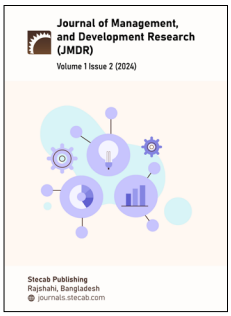

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Research Article

A Study of Urban Noise Pollution in Jalalabad City of Nangarhar Province, Afghanistan

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About Article

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ABSTRACT

This study examines the pervasive issue of global noise pollution and its implications for human health, specifically concentrating on 16 high-traffic locations within Jalalabad, Afghanistan, utilizing the Sound Meter application for data acquisition. The conspicuous absence of antecedent research accentuates the significance of this inquiry. The analysis identified traffic, loudspeaker systems, and human activities as primary contributors to ambient noise. Over a meticulously documented 32-day period in March and April of 2023, notable noise peaks were observed, notably at Talashy Square, registering 73.5 dB at 3:00 PM, and at Malang Jan Watt, reaching 87.5 dB at noon. Urgent intervention is imperative to ameliorate these conditions for the well-being of the city's residents, urging policymakers to implement efficacious noise abatement strategies. This research offers pivotal real-time noise data for Jalalabad and suggests mitigation measures, stressing the necessity for further scrutiny to assess strategy effectiveness, aiming for a harmonious urban environment.

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1. INTRODUCTION

The origin of the English word noise is the Latin word nausea. The term "wrong sound in the wrong place at the wrong time" can be used to describe noise (Chauhan *et al.*, 2010). Noise has many undesirable qualities, including pollution and health risks. Environmental concerns are not simply something that wealthier nations should be concerned about; they also impact developing and rising nations (Aziz *et al.*, 2022). Additionally, the phenomenon of noise has an impact on individuals' physiological and psychological health. In many metropolitan locations, it is a significant environmental problem (Murat & Ebru, 2016). The majority of the responsibility for changing the planet's acoustic environment belongs to people, who produce noises with a wide range of pitches and amplitudes (Ur *et al.*, 2017).

A sound pressure level of greater than 55 dB is considered to be noise pollution, and exposure to loud noise over an extended period of time is harmful to human health. (Muralidharan *et al.*, 2018). However, according to the WHO, noise pollution has risen to the position of the third most dangerous kind of environmental pollution today, behind only water pollution and air pollution (Murat & Ebru, 2016). In addition to growing levels of air and water pollution, noise pollution is also getting more widespread every day. Noise-induced hearing loss, which affects an estimated 120 million people worldwide and results in incapacitating hearing issues, is the most prevalent and irreversible occupational threat in the world, according to the WHO (Bari *et al.*, 2017). Noise pollution has a significant negative influence on the lives of individuals who are exposed to it and also has an impact on human health (Amin & Aslam, 2012). As a result, given the evidence that implies noise pollution may have harmful effects on human health, a study is needed to better understand noise pollution concerns and mitigation (Ali & Kamraju, 2020.).

In this study, we determined the level of noise in 16 selected busiest locations of Jalalabad city. The noise level meter or Android mobile phones have been used for collecting data related to the noise level and this study aims to have real and exact information about the level of noise in selected locations. At each location, the duration of data collection was two days and the overall duration of data collection was 32 days. Additionally, we have used proforma(s) to record the minimum and maximum level of noise in each data collection. Also, the collected data is analyzed by MS Excel program and the graphs have been drawn for better analysis. This study presents a summary of overall information for controlling and mitigating noise pollution in the selected busiest locations of Jalalabad city.

2. LITERATURE REVIEW

Noise pollution has throughout the years increased to an unsettling level due to the rapid growth of industry, urbanization, transportation infrastructure, and population growth. These factors also include an increase in the number of cars on the road (Sahu *et al.*, 2020). The inadequate and inefficient public transportation systems in numerous urban areas have led to a significant rise in the prevalence of personalized vehicles. Furthermore, the continuous presence of various vehicles on the roads contributes to irregular traffic flow, directly causing traffic congestion and subsequently leading to noise pollution (Karthik & Partheeban, 2013).

