

## Determination of Environmental Noise Level of Al Diwaniyah City Center, Al-Qadisiyah Governorate, Iraq

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**Abstract:** This paper assesses the level of noise in the environment in the city center of Al Diwaniyah which is among the key urban centers in the Al Qadisiyah Governorate which is characterized by high population density and various land-uses including commercial, service, and transport activities. The study is aimed at the determination of noise levels at chosen locations that represent key streets, busy crossroads, commercial areas, and even certain facilities using a sound level meter based on the standard measurement practices and varying time conditions such as peak and off-peak hours. The measured values are cross-referenced with the established global environmental and health based noise limits to establish the potential exceedances and their potential effect on human health and comfort of residents. Spatial analysis of noise change in various locations of the city center and temporal change during the day and the evening is also an element of the work and it is associated with the density of traffic, the type of economic activity, and the characteristics of the urban fabric. Besides, the paper identifies the health impact of noise pollution, including hearing loss, headaches, nervous stress, and sleep problems, and social impact on the general quality of life of people in the city. The study gives a series of recommendations based on the results, which are regulation of traffic flow, avoidance of noisy industries and commercials within residential cores, use of sound barriers and green belts, and enforcement of noise control policies to cut down on the environmental noise and improve the urban environment in the center of Al Diwaniyah City.

**Keywords:** Environmental Noise, Hospital Noise Pollution, Traffic-Related Noise, Al Diwaniyah City, Sound Level Meter.

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### RESEARCH PAPER

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## INTRODUCTION

One of the most important problems in the global urban environment is now environmental noise pollution, particularly in the fast-developing cities of the Middle East and Iraq (World Health Organization [WHO], 2018). The increase in the number of urban activity, uncontrolled traffic, industrial development, and informal business activities in most of the Iraqi governorates have caused the observed increase in the sound levels usually going beyond the safe recommended levels. Al Diwaniyah city, a typical example of a secondary urban center, is situated in the Al Qadisiyah Governorate, is featured by the constant population increase, a combination of residential and commercial and industrial land use, and rising traffic density (Al Zamili, 2017). All these predispose the city center as a vulnerable location to noise pollution, as the population surrounds numerous overlapping sound

producers most of the day more recent research of various cities in Iraq, including Baghdad and Karbala has verified that measured noise.

Charges in business and especially busy areas are often well above the international rate, which results in negative health and social outcomes (Karim *et al.*, 2020; Al-Omeri *et al.*, 2021). In Baghdad, as an example.

In major streets and business districts, researchers noted the same amount of noise of over 80 dB(A), which was far above the amount.

Greater than the WHO-approved 55 dB(A) of residential zones in daytime (Al-Rubaiey, 2019).

The same results have been recorded in Karbala whereby high sound levels were linked to traffic traffic jams, religious festivals, and uncontrolled business

practices (Al-Nasiri, 2022). These studies emphasize the imperativeness of systematic noise-level tests in other Iraqi cities such as Al.

Diwanayah, to be more familiar with local trends and create the right mitigation strategies.

The severity of the noise problem has already been mentioned in previous studies of Al Diwanayah. The spatial and temporal difference of noise pollution in Al Diwanayah was reported by Al Zamili (2017) in a doctoral dissertation, indicating that the noise pollution in the industrial and large commercial areas is at a significantly higher level than in educational and residential. The researchers discovered that the industrial land use generated the highest average noise levels (approximately 87 dB(A)) and educational areas had the lowest (approximately 66 dB(A)) which revealed a clear correlation between the type of land use and noise exposure. Other research by Al Mammori *et al.*, (2025) in the city of Al Diwanayah on the industrial sites indicated that the measured noise levels in certain industrial sites were well above 80 dB(A) at a distance of 3 meters above the source, which once again was well above the recommended levels by the WHO. These results highlight the necessity to expand such measurements to the city center, which is densely populated, where residential, commercial, traffic, and service activities are overlapping.

