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Geographical Analysis of the of Noise Pollution Problem in Nasiriyah City

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Abstract

The phenomenon of noise is one of the problems that major cities suffer from, and it is the result of the accumulation of dissonant sound waves in the internal and external environments alike, as urban congestion and traffic density are at the forefront of noise emitters, especially noise is the worst characteristic of the housing sector that leads to people's desire to move to another place in the city, so the research aims to assess the noise levels in the city of Nasiriyah, identify the sources of its emissions and the amount of environmental damage caused by it, and determine the appropriate mechanisms to mitigate it. There are a number of noise pollution causes that made life and its quality stressful in contrast to its urban areas and its economic and social activities. The research relied on collecting data for analysis, justification, evaluation, and selection of solutions on the field study represented by measuring the noise level in the streets, markets, and neighborhoods of the city at different times, and comparing the results with the Iraqi and international determinants. The average level of variation was (51.14-77.685) decibels, The most intense was in the western Al Jazeera sector, as it recorded 77.68 decibels, and thus these noise levels are unacceptable according to the World Health Organization, which is reflected in the effects of health and productivity and on the quality of life and the health of the individual and society, which means that noise has become the main feature of cities, and overcrowding is primarily responsible for that, Most urban residents consider noise to be second only to water pollution among the environmental issues of concern to residents and relevant authorities.

Introduction

The problem of noise pollution is one of the ancient problems with the existence of man in nature. Some ancient writings on digital (clay) tablets discovered in archaeological excavations such as the city of Sumer and Babylon indicated that there were cases of boredom, gloom and pessimism in the overcrowding and crowding in towns and cities teeming with population and various activities. Especially, noise is the emission of unwanted sounds that affect the psychological and health status of the population and has negative repercussions on the environment. The intensity of these sounds is measured in the decibel unit, whose levels vary according to the units of measurement of this device. A whisper is estimated at (30 decibels), while normal speech is between (30-50 decibels), calling in a loud voice (90 decibels) (Mohammad Yousry Ibrahim Dabes, 1997; Mamolar et al., 2023)

First: The theoretical and conceptual framework of the research

Research problem

The research problem is represented by the following question: Are noise levels an environmental factor associated with the low quality of life in the city of Nasiriyah? What are the main sources of noise in it?

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Research Hypothesis

Noise is one of the most prominent forms of environmental pollution that contributes to the deterioration of the quality of life in the urban environment of the city of Nasiriyah. Traffic noise, industrial activities and market noise are the most important sources.

The importance of research

Noise is one of the environmental pollutants affecting the quality of life and the health of the individual and society, as well as its productive effects, which requires attention to reduce its harm.

Research Methodology

The research was based on the descriptive geographical approach, as the geographical factors associated with the phenomenon under study were searched, and then the results were analyzed and interpreted and evaluated environmentally.

Research tools and methods used

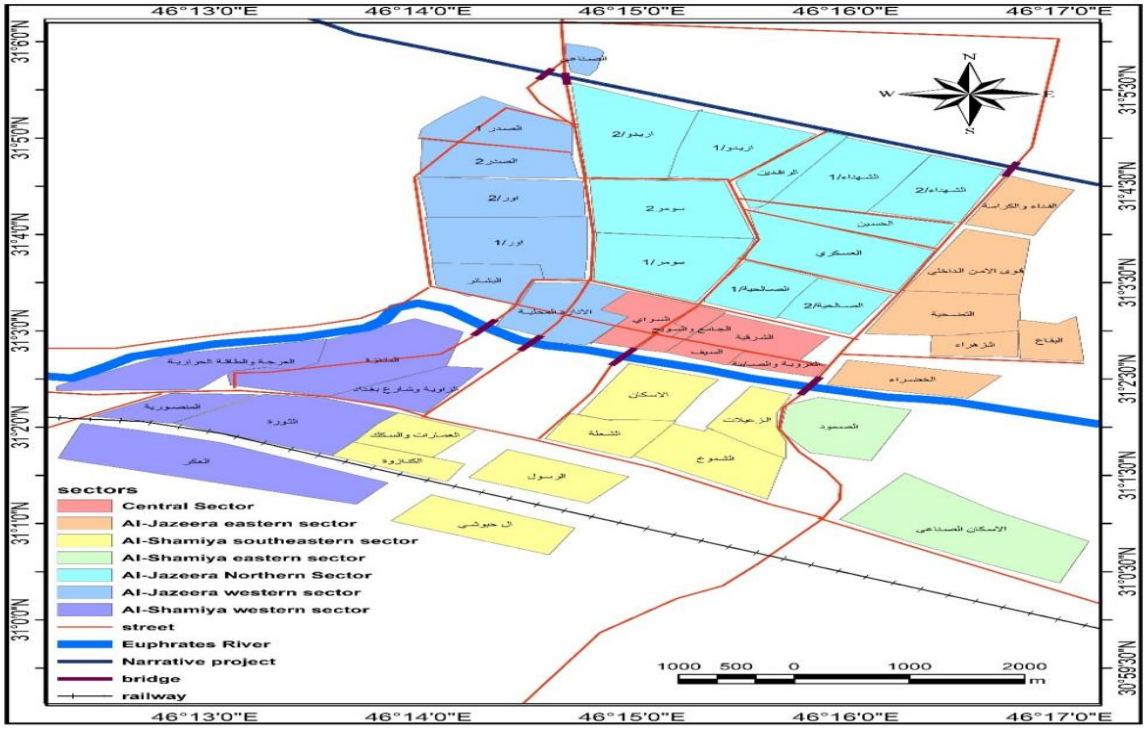
The noise pollution measurements were carried out using the (SVAN 955) portable noise level meter, in addition to the SA200 van calibration device. Noise was measured in three important fields of seven sectors in the city of Nasiriyah.