Noise pollution can be attributed to two primary factors, namely man-made sources of noise and environmental sources of noise (Toppr, 2023). Traffic noise originates from the movement of vehicles on roads and is influenced by various factors. These factors include the density of vehicles, the type and condition of the roads, vehicle speeds, gradients, intersections, the proportion of trucks on the road, temperature, and the degree of building deflection. All of these elements collectively contribute to the intensity of noise emitted by vehicles (Aziz *et al.*, 2012). However, according to the calculations, a 50% decrease in overall traffic volume or a 50% decrease in the volume of high vehicular traffic would result in a 3 dB(A) drop in noise levels (Eduardo *et al.*, 2015). Based on calculations, a reduction of 50% in the overall traffic volume or a 50% decrease in high vehicular traffic volume would lead to a corresponding decrease of approximately 3 dB(A) in noise levels (Suárez & Barros, 2014).

Industrial noise is generated through a range of technological processes, such as the operation of internal combustion engines and other machinery commonly found in industrial sites. These processes produce noise as a result of the friction between machine components and raw materials or finished goods. The resulting vibrations propagate through the surroundings and are perceived as noise by human beings (Teopent, 1918). Moreover, there is compelling evidence pointing to a growing occurrence of occupational noise within work environments, which is a concern globally across all regions (Kaluli & Kanali, 2016).

Globally, including both industrialized and developing nations, traffic-related noise constitutes a significant contributor to environmental pollution (Gupta & Ghatak, 2011). While environmental noise pollution is recognized as a stressor and has a profound impact on overall well-being (Auger *et al.*, 2018). The global shift towards non-carbon energy generation has sparked a heightened interest in examining the potential adverse health impacts associated with various sources of environmental noise, particularly wind turbines. As these turbines become more prominent features on landscapes and coastal seascapes, concerns regarding their effects on human well-being have gained significance (Hume *et al.*, 2012). There is a growing recognition that ambient noise poses a significant environmental challenge, and in the modern world, it has become imperative to address the associated public health issues (King & Murphy, 2016).

Noise can stem from a wide array of sources, encompassing traffic, loudspeakers, crowded areas, and many others (Rİyad *et al.*, 2020). Consequently, the primary sources of noise include commercial establishments, vehicles, and airplanes, as well as construction and demolition activities (Bari *et al.*, 2010). Among various sources, traffic noise emerges as a prominent contributor to overall noise levels in metropolitan areas. Factors such as horn honking, heavy traffic, and sudden surges in traffic flow are primary contributors to traffic noise in urban settings (Sahu *et al.*, 2020). In metropolitan settings, the predominant noise source derives from traffic, generated by vehicular movement, horn utilization, and congestion within roadways (Shirzad *et al.*, 2022).

The prevalence of noise pollution is on the rise and has a detrimental impact on people's health. It can lead to various health issues, including sleep disorders, hearing loss, reduced productivity, sexual dysfunction, as well as cardiovascular, pulmonary, and neurological impairments. Furthermore, exposure to noise pollution has been associated with a shorter lifespan (Singh & Dev, 2010). In addition to causing annoyance, stress, and hearing loss, noise pollution in urban areas also contributes to the development of coronary heart disease. Moreover, regular noise exposure is associated with sleeping problems and mental health issues (Yadav *et al.*, 2021). According to recommendations from the World Health Organization (WHO), noise pollution has various adverse health impacts. These include disrupting intended activities, causing annoyance, psychophysiological and mental health effects, impairing performance and residential behavior, interfering with speech communication, disrupting rest and sleep, and potentially leading to hearing impairment (Berglund *et al.*, 1995). Sound levels below 80 dB are generally considered safe for the human ear. However, exposure to sound levels exceeding 80 dB can lead to temporary hearing loss, which may become permanent if not promptly addressed. Noise levels above 160 dB can result in permanent hearing impairment, eardrum rupture, and inner ear damage, ultimately leading to complete deafness. Moreover, high noise levels have adverse effects on pregnant women, impacting the developing embryo. Noise exposure can also raise blood pressure, cause stomach ulcers, and palpitations, and contribute to nervous disorders, irritability, and rage. Noise levels exceeding 200 dB pose a significant risk of complete deafness due to severe damage to the inner ear and eardrum rupture. Additionally, noise pollution can impact the embryo of pregnant women, elevate blood pressure, cause stomach ulcers, palpitations, psychological disorders, and provoke rage (Weebly, 2023).