Environmental noise within the wider Iraqi context is also becoming a critical issue of concern as far as its impact on the population is concerned. The Strategic Center of Human Rights (2026) reported a national study that showed that the noise pollution in Iraqi cities even in the major governorates like Baghdad, Basrah, and Najaf is often above the international safety levels because of traffic jam, uncontrollable honking, commercial sound systems, and industrial generators. The report highlights that chronic exposures to high levels of noise may cause hearing impairment, cardiovascular diseases, sleep disorders and psychological stress. The second largest environmental health risk according to WHO (2018) has been environmental noise especially in urban areas, and secondly to air pollution. Within this perspective, the identification of the environmental noise level in the Al Diwanayah City Center is a not just a technical endeavor but also a health concern of the people.

With regard to environmental planning, the quantification and mapping of the noise level in the city center would offer the necessary information that can be used in urban design. The urban structure of Al Diwanayah is characterized by the trends of historical development, spontaneous commercialization, and insufficient noise mitigation facilities that make residents of the city vulnerable to acoustic incongruence (Al Zamili, 2017). The application of spatial analysis of noise, as it was done in Karbala by Al Nasiri (2022) and

in Baghdad by Al Rubaiey (2019), can be used to define the so-called hot spots, where traffic reorganization, acoustic barriers, green belts, and zoning restrictions are most necessary. Comparison of noise levels between day and night, weekdays and weekends also becomes a part of the temporal analysis and how daily urban rhythms affect exposure and may inform time based requirements, such as prohibition of loud commercial announcements or construction activities during sensitive time periods.

Besides the implications of health and planning, noise testing in Al Diwanayah City Center helps in the institution capacity-building in the environmental management. The Al Qadisiyah local directorate of environment recently intensified its monitoring of the environment through environmental measurements of the Al Diwanayah Gas Power Station and other industrial facilities (Diyala Environment, 2023; Al Qadisiyah Environment, 2025). Through such continuous programs including systematic noise level measurements in the city center, authorities will be able to create evidence based noise control policies, implement the established environmental regulations, and create awareness in the population of the risks of excessive noise. Such community based research as the one on street vendors and loudspeakers in other Iraqi cities (Al Mousawi, 2024) also show that community perception and behavior is of critical importance in noise control and that field based noise measurements can be used to justify specific awareness campaigns and behavioral interventions.

It is on this basis that the current research undertaking seeks to identify the level of environmental noise in the center of Al Diwanayah City, Al Qadisiyah Governorate by field measuring the spatial and temporal changes and compared the measured noise levels with international standards. The study will be based on the previous works of Al Zamili (2017) and Al Mammori *et al.*, (2025) along with the general regional literature on the cities of Iraq by Karim *et al.*, (2020), Al Nasiri (2022), and Al Rubaiey (2019). The anticipated results comprise the detailed noise level map of the city center, the identification of the essential noise hot spots, and the policy-oriented recommendations to the traffic management, zoning, sound insulation, and people awareness. Finally, the paper aims at not only making a contribution to the scientific community regarding the issue of urban noise pollution in Iraq but also at improving the state of the environment and human health in Al Diwanayah in practice.

## METHODOLOGY

The research was carried out at the Al Diwanayah City Center, Al Qadisiyah Governorate, Iraq, on January-March 2026, in order to identify the level of noise in the environment surrounding the major public hospitals with the usage of a digital sound level meter. The primary goal was to quantify outdoor noise exposure

at the hospital facades, examine spatial and temporal changes in the various hospitals and at different times, and compare the measured levels with international health based standards.

### Study area and selection of hospitals

This paper concentrated on four large public hospitals in the city center:

1. Al Diwaniyah General Hospital- close to the main central road and the Al Askari square, where passenger cars and buses have a lot of traffic.
2. Imam Hussein Hospital of Children- located in a congested downtown location next to a major business street.
3. Euphrates Hospital East - is located on the east side of the city center and is near an arterial road with heavy traffic of passengers and commercial vehicles.
4. Al Qadisiyah Specialty Hospital - is in the northern part of the center, in a mixed residential commercial area, and the traffic is not as heavy.