Search area limits

The research area was determined in the city of Nasiriyah, the administrative center of Dhi- Qar Governorate, which occupied the first rank in population and spatial terms, in addition to its administrative and economic importance, as it has a historical dimension; Due to its proximity to the site of the ancient city of Ur in southern Iraq, its urban area is about (3000) hectares, and the latitude is (31) bisected by two equal sides, and between longitudes (46.1 -46.3) to the east, which extends locally on the course of the Euphrates River, which divides it into two sides. (right and left). Map (1).

The concept of noise

Sound can be defined as an external indicator that affects the ear and causes the sense of hearing, so every vibrating body forms its source of sound, as the vibration of the body causes the air molecules around it to vibrate in the form of waves that spread in all directions, and we cannot count every sound as noise. The sound has the characteristic of consistency and regularity in wave frequencies (Hassan Ahmed Shehata, 2006). It is also known as those sounds that a person does not accept or like when hearing them, meaning that they are of high frequencies that lead to severe vibration of the permission seekers, and their sounds are irregular, that is, they do not have a tone. (Sonia Urzroni Wartan and Yasmin Najm Abdullah, 2013). According to the WHO Regional Office for Europe, noise pollution (after air pollution) from roads is the second most serious problem directly or indirectly affecting the health and well-being of the population. The World Health Organization recommends keeping the continuous road noise level during daylight hours of 16 hours (6:00-22: 00) well below 53 dB (WHO, 2018). The seriousness of the negative effects of excessive traffic noise pollution on human health cannot be quantified or observed in the short term. However, cumulative exposure has been linked to sleep disturbance, decreased cognitive performance, hearing loss, cardiovascular disease, increased levels of stress, irritability, and antisocial behavior (Raman, M.; Chhipa, R.C., 2014; Schäfers, 2022) In terms of the social cost, the negative effects of noise on people in general and traffic noise in particular lead to the reduction of elements of their well-being. According to the World Health Organization, "Health is a state of complete physical, mental and social well-being (Ouis, D., 2001). So increasing noise pollution, if it remains unchecked, will affect the social and economic well-being of future generations.



Map (1). The residential sectoral classification of the research area - Nasiriyah city for the year 2022
Source: Republic of Iraq, Ministry of Municipalities and Public Works, Nasiriyah Municipality Directorate.

Second: Evaluation of the noise level in the city of Nasiriyah

Transportation Noise

The urban environment of Nasiriyah city has become very congested with traffic in conjunction with the increase in the growth of its population, as the total number of vehicles registered with the General Traffic Directorate in Dhi Qar Governorate for the year 2019 reached (162,516 cars) (Annual Statistical Collection, 2021), offset by the overcrowding of constructed buildings and the lack of green spaces. It negatively affects the health and well-being of the population. Data were collected on official working days to be accurate in data collection, based on the standards of the International Organization for Standardization (ISO), which is a global federation of national standards bodies (1993, 1996), and for the purpose of not making noise reduction corrections due to meteorological standards such as temperature ambient relative humidity, and wind (Quiñones-Bolaños, E.E. *et al*, 2016; Nyborg et al., 2022) the mean temperature and relative humidity were between 20-40°C and 60-80%, respectively, and the wind speed was very calm at the time of noise level data collection. Table (1) shows the noise levels in some streets of Nasiriyah. From table (1), it is noted that the noise level in all streets was above the standard level(53 dB), and that the loudest street in the noise level in the morning was on the main street in the western side of Ur neighborhood, recording (75.59 dB); Because of the large number of vehicles that includes various passing cars and machines (45 vehicles/minute), and its high speed, in addition to the width of the street (25 meters), which made it accommodate the largest number of cars, and the passage of large trucks through it.