In summary, the literature underscores the multifaceted nature of urban noise pollution, particularly in rapidly developing cities like Jalalabad. The significant contributions of traffic, industrial activities, and urban infrastructure to elevated noise levels are well-documented, with serious implications for public health and well-being. As evidenced by the increasing prevalence of noise-related health issues, such as sleep disturbances and cardiovascular problems, it is clear that effective noise management strategies are essential. This review not only highlights the urgent need for targeted interventions but also establishes a foundation for future research aimed at assessing the efficacy of such measures in mitigating noise pollution in urban environments. By integrating findings from various studies, we can better understand the complexities of noise pollution and advocate for policies that promote healthier, more sustainable urban living conditions.

2.1. Research significance

In today's world, noise pollution has gained the distinction of being the third most hazardous form of pollution, with humans primarily being held accountable for its generation. Given the prevailing condition of noise pollution and its diverse repercussions on human well-being, including sleep disruptions, annoyance, and various health ailments, along with its detrimental effects on the environment and other living beings, it is necessary to determine the level of noise and have real-time data for controlling and mitigation of noise pollution in the selected 16 busiest location of Jalalabad city of Nangarhar province of Afghanistan. Unfortunately, as per our literature review, we don't have research studies available on the determination of noise level in these selected locations of Jalalabad city. This study will help improve the efficiency and quality of life for residents of Jalalabad city.

3. METHODOLOGY

3.1. Materials

3.1.1. Mobile phone applications/software and proforma for data collection

In today's modern era, smartphones have become valuable tools for researchers, offering a wide range of applications and software that can facilitate various aspects of conducting research and studies. In our study, we utilized the Android mobile application called Sound Meter, developed by a developer called ToolDev, to collect noise level data instead of using traditional dB meters. This application provides accurate measurements and offers real-time data on the minimum, average, and maximum decibel (dB) levels, along with graphical representations. The use of this application allowed us to gather precise and up-to-date information for our research and enter this information into a proforma prepared for the data collection.

Figure 1. Sound meter application (toolsdev, 2023)

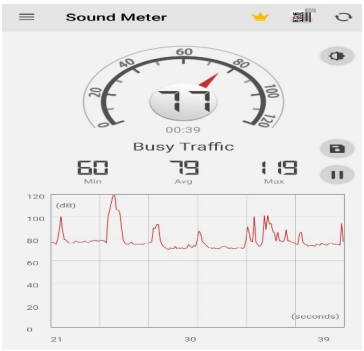

Figure 2. Application preface in on mobile (ToolsDev, 2023)

3.2. Methods

3.2.1. Study area

Jalalabad, situated in the eastern province of Nangarhar, Afghanistan, is a city positioned along the banks of the

Kabul River. It is located approximately 150 kilometers east of the country's capital, Kabul. With its strategic location, Jalalabad serves as a prominent hub for trade and commerce in the region. The city boasts several educational institutions, universities, hospitals, and government establishments. According to the latest data provided by the Afghanistan Central Statistics Organization (CSO) in 2021, the population of Jalalabad was estimated to be around 356,274. It is worth mentioning that population estimates in Afghanistan can be challenging to obtain and may not always be completely reliable. Nangarhar province consists of 22 districts, with the central city of Jalalabad being divided into 10 zones (Behsoodi *et al.*, 2023). The assessment of noise levels was conducted in 16 specific locations within Jalalabad city, chosen for their reputation as the busiest and most crowded junctions in the area. The selected locations for data collection include Eidgah Masjid, Malang Jan Watt, Mukhaberat Square, Talashy Square, Kabul Hadi, Pashtoonistan Watt, Angor Bagh Square, Khalis Family Square, 2 Saraka Avenue, Konar Adda, Sehat Ama Square, Mastofyat Square, Blandghar Bazar, Behsood Bridge, National Bank Square, and Kama Adda.

The data collection process involved gathering noise level data for two days in each of the selected locations. Data was collected from 7:00 AM to 7:00 PM to capture a comprehensive representation of noise levels throughout the day. The sound meter mobile application was used to ensure accurate measurements. Proforma(s) were utilized to record the minimum and maximum noise levels observed during each data collection session. The entire data collection period lasted for 32 days in March and April, 2023. Subsequently, the collected data was analyzed using the MS Excel program, and graphs were created for each location to visually depict the noise levels.