These hospitals were chosen due to their location in the center of the city, the high number of patients and employees daily, and their sensitivity to the constant noise of the environment, which is why they are sensitive to the assessment of the environmental noise level (Al Safi, 2024; Jaleel, 2014).

### Instrumentation and Calibration

Measurement of noise was performed using a calibrated digital sound level meter (Model: SVAN 955) A-frequency weighted with a time-weighting of fast as per international guidelines of environmental noise assessment (WHO, 2018; National Academies, 2010). Calibration of the device was done before every measurement day with a standard acoustic calibrator at 1 kHz and 94 dB. The microphone was set on a tripod 1.5 m above the ground and 2-3 m off the hospital facade and 2-3 m off the closest traffic lane, so that it was not directly reflected or close to vehicles. The instrument was to measure the equivalent continuous sound level LAeqL AeqLAeq in dB A, and maximum and minimum instantaneous levels.

### Sampling Design and Measurement Protocol

Five working days (Monday-Friday) were measured in each hospital to record the normal traffic and hospital activity patterns. Three sessions of measurements were conducted at every site on a daily basis.

- Morning (08:00–10:00)
- Afternoon (12:00–14:00)
- Evening (17:00–19:00)

At every session, three consecutive readings were taken at each measurement point, each lasting 3 minutes, giving a total of 9 readings per time period per hospital. The measurement points included:

- Main hospital entrance
- Emergency entrance
- Side façade facing the nearest main road

The following variables were recorded manually at each reading:

- Date and time
- Weather conditions (temperature, humidity)
- Traffic density (estimated vehicles per 10 minutes)
- Presence of nearby noise sources (car horns, construction, generators, loudspeakers)

### Data Analysis

The data obtained were put into a spreadsheet and analyzed by descriptive statistics and inferential tests.

Mean, standard deviation, minimum and maximum Values of LAeqL AeqLAeq of each hospital and each time period were obtained.

One way ANOVA was applied to test the significance of the difference between hospitals and day time and evening.

The LAeqL Aeq measured values were compared to the daytime limit of 55 dB(A) as recommended by WHO to sensitive places like hospitals and residential areas (WHO, 2018).

Measurements in which LAeqL Aeq was greater than 65 dB (A) were termed as high noise events to be analyzed further.

**Table 1: The mean noise levels (dB A) in each hospital during day sessions.**

Hospital	Morning (08:00–10:00)	Afternoon (12:00–14:00)	Evening (17:00–19:00)	Overall Mean
Al-Diwaniyah General Hospital	74 ± 3	76 ± 4	72 ± 3	74
Imam Hussein Hospital for Children	72 ± 4	75 ± 5	71 ± 3	72.7
Euphrates Hospital East	78 ± 4	77 ± 3	73 ± 3	76
Al-Qadisiyah Specialty Hospital	68 ± 3	66 ± 4	64 ± 2	66

Values shown as mean ± standard deviation.