As for the lowest level of morning noise, it was recorded in the street that links Al-Tadhhiya and Al-Fidaa (62.86 dB), because the rate of vehicles passing in that street was (5 vehicles/minute), in addition to the presence of speed bump to reduce the speed of cars, which reduces their noise.

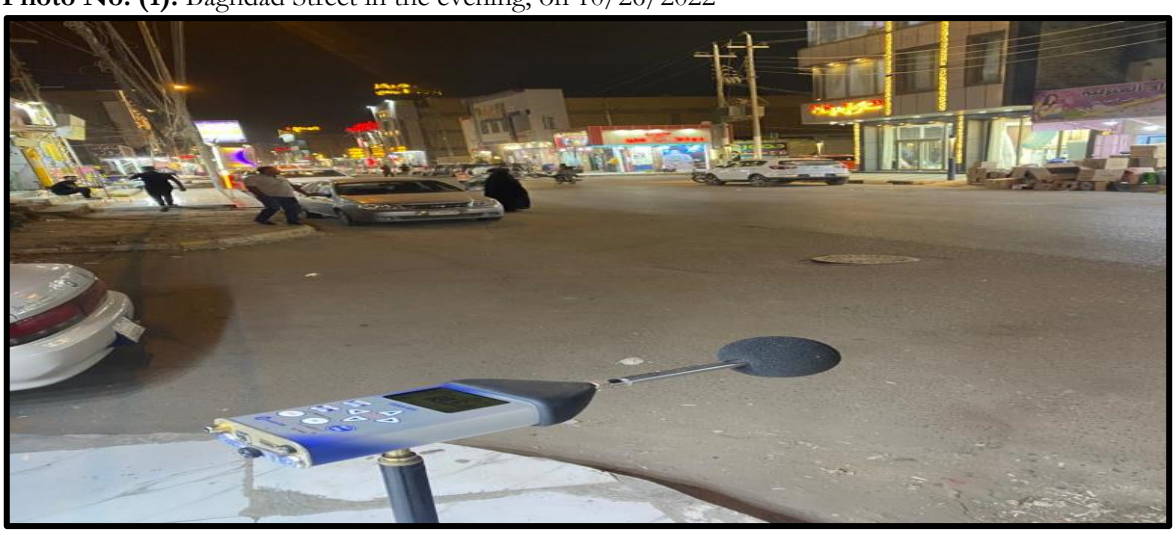
As for the highest noise level in the evening, it was recorded by the main western street of Ur neighborhood (77.68 dB) according to the above reasons and because it also connects several areas (the first and second Ur neighborhoods, the first and the second Al-Sadr City, , and Al-Mohiyah neighborhood under construction), while Baghdad Street recorded the lowest noise level (61.1 dB), as the street witnessed a slow movement of cars (4 cars/min) (Photo No. 1).

Table (1). Noise levels in a number of roads and streets in the city of Nasiriyah, according to sectoral division, in October 2022 AD.

Sector	Morning		Evening	
	Noise intensity rate [dB]	Time of measurement	Noise intensity rate [dB]	Time of measurement
Central Sector (Al-Habbobi)	**72.115**	**9:24**	**71.015**	**17:19**
Al-Jazeera eastern sector (The street links between Al-Tadhhiya and Al-Fidaa)	62.865	8:37	67.965	16:21
Al-Shamiya eastern sector (First street in Al-Iskan Al-senaee)	67.17	12:06	68.995	19:27
Al-Shamiya southeastern sector (The street separating the Al-ImaratAl-Sakaniya and Al-Mahedia area)	73.61	11:23	64.125	18:47
Al-Shamiya western sector (Baghdad Street)	68.675	10:19	61.1	17:39
Al-Jazeera western sector (The main western street of Ur neighborhood)	75.595	9:29	77.685	16:46
Al-Jazeera Northern Sector (Nile Street-Sumer neighborhood)	**75.29**	**8:37**	**74.85**	**16:08**

Reference: Field study, data were obtained by a sound level measuring device in Dhi Qar Environment Directorate. The measurement period was 5 minutes.