Figure 3. Jalalabad city, Nangarhar province, Afghanistan (2023)

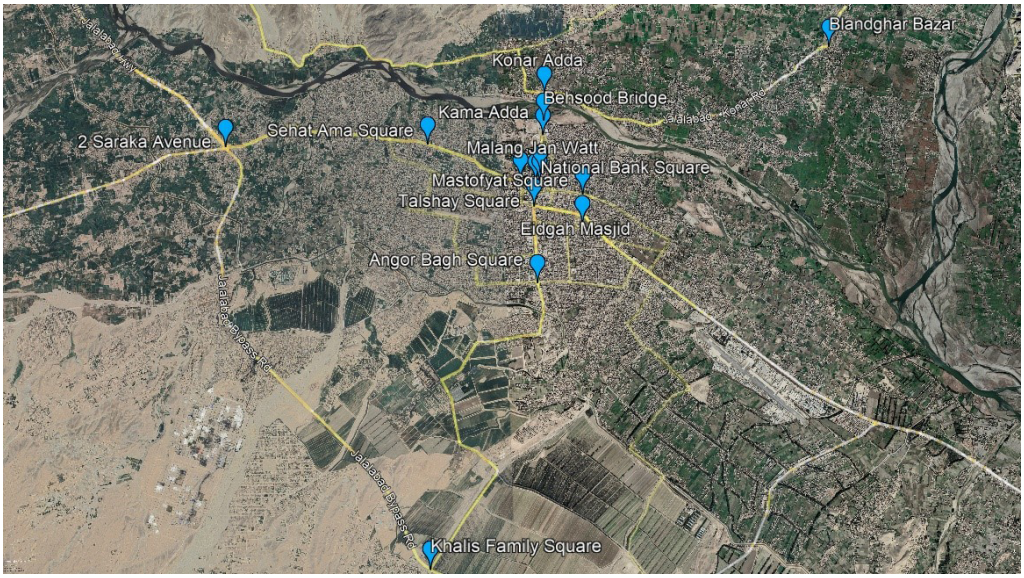

Figure 4. Selected location for data collection in Jalalabad city, Afghanistan (Google Earth Pro)

4. RESULTS AND DISCUSSION

The following tables and graphs display the data collected from the sixteen selected locations, demonstrating the correlation between noise levels and time. These visual representations provide information on the minimum and maximum noise levels observed. They present the average noise data in real time over two days, specifically from 7:00 AM to 7:00 PM.

4.1. Average minimum level of noise:

Table 1. Average of minimum level of noise in selected locations (in db)

Study Location Name	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM
Eidgah Masjid	49.5	38	50.5	54.5	48.5	31.5	42	31	33	49.5	32	31.5	35.5
Malang Jan Watt	68	68.5	61	61.5	69.5	66.5	63.5	60.5	59.5	58.5	66.5	58.5	56.5
Mukhaberat Square	57.5	55.5	60.5	63.5	58	61.5	58	61.5z	60.5	57.5	62.5	59.5	63.5
Talashy Square	62	58.5	64	60	60	60	62	60	73.5	61.5	57.5	62.5	60.5
Khalis Family Square	56.5	58.5	65.5	59.5	60.5	58.5	54.5	52.5	52	60	64	62.5	65
Kabul Hadi	64.5	61.5	65.5	67.5	60.5	62.5	57.5	60	60	62	64.5	58.5	60
Pashtoonistan Watt	58	63	59	62	67	64	58	68	61	60	58	61	64
Angor Bagh Square	68	66	67	68	59	57	59	60	59	57	57	68	67
2 Saraka Avenue	59.5	66	62	62	60.5	60.5	60.5	60	59	58.5	60.5	58	62
Konar Adda	63.5	62.5	70.5	63.5	65.5	67.5	66	65.5	63.5	62	63.5	62.5	64.5
Sehat Ama Square	63.5	64.5	64.5	70.5	67.5	64	62.5	60.5	60.5	62.5	62	63.5	61
Mastofyat Square	56.5	58	59.5	58.5	61	58.5	59.5	61.5	57	56.5	58.5	57	54.5
Blandghar Bazar	50.5	53	51.5	52.5	54.5	56	55	59.5	56.5	60	58	56	53.5
Behsood Bridge	54	54.5	50.5	52.5	48.5	51.5	59	58.5	56	56	54.5	59	58.5
National Bank Square	63.5	59	62.5	60	61	60.5	62	60	59.5	60	62	60.5	61
Kama Adda	57	63.5	60	61	59.5	60.5	55.5	59.5	61	56.5	61.5	60	58