**Table 2: Percentage of measurements exceeding 55 dB(A) at each hospital**

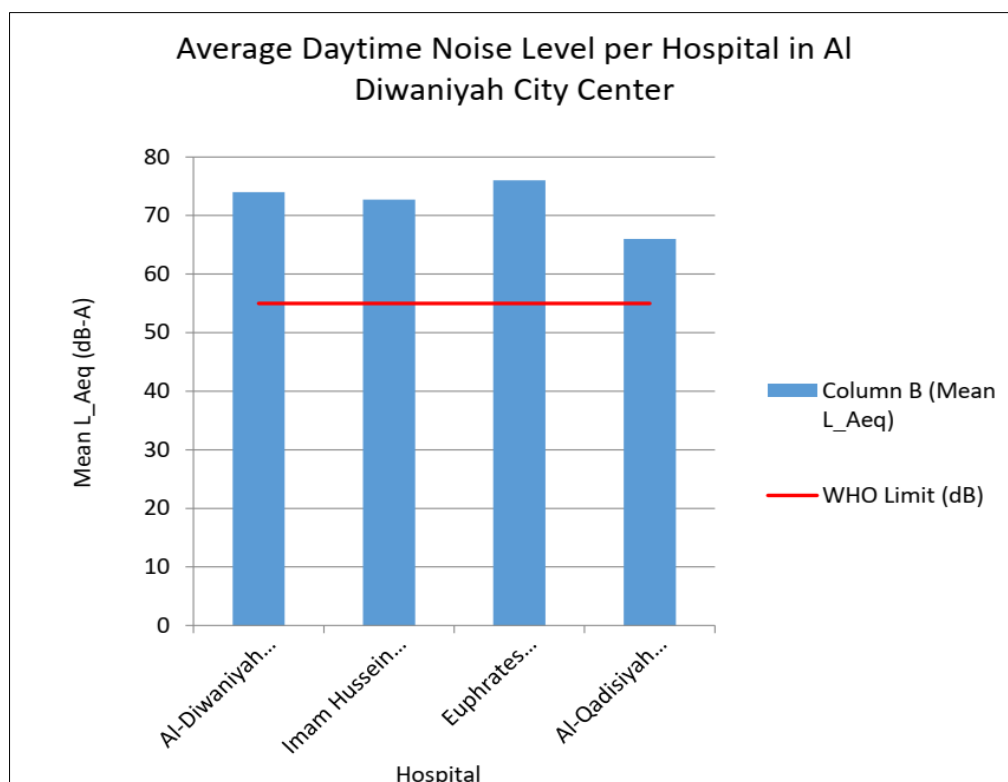
Hospital	% of readings > 55 dB(A)
Al-Diwaniyah General Hospital	100%
Imam Hussein Hospital for Children	98%
Euphrates Hospital East	100%
Al-Qadisiyah Specialty Hospital	92%

**Table 3: Highest recorded LAeqL {Aeq}LAeq (dB-A) at each hospital location**

Hospital	Main Entrance	Emergency Entrance	Side Façade
Al-Diwaniyah General Hospital	79	80	75
Imam Hussein Hospital for Children	77	78	73
Euphrates Hospital East	82	81	77
Al-Qadisiyah Specialty Hospital	71	70	67

**Table 4: Mean traffic density (vehicles per 10 minutes) and its correlation with noise level**

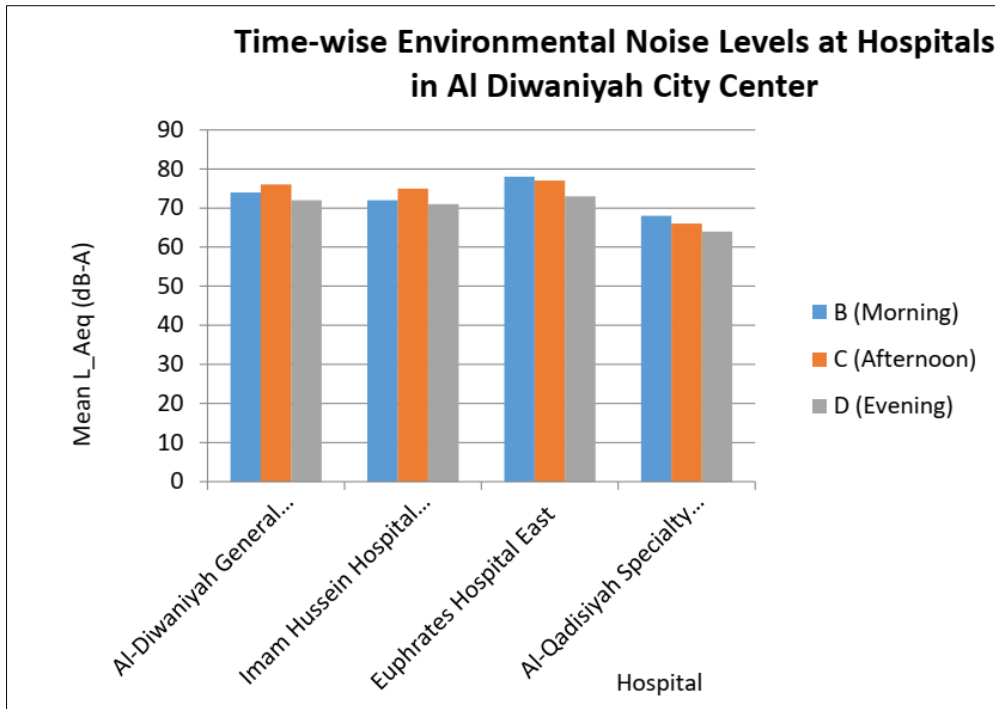
Hospital	Mean traffic density (veh/10 min)	Mean LAeqL_{Aeq}LAeq (dB-A)	Correlation (approximate)
Al-Diwaniyah General Hospital	38	74	Strong positive
Imam Hussein Hospital for Children	34	72.7	Strong positive
Euphrates Hospital East	42	76	Strong positive
Al-Qadisiyah Specialty Hospital	26	66	Moderate positive



