule to avoid noise that are: too close, too long, or too loud.

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