The provided table depicts the average minimum noise levels in the sixteen busiest locations of Jalalabad city. Traffic and loudspeakers emerged as the primary sources of noise in these selected areas, while in certain instances, noise originated from individuals. Notably, the following locations recorded higher minimum noise levels:

- Eidgah Masjid: The minimum noise level was 54.5 dB at 10:00 AM.
- Malang Jan Watt: The minimum noise level peaked at 69.5 dB around 11:00 AM.
- Mukhaberat Square: Throughout the day, different periods witnessed minimum noise levels of 63.5 dB at 10:00 AM and 7:00 PM.
- Talshay Square: The minimum noise level rose to 73.3 dB at 3:00 PM.
- Khalis Family Square: A minimum noise level of 65.5 dB was recorded at 9:00 AM.
- Kabul Hadi: The minimum noise level reached 67.5 dB at 10:00 AM.
- Pashtoonistan Watt: At 2:00 PM, the minimum noise level was 68 dB.
- Angor Bagh Square: Various time slots, including 7:00 AM, 10:00 AM, and 6:00 PM, experienced a minimum noise level of 68 dB.
- 2 Saraka Avenue: The minimum noise level was 66 dB at 8:00 AM.
- Konar Adda: At 9:00 AM, the minimum noise level peaked at 70.5 dB.
- Sehat Ama Square: The minimum noise level reached 70.5 dB at 10:00 AM.
- Mastofyat Square: At 2:00 PM, the minimum noise level was 61.5 dB.
- Blandgar Bazar: The minimum noise level recorded was 60 dB at 4:00 PM.
- Behsood Bridge: Different periods witnessed minimum noise levels of 59 dB at 1:00 PM and 6:00 PM.
- National Bank Square: At 7:00 AM, the minimum noise level was 63.5 dB.
- Kama Adda: The minimum noise level reached 63.5 dB around 8:00 AM