Photo No. (1): Baghdad Street in the evening, on 10/26/2022



Market Noise

Sound level measurements were made in seven (7) different locations of the markets, the measurement distance was determined at a distance of (1.3 meters) and in the central area of the market where the

activities were loud, the measurements were taken twice a day for each market, i.e. during the morning hours of (9-12 a.m.), and in the evening (4-7 p.m.), and the proportions of behaviors (such as shopping, passing, standing, and talking to others) differ in different shopping areas, but they generally do not change with crowd density (Li & Meng, 2015; Méndez-Giménez et al., 2022) Therefore, differences in behavioral characteristics were not taken into account.

Visiting commercial centers results in huge traffic rates in an enclosed area even with open spaces and leads to high sound levels. This did not result in poor acoustic comfort, due to the noisy space, and these effects mainly affect workers in shopping malls. In the case of low clarity of speech, employees may have to raise their voice levels and feel uncomfortable. Moreover, if sound pressure levels exceed the recommended limit (85 dB), set by the Occupational Safety and Health Administration (OSHA) (The United State, 2011), the possibility of permanent hearing loss increases, and the effects of noise on health can be auditory or non-auditory. Controlling noise will reduce these negative health consequences (Basner, M. *et al*, 2014; Passchier-Vermeer, W. *et al*, 2000). The noise generated by the activity of the commercial markets, which is located at a small distance from the residential buildings, was analyzed. The main sources of noise are the movement of cars, the noise generated by shopping activities, unloading and loading cars, in addition to promotional mechanisms using loudspeakers. According to the World Health Organization (WHO), in the Community Noise Handbook, local economic activities with noise and vibration sources at a distance from protected areas are defined so that the continuous equivalent sound level at the building facade is less than 55 (dB) in the daytime (from 7:00 to 23:00) and 45 (dB) at night (from 23:00 to 7:00) (Berglund, B. *et al*, 1999). While the national determinants of noise levels outside buildings for service and commercial areas were 65 (dB) during the day and 60 (dB) at night.

From Table (2), it is clear that the noise levels were higher during the evening periods compared to the morning periods, and despite the fact that commercial activities are always at their peak in the morning, as sellers and shoppers come with full capacity and want to buy and sell their goods in these early hours, However, the matter was different in the markets of the city of Nasiriyah, because most of its residents are associated with their morning jobs, as all markets and commercial areas recorded an increase in the noise level above the standard level (55 decibels). The market in Al-Thawra neighborhood recorded the highest noise level in the morning and evening periods (76.51, 78.31 decibels) respectively (Photo No. 2), being an informal market overlooking the main street, where there was a lot of car traffic (30 cars / minute), with loudspeakers to promote the goods.

Photo No. (2): Al-Thawra Market in the morning, on 10/26/2022

While the Sumer market recorded the lowest noise level in the morning and evening (63.12 dB in the morning and evening) as it is a secluded market (except for the shops facing the street) from the street and the movement of people was very little.

Table (2) shows that the highest noise level in the morning was recorded in Al-Thawra Market (76.51 decibels) as it is an irregular market and overlooks the main street (two sides) in Al-Thawra neighborhood, which is crowded with cars, as well as the presence of loudspeakers promoting products despite the moderate movement people in it because the measurement time is relatively late (10:43 a.m). As for the lowest morning noise level, it was recorded by the Sumer neighborhood market (63.12 dB), where there was very little movement.

As for the noise level in the evening for the markets, Al-Thawra market recorded the highest noise level (78.31 decibels) because the shopping in it was at the peak time (5.12 p.m) with some loudspeakers promoting the goods and the passage of a group of auto rickshaw and cars as it overlooks a main street, while the market in the Sumer neighborhood market maintained the lowest noise level (63.12 dB)for the above reasons.

Table (2). Noise levels in the popular and commercial markets, by sectoral section of the city of Nasiriyah, in October, 2022 AD.