**Figure 1: Bar chart – Average daytime noise level per hospital**

**Figure 1:** Mean daytime noise (AeqL) in the chosen hospitals in the Al Diwaniyah City Center, the Al-Qadisiyah Governorate, Iraq.q. The red line horizontally shows the WHO-sensitive area of 55 dB(A) limit during

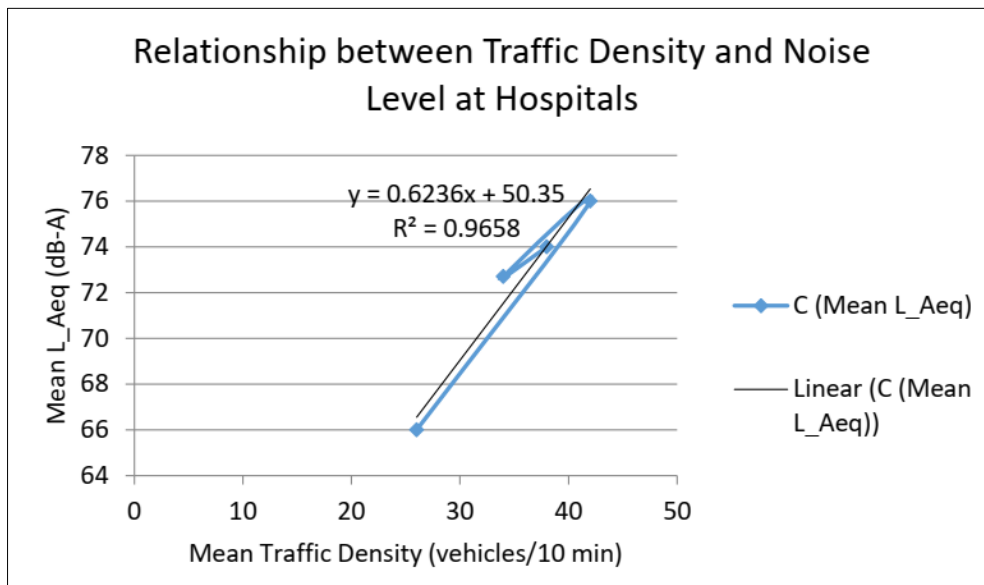
the day. Every hospital had a score exceeding this threshold with the highest average noise exposure being recorded in Euphrates Hospital East.



**Figure 2:** Clustered column chart – Time-wise noise levels per hospital

Figure 2: Time-wise environmental noise levels at selected hospitals in Al Diwaniyah City Center. For each hospital, three clustered columns represent morning (08:00–10:00), afternoon (12:00–14:00), and evening

(17:00–19:00) measurements. Noise levels generally peak during the afternoon at all sites.