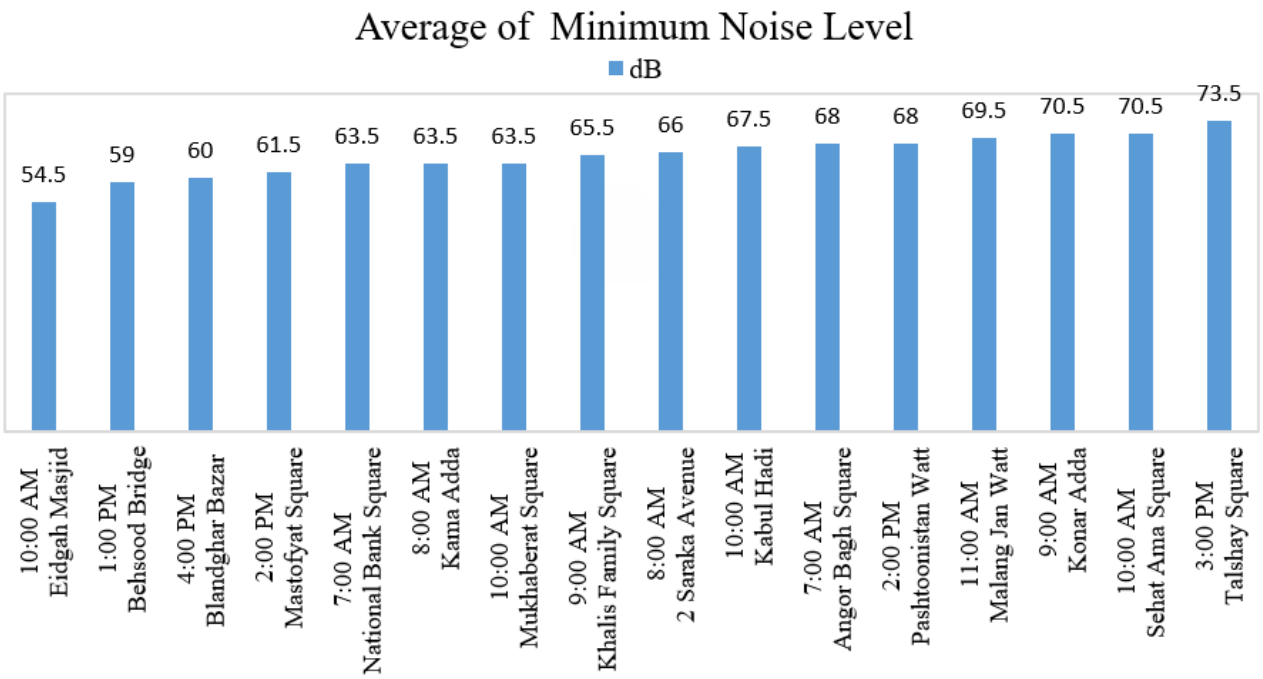

Figure 5. Average of Minimum Noise Level

Based on the noise levels shown in the graph above, we can conclude that the lowest noise level in the selected study locations is higher than 55 dB, which is considered noise pollution. In summary, our study results indicate that even the minimum noise levels in these areas qualify as noise pollution.

Average Maximum Level of Noise

Study Location Name	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM
Eidgah Masjid	67.5	78.5	75.5	70.5	81.5	74	69.5	61	75.5	75.5	70.5	79.5	79
Malang Jan Watt	82.5	85.5	79.5	81	83.5	87.5	84.5	78.5	79.5	78.5	82.5	75.5	78
Mukhaberat Square	78.5	75.5	80	86	78	81	79.5	81	82.5	78.5	82.5	77.5	80.5
Talshay Square	79	83.5	79	80	80.5	86	79.5	82	78.5	77	77	79.5	79.5
Khalis Family Square	78.5	76	80.5	76.5	73.5	70.5	69.5	69.5	68	79.5	79	81.5	85
Kabul Hadi	77.5	77.5	81.5	86.5	79.5	79	75.5	81	76	78.5	81.5	78.5	81
Pashtoonistan Watt	73	83	79	81	84	80	78	82	84	81	77	78	80
Angor Bagh Square	82	81	82	84	79	75	77	80	79	76	74	84	81
2 Saraka Avenue	79.5	83.5	82	79.5	79.5	80	85.5	80.5	79	77.5	82	77	83
Konar Adda	72.5	73.5	84.5	81.5	82.5	86.5	84.5	82.5	85.5	81	83.5	84.5	86
Sehat Ama Square	82	84.5	81.5	85.5	81	84.5	83	82.5	80.5	83.5	84.5	84.5	83.5
Mastofyat Square	77.5	70.5	76.5	76.5	73	76	74.5	77.5	75.5	78.5	77.5	81	79.5
Blandghar Bazar	73	74.5	72	77.5	77.5	77.5	76.5	81	79.5	78.5	78.5	75	74.5
Behsood Bridge	72.5	73	69.5	76.5	79.5	77	78.5	76.5	77.5	78.5	75	80.5	76.5
National Bank Square	75.5	77.5	74	76.5	75	77	79	77	76.5	78.5	78.5	79.5	78.5
Kama Adda	78.5	76.5	78.5	79.5	78	80.5	74	79.5	81.5	78	80.5	81	79.5

The average maximum noise levels have been calculated and are presented in the table above. Moreover, the table illustrates the relationship between real-time noise data and the duration of time. It is worth noting that traffic, loudspeakers, and people are the primary contributors to noise in these locations. The following are notable high average maximum noise levels recorded in the sixteen locations:

- Eidgah Masjid: The noise level reached 81.5 dB at 11:00 AM.
- Malang Jan Watt: At 12:00 PM, the noise level peaked at 87.5 dB.
- Mukhaberat Square: The noise level was measured at 86 dB at 10:00 AM.
- Talshay Square: At 12:00 PM, the noise level reached 86 dB.
- Khalis Family Square: The noise level recorded was 81.5 dB at 6:00 PM.
- Kabul Hadi: At 10:00 AM, the noise level was 86.5 dB.
- Pashtoonistan Watt: The noise level varied at different times, with 84 dB recorded at 11:00 AM and 3:00 PM.
- Angor Bagh Square: The noise level reached 84 dB at various times, including 10:00 AM and 6:00 PM.
- 2 Saraka Avenue: At 1:00 PM, the noise level was 85.5 dB.
- Konar Adda: At 12:00 PM, the noise level peaked at 86.5 dB.
- Sehat Ama Square: The noise level recorded was 85.5 dB at 10:00 AM.
- Mastofyat Square: At 6:00 PM, the noise level reached 81 dB.
- Blandghar Bazar: The noise level peaked at 81 dB at 2:00 PM.
- Behsood Bridge: At 6:00 PM, the noise level was 80.5 dB.
- National Bank Square: The noise level measured was 79.5 dB at 6:00 PM.
- Kama Adda: At 6:00 PM, the noise level reached 81 dB.