Sector	Morning		Evening	
	Noise intensity rate [dB]	Time of measurement	Noise intensity rate [dB]	Time of measurement
Central Sector (near the cloth market (Al-Qaisariya)	69.345	9:37	75.83	17:29
Al-Jazeera eastern sector (the street branching from the highway in Al-Tadhhiyah)	70.49	8:55	73.27	16:41
Al-Shamiya eastern sector (a market in Al-Iskan Al-senaee center)	63.59	11:47	63.95	19:07
Al-Shamiya southeastern sector (the street separating Al-Shula from Al-Iskan Al-Qadeem)	68.365	11:02	69.165	18:24
Al-Shamiya western sector (Al-Thawra neighborhood market)	76.515	10:43	78.315	18:01
Al-Jazeera western sector (Al-Sadr City Market)	70.125	9:54	73.38	17:12
Al-Jazeera Northern Sector (Sumer neighborhood market)	63.125	9:15	63.125	16:31

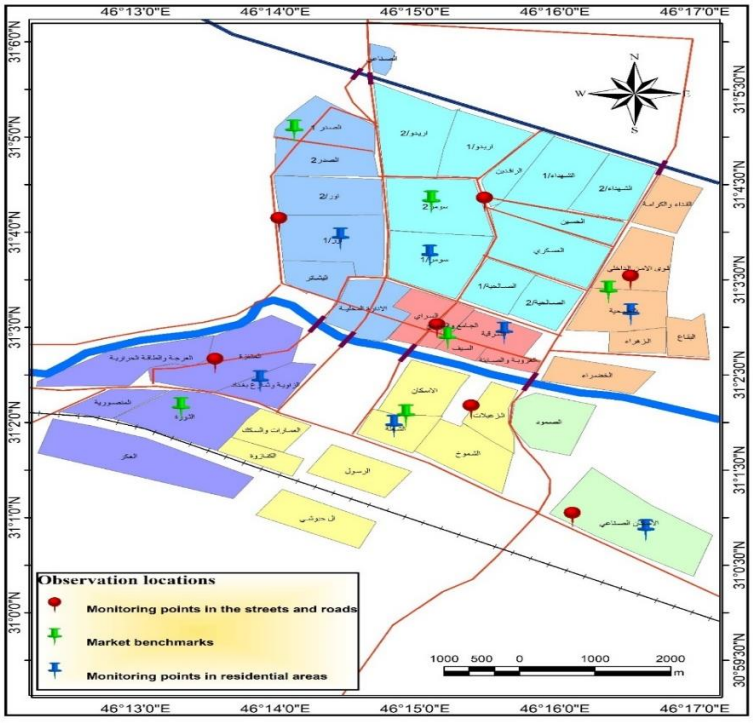
Reference: Field study, data were obtained by a sound level measuring device in Dhi Qar Environment Directorate. The measurement period was 5 minutes.

3- Residential Noise

Table (3) shows the noise levels in a number of residential neighborhoods in the city of Nasiriyah. All measurements were made during working days and under ideal weather conditions, calm winds and clear skies. The duration of each measurement for each location took five minutes.

The data of Table (3) show that the highest noise level in the morning was recorded in the Sumer neighborhood (65.93 decibels) due to the narrow streets of the neighborhood with the playing and screaming of some children and the passage of some street vendors raising loudspeakers to promote their goods and alert people of their passage. While the neighborhoods (Al-Sharqiya, Al-Tadhhiya, Al-Iskan Al-Sinaee, Al-Shula, Baghdad Street, Ur) recorded a noise level below the Iraqi determinants for the highest noise level in residential areas due to the scarcity of movement of pedestrians and cars in them, as Al-Shula neighborhood recorded the lowest noise level (51.24 dB) from those areas.

As for the evening period, Al-Sharqiya neighborhood recorded the highest noise level (66. 48 decibels) due to the movement of children while they were



Map (2). Locations for monitoring noise levels in streets, markets, and several residential neighborhoods in the city of Nasiriyah 2022
Source: Table (1, 2, 3) by adopting GIS technology

playing in the street, with some motorcycles and cars passing by. Whereas, Al-Shula neighborhood recorded the lowest noise level (51.14 decibels) due to the scarcity of pedestrians and cars in it, noting that the noise level in the evening for all sectors exceeded the Iraqi national limits.

If these measurements are compared with the national determinants of noise levels measured in decibels and shown in Table (4), these neighborhoods can be divided into two levels:

Table (3). Noise levels in the residential sectors of the city of Nasiriyah, in October, 2022 AD.