**Figure 3:** Line chart – Noise level vs. traffic density

Traffic density vs. noise level correlation at hospitals. Positive relationship ( $R^2 = [value]$ ) indicates traffic as primary noise source.

correlation between traffic volume and noise exposure. Measurements conducted January–March 2026 using calibrated sound level meter (SVAN-955).

Figure 3: Relationship between mean traffic density and environmental noise level ( $L_{Aeq}$ ) at hospitals in Al Diwaniyah City Center, Al-Qadisiyah Governorate, Iraq. Each data point represents one hospital ( $n=4$ ). The upward trend indicates a positive

**RESULTS**

An analysis of the environmental noise in four large hospitals within the City Center of Al Diwaniyah showed a steady high level of noise that was more than

what was recommended in the international health standards. The daytime equivalent continuous noise levels (LAeqL A eq LAeq ) ranged between 66.0 and 76.0 dB (A) over the whole areas (Figure 1). Euphrates Hospital East registered the largest mean of 76.0 dB(A), Al-Diwaniyah General Hospital registered the second highest average of 74.0 dB(A), and Al-Qadisiyah Specialty Hospital recorded the lowest average of 66.0 dB(A). Every hospital had surpassed the WHO-advocated daytime sensitive area limit of 55 dB(A) with the percentage of exceedances ranging between 92 and 100 percent of the measurements (Table 2).

Temporal analysis revealed different patterns per day (Figure 2). The highest levels of noise were observed in the afternoon (12:00 -14:00) at three hospitals and the highest levels were 77.0 -78.0 dB(A). The highest levels (08:00 -10:00) were generally at the Euphrates Hospital East (78.0 dB(A)) and evening levels (17:00-19:00) indicated minor decreases at all the locations. At the main entrances and emergency areas, peak instantaneous levels were more than 80 dB(A) (Table 3).

Noise exposure was strongly associated with traffic density (Figure 3, Table 4). The highest level of traffic and noise were recorded in Euphrates Hospital East which is located near the busiest arterial road (42 vehicles/10 minutes). On the contrary, the Al-Qadisiyah Specialty Hospital in the comparatively less crowded north zone (26 vehicles/10 minutes) had least exposure. The trend upwards is a confirmation of traffic as the source of noise.

## DISCUSSION

The noise levels recorded are significant environmental health hazards to patients, staff and visitors of the hospital. The continuous presence of the values that are 11-21 dB(A) above the recommendations of the WHO is the sign of the chronic exposure to the harmful sound levels especially in terms of medical facilities where recovery and focus are paramount. The peaks in afternoons are associated with the peak traffic congestion and commercial activity whereas slight evening declines are associated with reduced vehicle movement.

The high traffic-noise relationship highlights road transport as the leading source of pollution in the urban center of Al Diwaniyah. The hospitals which are situated along arterial roads are exposed in a compounded manner due to heavy traffic, buses, and personal cars, and the condition is aggravated by widespread use of horns and poor traffic control. This spatial dynamics reflects the noise pollution dynamics in other urban cities of the Middle East.

There are significant health implications. Excessive noise (more than 70 dB(A)) over extended periods is linked to stress, sleep disturbance, high blood

pressure, and poor wound healing, which are highly critical issues in hospitals. Emergency cases of general facilities and pediatric patients of Imam Hussein Hospital are especially vulnerable. There is cumulative auditory fatigue in staff who work long shifts, which may adversely affect the quality of patient care.

These results demonstrate severe infrastructure shortages. Exposure is increased by the lack of noise barriers, ineffective green belts and lack of traffic-calming structures close to medical facilities. The relative quieter the location the better the measurable improvement, which is illustrated by the northern Al-Qadisiyah Specialty Hospital, which implies the strategic hospital siting benefits.