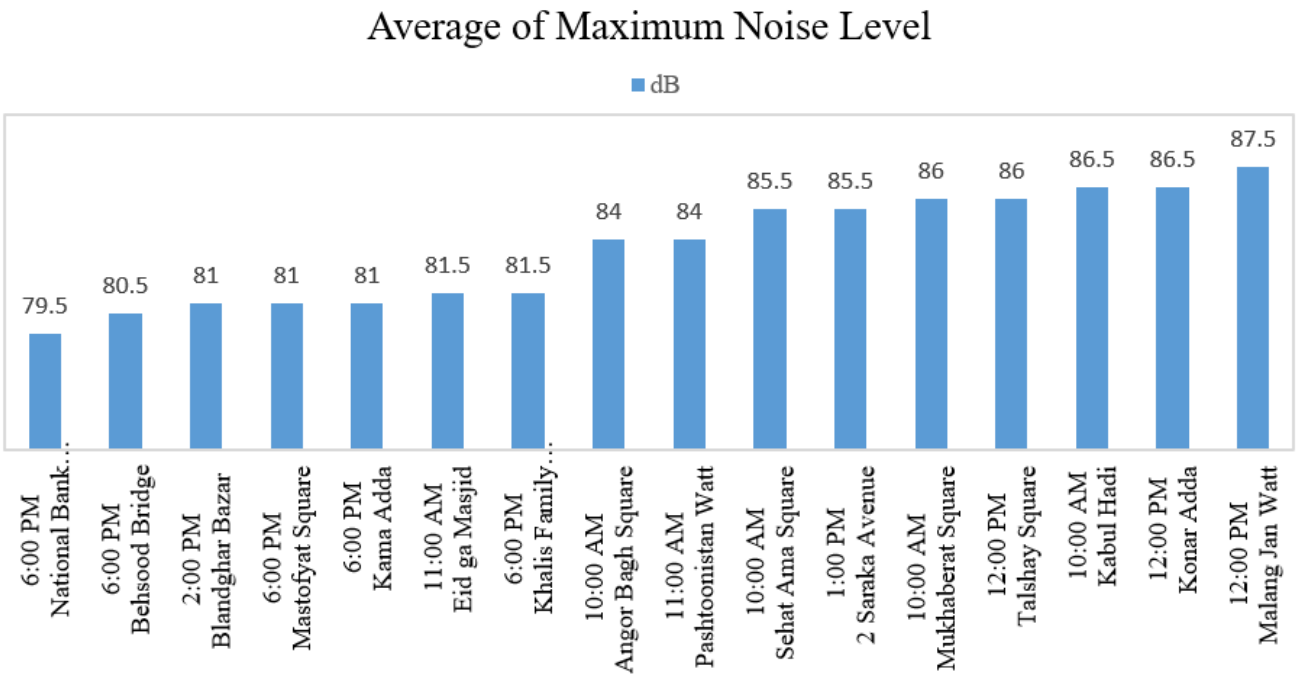

Figure 5. Average of Maximum Noise Level

By analyzing the noise levels shown in the graph, we can conclude that the noise in the selected study locations is higher than what is considered acceptable by the national environmental protection agency of Afghanistan and the World Health Organization (WHO). This high level of noise can negatively impact people's health.

5. CONCLUSION

In conclusion, this study focused on assessing the level of noise pollution in 16 selected busy locations of Jalalabad city in Nangarhar province, Afghanistan. The findings of our study were striking, revealing that traffic, loudspeakers, and human activities were primarily responsible for the elevated noise levels in Jalalabad city. Based on the collected data and observations from these locations, the main and common noise producer in all study locations was a large number of vehicles and traffic congestion. However, in some locations with heavy traffic, loudspeakers from food sellers also contributed to noise pollution.

Over 32 days, we diligently collected data from 7:00 AM to 7:00 PM in each of the 16 locations, ensuring a comprehensive and accurate assessment. The average minimum noise levels varied significantly across the locations, ranging from a relatively calm 54.5 dB at 10:00 AM in Eidgah Masjid to a disturbing 73.3 dB at 3 PM in Talshay Square, mainly due to traffic and food sellers. Similarly, the average maximum noise levels varied from 81.5 dB at 11:00 AM in Eidgah Masjid to 87.5 dB at 12:00 PM in Malang Jan Watt (Malang Jan Square), exceeding NEAPA (National Environmental Protection Agency of Afghanistan) rules and regulations and WHO standards and having negative effects on social life and the environment.