Sector	Morning		Evening	
	Noise intensity rate [dB]	Time of measurement	Noise intensity rate [dB]	Time of measurement
Central Sector (Al-Sharqiya)	53.455	9:12	66.48	17:02
Al-Jazeera eastern sector (Al-Tadhhiya)	58.935	8:46	58.14	16:21
Al-Shamiya eastern sector (Al-Iskan Al-Senaee)	55.715	11:58	57.5	19:16
Al-Shamiya southeastern sector (Al-Shula)	51.245	11:11	51.14	18:36
Al-Shamiya western sector (Neighborhood in Baghdad Street)	58.805	10:27	60.8	17:47
Al-Jazeera western sector (Ur neighborhood)	51.28	9:39	53.32	16:54

Sector	Morning		Evening	
	Noise intensity rate [dB]	Time of measurement	Noise intensity rate [dB]	Time of measurement
Al-Jazeera Northern Sector (Sumer neighborhood)	65.93	8:45	63.81	16:17

Reference: Field study, data were obtained by a sound level measuring device in Dhi Qar Environment Directorate. The measurement period was 5 minutes.

Neighborhoods with a high noise level (more than 60 decibels during the day and more than 50 decibels at night)

The Morning Period

It includes the northern Al-Jazeera sector (Sumer neighborhood) (65.93 dB); This is due to the narrow streets of the neighborhood, with some children playing and screaming, and some street vendors passing by raising loudspeakers to promote their goods and warn people of their passage.

The Evening Period

It includes all sectors due to the activity of children's toys and the passage of cars and motorcycles in the evening due to the mild weather during this period.

Neighborhoods with an acceptable noise level (less than 60 decibels during the day and less than 50 decibels at night)

The Morning Period

It includes the southeastern Al-Shamiya sector (Al-Shula neighborhood), which recorded the lowest noise intensity measurement within this category of neighborhoods (51.24 dB), and the eastern Al-Jazeera sector (Al-Tadhhiya), which recorded the highest noise intensity measurement (58.93 decibels), in addition to the central sector (Al-Sharqiya), the eastern Shamiya sector (Al-Iskan Al-Sinaee), the western Shamiya sector (neighborhood in Baghdad Street), the western Jazeera sector (Ur neighborhood). The reason for this is due to the fact that most people go to their field of work and the relative distance of these areas from the commercial movement and state departments.

Table (4). Iraqi national determinants of noise levels in residential neighborhoods

Location	Noise level in the evening (dB	Noise level during the day (db)
Residential areas within the city	50	60
Residential areas outside the city	45	55
Residential areas within the industrial areas and vice versa	45	60

Reference: Republic of Iraq, Ministry of Environment, Dhi Qar Environment Directorate, 2022.

Third: Effects of Noise Pollution in the City of Nasiriyah

The effects of noise on human health can be divided into (auditory) and (non-auditory) effects, as follows

A- Audio Effects: It can be divided into two parts

Hearing loss

Noise is the leading cause of preventable hearing loss. Noise-induced hearing loss can be caused by a one-time exposure to an intense, impulsive sound (such as a gunshot), or by long-term exposure to a steady state with ascertained sound levels above 75-85 dB. The hallmark pathological feature of noise-

induced hearing loss is the loss of auditory sensory cells in the cochlea, and these cells cannot regenerate in mammals, so no recovery can occur; so prevention of noise-induced hearing loss is the only option to preserve hearing. Hearing loss leading to an inability to understand speech in everyday situations can have a severe social impact, and can also affect cognitive performance and reduce interest in tasks. Accidents and falls are also associated with undiagnosed hearing loss, with a 10-20% increase in mortality at 20 years (Karpa MJ *et al*, 2010). Studies indicate that children appear to be more susceptible than adults to noise-induced hearing loss (Berglund B & LindvaJl T., 1995). Note that the end results of hearing loss are loneliness, depression, speech impairment, poor school and job performance, limited job opportunities, and a sense of isolation (Suter AH., 1991; Passchier-Vermeer W, Passchier WF., 2000).

Auditory fatigue

It is a process of temporary hearing loss (Pretty Omar Afifi *et al*, 2020) and appears at a noise level of 90 decibels and may be associated with side effects such as dizziness and tinnitus (S. A. Agarwal, 2009). Tinnitus is an imaginary auditory sensation that significantly reduces the quality of life. Most cases of tinnitus are associated with hearing loss caused by aging or exposure to noise (Domina Petric, 2022).

Non-auditory effects: it includes

Annoyance

Noise can be defined as a general feeling of dissatisfaction, or a negative reaction caused by noise. Among the ways in which annoyance can be expressed are fear, uncertainty, and mild anger (Stansfeld & Matheson, 2003; RIVM, 2005). In the human environment (which also includes neighbors, industry, etc.) traffic is the single most important source of noise nuisance (Niemann & Maschke, 2004; RIVM, 2004).