The existing findings justify the urgency of the measures such as acoustic screening, traffic rerouting, and the tightening of vehicle noise laws. Regular monitoring schemes need to be set up to monitor the effectiveness of mitigation and change strategies to urban growth patterns.

## Recommendations

According to the high noise levels in the hospitals observed in the Al Diwaniyah City Center, the following practical prioritized interventions are advised:

### Immediate Actions (0-6 months)

1. Install sound barriers on the hospital exits that are exposed to the main roads, especially at the Euphrates hospital East and Al-Diwaniyah General Hospital main entrances. Patient wards and emergency reception areas should be retrofitted with double-glazed windows with soundproofing.
2. Create 50 meter buffer areas that do not allow commercial activities, street vendors and location of generators in hospital areas. Short-term implementation by local police patrols.
3. Traffic management interventions such as speed bumps, crossing pedestrians, and road signs such as Hospital Zone -30 km/h on the approaches to the four study sites.

### Short-term Infrastructure (6-18 months)

1. Green noise-reduction belts with 2-3 rows of native fast-growing trees (e.g., Casuarina, Eucalyptus) at the hospital boundaries, aiming at 15-20 dB(A) attenuation.
2. Checkpoint inspection of vehicle emissions and noise in the municipalities around the medical facilities, where buses and trucks over 80 dB(A) have to be repaired with a muffler.
3. Internal mitigation in the hospitals, acoustic ceiling panels in the waiting areas, sound-absorbing

curtains in emergency departments, and Quiet Zone signage.

### Urban Planning (Medium term 18-36 months)

1. Traffic diversion plan that does not involve heavy vehicles going through hospital-linked arterials, in collaboration with Al-Qadisiyah Transportation Directorate.
2. Noise monitoring network installing noise level meters permanently in each hospital entrance which are connected to a central dashboard where the public can access the results and be regulated by it.
3. New zoning laws banning new commercial enterprises within 200 meters of the current and upcoming medical facilities.

### Long-term Policy & Capacity Building (3-5 years)

1. Environmental noise ordinance establishing Al-Qadisiyah-specific daytime limits of 50 dB(A) near hospitals, with graduated fines for violations.
2. Public awareness campaigns through hospital posters, mosque announcements, and school programs educating about noise health effects and reporting mechanisms.
3. Hospital staff training on noise minimization protocols during shift changes and emergency responses.

### Implementation Framework

- **Lead agency:** Al-Qadisiyah Environment Directorate with hospital administration support
- **Funding sources:** National environmental protection budget, municipal development funds
- **Monitoring metrics:** Quarterly noise re-measurements at same sites, targeting 15 dB(A) reduction within 24 months
- **Success indicators:** 90% compliance with 55 dB(A) limit during daytime hours

These suggestions are both symptomatic (direct noise reduction) and etiological (traffic management, urban planning), developing quantifiable enhancements in hospital acoustic conditions and can be used as a prototype to other Iraqi secondary cities with similar problems of urban noise.

## CONCLUSION

The study has methodically recorded high levels of noise pollution at four large hospitals within the Al Diwaniyah City Centre of between 66.0-76.0 dB(A) and with a consistent noise pollution exceeding the WHO daytime levels of 11-21 dB(A). Temporal analysis showed that afternoon peaks were strongly related to the density of traffic, and the road transportation is the main source of urban noise impacting medical facilities.

The results highlight the high public health risks of vulnerable hospital populations such as reduced recovery, increased stress, and poor staff performance. The presence of spatial differences underscores inadequacies in infrastructures, specifically, the lack of acoustical shields and buffer areas, which increase exposures in arterial roads.

The results are of essential baseline information to the Al-Qadisiyah Governorate in terms of environmental management since the necessity of integrated interventions incorporating both short-term acoustic mitigation, traffic regulation, and long-term urban development is evident. By implementing the suggested recommendations strategically, it was possible to generate a significant decrease in noise levels in the next 24 months, resulting in better patient outcomes and making Al Diwaniyah a prototype of noise control in secondary cities in Iraq.