In the selected study locations of Jalalabad city, the lack of public awareness about noise pollution and its effects on health and the urban environment, as well as the poor situation of traffic and traffic management, contribute to high-level noise and noise pollution. These findings underscore the urgent need for noise control and mitigation measures to improve the well-being and quality of life of Jalalabad's residents.

Based on our findings, we strongly recommend that local authorities and policymakers take immediate and decisive action to address the identified sources of noise pollution. Implementing comprehensive traffic management strategies,

enforcing regulations on the use of loudspeakers, and launching public awareness campaigns are critical steps in curbing noise levels and fostering a more serene urban environment. Additionally, urban planning strategies should incorporate noise reduction measures to create a more peaceful and livable environment for the residents of Jalalabad city.

RECOMMENDATIONS

Based on our findings and the current situation in Jalalabad city, we strongly recommend the following recommendations:
Implement Traffic Management Strategies: Develop and enforce effective traffic management strategies to reduce noise levels caused by vehicular congestion. This can involve improving road infrastructure, optimizing traffic flow, and promoting the use of public transportation.

- Regulate Loudspeakers: Enforce strict regulations on the use of loudspeakers in public spaces, particularly during sensitive hours. Set sound level limits and designate areas for amplified sound to minimize the impact of loudspeakers on noise pollution.
- Raise Public Awareness: Launch public awareness campaigns to educate residents about the harmful effects of noise pollution and the importance of individual responsibility in noise reduction. Encourage behavioral changes such as lowering the volume of personal electronic devices, respecting quiet hours, and utilizing noise-canceling technologies.
- Evaluate and Update Noise Regulations: Regularly review and update noise regulations and standards to align with international best practices and advancements in noise reduction technology. Consider adopting stricter guidelines to safeguard public health and well-being.
- Promote Green Infrastructure: Highlight the significance of green infrastructure in mitigating noise. Plant trees, construct green walls, and implement sound-absorbing surfaces to attenuate noise and create a more serene urban environment.
- Encourage Research and Innovation: Support further research on noise pollution in Jalalabad city, including the exploration of innovative technologies and solutions. Foster collaborations between academic institutions, researchers, and government agencies to advance knowledge and develop effective noise reduction strategies.
- Monitor and Evaluate Interventions: Continuously monitor the effectiveness of implemented interventions and assess their impact on reducing noise pollution. Regular evaluation will enable adjustments and improvements in noise management strategies over time.

By implementing these recommendations, Jalalabad city can make significant progress in reducing noise pollution, improving the quality of life for its residents, and creating a more sustainable and peaceful urban environment.

FUTURE SCOPES

The future scopes of study on A Study of Urban Noise Pollution in Jalalabad City of Nangarhar Province, Afghanistan can be categorized into the following areas:

- Noise Mapping and Hotspot Identification: Create comprehensive noise maps of Jalalabad city by integrating the collected data with geographical information systems (GIS). This will allow policymakers and urban planners to identify noise hotspots and prioritize interventions accordingly.
- Health Impact Assessment: Investigate the health implications of prolonged exposure to high noise levels in Jalalabad city. This could involve collaborating with health experts and conducting surveys or medical studies to assess the impact of noise pollution on the physical and mental well-being of the city's residents. The findings can be used to raise awareness and advocate for appropriate measures to protect public health.
- Public Awareness and Education: Develop public awareness campaigns and educational programs to inform the residents of Jalalabad about the harmful effects of noise pollution and the importance of noise control. This could involve workshops, seminars, and distribution of informational materials to empower individuals and communities to take action against noise pollution.
- Collaboration and Knowledge Sharing: Foster collaboration with researchers, experts, and organizations working on noise pollution and urban environmental issues at regional and international levels. Share findings, best practices, and lessons learned to contribute to a broader understanding of noise pollution management and promote sustainable urban development.
- Comparative analysis with other cities: Compare the noise pollution levels in Jalalabad City with other cities in Afghanistan or internationally that share similar urban characteristics. Identify best practices from cities that have successfully managed noise pollution and evaluate their applicability to Jalalabad City.

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