Sleep disorders

The effect of noise on sleep has important health implications, and it is known that uninterrupted sleep is a prerequisite for healthy physiological and mental function in healthy people (WHO, 2007). Three types of noise effects on sleep can be distinguished:

Effects on sleep behavior (primary effects): Night noise can increase the excitability of the human body, i.e. lead to activation of the nervous system, which may cause the child to wake up or prevent him from sleeping (WHO, 2007; H.M.E. Miedema et al, 2002; Ising et al., 2004)

Effects on appearance and mood over the next day (secondary effects): Secondary effects of sleep disturbance include decreased perceived quality of sleep, increased sleepiness, fatigue, and irritability (HCN, 2004). While there are other indicators of other effects such as depressed mood (D. Ouis, 2002).

Long-term effects on well-being and health: Nocturnal noise can lead to insomnia and increased drug use (WHO, 2007; HCN, 2004). It may also lead to chronic discomfort (Berglund *et al*, 2009; RIVM, 2004). Furthermore, an increased risk of cardiovascular disease due to night noise is plausible, although there is only limited evidence of this effect (WHO, 2007; H.M.E. Miedema *et al*, 2002). There are certain indications that night noise can contribute to mental illness (WHO, 2007).

Disorder in cognitive performance (learning and understanding)

Hypothesized mechanisms of noise effects on children's cognition include communication difficulties, attention deficits, increased arousal, learned helplessness, frustration, noise disturbance, and sleep disturbance consequences for performance (Stansfeld S, 2000; Evans GW. C hild, 2006). Based on WHO guidelines on societal noise, noise pollution interferes with spoken communication, affects understanding, impairs task performance including attention to reading and memory, and leads to problems with concentration and communication (Goines & Hagler, 2007; Hagler, 1999).

High blood pressure

Several occupational studies have indicated that individuals chronically exposed to continuous noise at levels of at least 85 dB experienced higher blood pressure than those who were not exposed to noise (Zhao Y *et al*, 1991; Lang T, 1992).

Cardiovascular disease

Both short-term laboratory studies in humans and long-term studies in animals have provided biological and plausible mechanisms for the theory that long-term exposure to environmental noise affects the cardiovascular system and causes significant diseases (including hypertension, ischemic heart disease, and stroke) (Babisch W, 2011). Acute exposure to various types of noise is associated with excitation of the autonomic nervous system and the endocrine system (Lusk SL *et al*, 2004). Investigators have repeatedly noted that noise exposure increases systolic and diastolic blood pressure, alters heart rate, and causes the release of stress hormones (including catecholamines and glucocorticoids) (Babisch W, 2011).

Neurological and psychological effects

Long exposure to loud noises changes how the brain processes speech, which can make it more difficult to distinguish between speech sounds (Domina Petric, 1974). The psyche and quality of life of bus drivers have been affected by noise pollution, and noise pollution causes serious psychological symptoms for drivers such as anxiety, depression, hostility, etc., especially when drivers are exposed to longer work periods and above certain values (Z.Akan *et al*, 2012).

Mental health disorder

Noise pollution is not believed to be a cause of mental illness, but it is hypothesized that it accelerates and intensifies the development of underlying mental disorders. Noise pollution may cause or contribute to negative effects such as anxiety, tension, nervousness, nausea, headache, emotional instability, argumentativeness, impotence, changes in mood, increased social conflict, neurosis, hysteria, and psychosis (Berglund B *et al*, 1995).

Fourth: Proposed ways to address noise pollution in the city of Nasiriyah

Emission and spread reduction treatments

There are two basic ways to mitigate noise:

First: Noise emissions can be reduced at their source, through measures related to vehicles/drive lines, tyres, road surfaces and traffic management. **Second**: noise can be reduced by reducing people's exposure using spread prevention or isolation measures (by increasing the distance between source and receiver by isolating buildings or creating noise barriers).

Methods of noise reduction

Low-noise road surfaces, such as thin-layer, double-layer, porous and rubber pavements, offer great potential for significantly reducing road noise, which is complemented by taking technical measures to reduce engine, exhaust and tire noise from cars and trucks.