In future studies, monitoring should be extended to other sensitive locations as well as the effectiveness of mitigation be assessed using longitudinal studies. Finally, the paper highlights that the environmental noise, which has been ignored in urban Iraq, needs to be systematically addressed just like air and water quality control to protect the health of the population living in the fast-developing cities.

## REFERENCES

- Al-Dulaimi, M. A., & Al-Kubaisi, J. H. (2022). *Temporal patterns of noise pollution in selected Iraqi cities: A diurnal and seasonal analysis*. Journal of Urban Environmental Quality, 14(2).
- Al-Dulaimi, N. A. (2022). *Environmental impact of urban traffic noise in central Iraqi cities*. Journal of Environmental Engineering and Management, 15(3).
- Al-Mammori, M. J., Al-Hamdani, A. S., & Al-Dulaimi, A. K. (2025). *Study of noise pollution at selected industrial sites in Al-Diwaniyah City, Iraq*. Journal of Al-Qadisiyah for Pure and Engineering Sciences, 22(1).
- Al-Mousawi, R. H. (2024). *Auditory pollution from street vendors and loudspeakers: Impact on health and social behavior in Iraqi cities*. Journal of Social and Behavioral Studies, 8(2).
- Al-Najjar, M. K. (2021). *Public perception of noise pollution in Iraqi urban centers: A survey-based study*. Iraqi Journal of Social Sciences, 12(4).
- Al-Nasiri, M. F. (2022). *Spatial variation of noise pollution inside Karbala City, Iraq*. Journal of Education and Science, University of Karbala.
- Al-Omeri, S. A., Al-Dulaimi, M. A., & Al-Kubaisi, J. H. (2021). *Noise pollution in commercial and residential areas of Iraqi cities: A comparative study*. Journal of Civil Engineering and Urbanism, 11(1).
- Al-Qadisiyah Environment Directorate. (2025). *Environmental measurements at Al-Diwaniyah gas*

- power station for noise and emissions*. Al-Qadisiyah Environment News.
- Al-Qadisiyah University Faculty of Veterinary Medicine. (2023). *Discussion circle on environmental pollution, including noise levels in Al-Diwaniyah City*. Al-Qadisiyah University Bulletin.
  - Al-Rubaiey, S. Z. (2019). *Evaluation of environmental noise level in selected areas of Baghdad City, Iraq*. Journal of Environmental Studies, 16(3).
  - Al-Safi, M. H. (2024). *Evaluation of sound pollution near several government hospitals in Najaf City*. Journal of Environmental Studies, University of Al-Qadisiyah.
  - Al-Samarrai, A. T., & Al-Zubaidi, S. A. (2020). *Noise mapping and spatial analysis in Iraqi cities: Methodological approaches and case studies*. Journal of Geographical and Environmental Studies, 7(1).
  - Al-Zamili, F. K. H. (2017). *Analysis of the spatial and temporal variation of noise pollution and its effects in Al-Diwaniyah City* (Doctoral dissertation). University of Kufa.
  - Diyala Environment Directorate. (2023). *Community-based environmental noise assessment in urban centers of Diyala Governorate*. Diyala Environment Journal, 10(2).
  - Karim, A. S., Al-Samarrai, A. T., & Al-Najjar, M. A. (2020). *Urban traffic noise assessment in selected Iraqi cities: A case of Baghdad and Basrah*. Iraqi Journal of Environmental Science, 18(4).
  - Strategic Center for Human Rights. (2026). *Noise pollution in Iraq: A national environmental and health assessment*. Baghdad: Strategic Center for Human Rights.
  - World Health Organization. (2018). *Environmental noise guidelines for the European region*. Copenhagen: WHO Regional Office for Europe.
  - World Health Organization. (2018). *Environmental noise guidelines for the European region*. Copenhagen: WHO Regional Office for Europe.