Reducing speed and managing traffic Enforcement

Application of speed limits in urban areas has a positive effect on transportation noise. Traffic management measures have a positive impact not only on noise reduction but also on air quality and road safety. Reductions in traffic can be achieved by enhancing public transport, encouraging cycling and walking, managing parking lots, banning the driving of heavy goods vehicles, and demarcating routes and bypasses. Other examples of traffic management include measures that stimulate traffic flow to

become more fluid, by intelligently adjusting traffic lights, for example, to avoid choppy traffic as much as possible.

Spread prevention measures (noise barriers, insulation)

If the desired degree of noise reduction cannot be achieved through measures from the source, noise barriers and housing insulation may be useful in reducing noise propagation. On average, noise barriers reduce noise levels by 3-6 dB, depending on their design and height. Roadside noise barriers are only accepted for motorways and other detours where there is no need for pedestrians to cross. On busy urban streets, which are crossed by pedestrians along their entire length, noise barriers cannot be placed directly on the sidewalk. So only in non-urban areas can they offer a solution. If no other measures can be taken, or if other measures are insufficient, soundproof windows and insulated walls are the only possibility left for further protection against noise. To be effective, these windows must remain closed, and many people have difficulty adjusting to this limitation on their normal behavior (opening windows, etc.), especially during the summer. The noise reduction ability of the cultivated plants can be used to reduce noise pollution in city planning if the width of the cultivated plants is not less than 12 meters. For best effect, rows of trees should be planted perpendicular to the direction of the sound field (Martens, 1981). The ability to absorb noise takes place more in the leaves than in the branches and stems. Long, fleshy leaves with broad palms are more effective at reflecting and absorbing sound (Erdoğan E, Yazgan M, 2009).

The noise of the two-wheeled vehicle

Motorcycles are a major contributor to ambient noise levels especially if they make up a large portion of the total vehicle fleet, as their potential for nuisance is high due to the high proportion of illegal sound exhausts increasing instrumental noise and often aggressive driving behavior (L.C. (Eelco) den Boer A. (Arno) Schroten, 2007)

Noise regulation

The legal framework The Iraqi Law for Noise Control No. (41) of 2015 provided several remedies, including (Iraqi Council of Representatives, 2015):

The employer or the person in charge of the activity must comply with the following

First - To know the level of noise resulting from his work or activity by measuring it using the approved methods.

Second: Commitment to the national noise level determinants in the tables appended to this law.

Third - Using noise prevention methods or any other actions to ensure reaching the noise level limiter.

Fourth - Sending all workers to specialized agencies for hearing examination, including the National Center for Occupational Health and Safety, to do the following

a. Initial audiological medical examinations for workers before they are employed in jobs that expose them to noise.
b . Periodic medical examinations for workers exposed to continuous noise at least once a year, and those exposed to intermittent noise at least once every (6) six months.

Fifth - Providing workers exposed to intense noise, which are higher than the permissible limits, with personal protective equipment for the audio system.

Sixth: To take into account the relationship between the hourly daily exposure period and the allowable level of noise intensity for workers.

Seventh: Place warning signs for places with high noise levels indicating the need to use protective equipment when entering.

It is forbidden to do the following

First: Sounding alarms from all vehicles or otherwise, except in cases where it is required to remedy the occurrence of an accident and which are permitted by law, such as emergency vehicles.

Second: Operating means of broadcasting in public and private places in a manner that leads to disturbance to others.

Third - Operating loudspeakers of all kinds inside public places, except with permission from the concerned authorities.

Fourth: Operating loudspeakers of all kinds outside public places.

Fifth: The continuation of craft activities that generate noise in non-industrial areas after (9) nine o'clock in the evening until (7) seven o'clock in the morning.

Sixth: Establishing crafts and workshops such as blacksmithing and carpentry within residential areas, except in service and craft buildings of their own.

Seventh: Establishing carpentry, blacksmithing and car repair factories, and any activity that causes noise in non-industrial areas that affects the users of the place in accordance with the standards approved by the Ministry of Environment.

Eighth: Operating a loudspeaker or similar device in residential areas for the purpose of broadcasting propaganda using a recorder, radio, television or musical instrument at specific hours daily.

Ninth: Parking cars and large buses, or building garages for their overnight stays, or parking them in alleys.

The authorities concerned with the urban planning of cities and streets shall take into account the provisions of this law and the regulations and instructions issued pursuant there to when designing cities, streets, airports, ports and other similar facilities.

Municipalities must do the following

First: Addressing noise problems along public roads within cities by means that prevent or reduce noise, such as landscaping and barriers.

Second: Establishing multi-storey parking garages in crowded areas.

This is the approved e-mail for the purpose of reviewing this article

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