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Environmental Burden of Noise and Human Health Concern: A Review

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Abstract

Unnecessary, undesirable, or disruptive sound in the environment - noise pollution - is an environmental hazard. Noise pollution affects the quality of social and personal life in metropolitan areas. This study reviews the environmental burden of noise and its contribution to physical and mental health problems in Bangladesh. The study extracted data about the degree and impact of national noise pollution through several search engines using keywords and Boolean operators, followed by the PRISMA statement in every phase of literature searching. Major sources include road, air and rail traffic, construction, loudspeakers, industrial activities, and household appliances. Most studies identify road traffic as the main contributor in metropolitan cities of Bangladesh, with recorded highest average levels (132.5 dBA, 2020-2025) at daytime, far exceeding the tolerable limit of the WHO average standard (55 dBA). There are many laws in the country to control noise pollution, but this study identifies the lack of enforcement of these laws. High noise exposure is associated with hearing impairment, nervous system damage, reduced productivity, sleep disturbance, cardiovascular and neural disorders, and some psychological problems. Noise-related health costs and property value losses impose a substantial economic burden. The study recommends the development of effective management strategies in affected areas to reduce noise pollution.

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1. Introduction

Noise pollution not only worsens urban environments in densely populated nations like Bangladesh, but it is also a global problem (Quader et al., 2024). Any excessive, unwanted, unpleasant, loud, or disruptive sound in the environment, especially if prolonged, is noise pollution (Kanu et al., 2022). This type of pollution is common in many industrial activities and workplaces, but it also arises from human crowds, highways, buses, hydraulic horns, aviation traffic, trains, and outdoor settlement operations (Mesene et al., 2022; Karki et al., 2024). With the rise of industrialization and urbanization, noise hazards in urban areas are also increasing (Nipa et al., 2022). This environmental problem poses a significant concern for the public health sector worldwide. Noise pollution is a silent killer (Nwe et al., 2019; Kalawapudi et al., 2020), and continued exposure causes mental fatigue, hearing loss, sleep disturbance, cardiovascular diseases, cerebral stress, and high blood pressure (Baudin et al., 2021). According to a study by Bangladesh's Department of Environment (DoE), noise pollution in the nation's cities has

surpassed the government-imposed limit, with Dhaka being the most affected and Chittagong being the second most affected (Khan & Ahmed, 2023).

Noise measured in A-weighted decibels (dBA), when this value is above 85 dBA, can cause permanent damage, disturbing sleep, concentration, and overall well-being for both people and animals (Quader et al., 2024). Over the last 15 years, several studies have been conducted concerning sound or noise pollution in many cities of Bangladesh such as Dhaka megacity (Quader et al., 2024; Razzaque et al. 2010; Parvin, 2021; Jahan, 2021; Basak et al. 2024); Chittagong city (Islam et al., 2015; Uddin et al., 2018; Alam et al., 2025); Rajshahi city (Bari et al., 2017; Hasan et al. 2025; Sarker et al., 2023); Khulna city (Sultana et al., 2022; Moniruzzaman et al., 2021; Majumder et al., 2025); etc. Dhaka, the capital city of Bangladesh, is one of the world's loudest cities, with sound levels often reaching 110-132 dB (Basak et al., 2024), far exceeding the WHO's 55 dB limit (Jahan et al., 2021; Alam et al., 2025). Bangladesh's Noise Pollution Control Rules 2006 were revised in 2025, with the 2025 rules allowing traffic police to fine offenders directly and impose restrictions in silent zones. Yet inadequate enforcement continues, highlighting the need for greater public awareness and more stringent, consistent application of the law.

Noise is the background to daily living worldwide (Hien et al. 2020; Lagonigro et al. 2018). Noise has many detrimental effects on human health, such as irritation, sleep disturbance (Basner & McGuire, 2018; Nassur et al. 2019), cardiovascular diseases (Van Kempen et al. 2018; Evrard et al. 2015), decreased physical activity (Münzel et all., 2021), promotion of obesity, increased risk of type 2 diabetes, a potential link to anxiety and depression, and a decline in children's cognitive performance (Thompson et al. 2022). Numerous epidemiological findings indicate that traffic noise has a variety of effects on human health. According to Münzel et al. (2021), transportation noise has an impact on the sympathetic nervous system and endocrine stimulation, causing the release of stress hormones into the blood. Additionally, it irritates, lowers sleep quality (Münzel et al., 2021), and affects the quality of life (Riedy et al., 2021). Transportation noise is the main noise problem in metropolitan areas of Bangladesh**,** especially the frequent use of hydraulic and high-decibel horns, although these have been outlawed by a court decision in 2017. Activities related to construction, sound systems, and loudspeakers at social and political gatherings, industrial operations, machinery, and general activity in markets and other human gatherings also contribute substantially. The primary aim of a noise pollution study is to evaluate, monitor, and mitigate the impacts of unwarranted sound on public health and the environment. Key objectives of this review study include identifying noise sources, getting an idea of noise levels in major cities, analysing health/behavioural effects on human beings and animals, and developing control strategies for excessive noise in Bangladesh using about 50 published articles and other literature**.**

2. Literature Review

This study collects peer-reviewed published articles on sources, exposure, health effects, spatial patterns, regulation, and mitigation of noise pollution in Bangladesh. This pollution in Bangladesh significantly exceeds national standards and WHO limits across major urban and rural transition zones, driven primarily by road traffic and hydraulic horns (Islam et al. 2026). Sarkar et al. (2023) identified the major sources of noise pollution in Bangladesh. According to their study, road traffic, hydraulic horns, social and religious events, construction and industry, etc., are the main sources of noise in the country. Motorized vehicles—specifically motorcycles, three-wheeled auto-rickshaws (easy bikes), and heavy buses—are the primary contributors to ambient noise. Despite official bans, illegal and high-decibel hydraulic horns remain widely used by drivers, drastically elevating roadside noise. Loudspeakers, microphones, and sound systems used during public gatherings, political rallies, and festivities compound community noise stress. Unregulated infrastructural expansion, heavy machinery, and local industrial workshops add continuous background noise (Islam et al. 2026).

Empirical findings of noise pollution across cities of Bangladesh were included in this study. Ranked among the most noise-polluted global megacities. Recorded levels in hotspots like Badda in Dhaka city reach 92 dB, and Farmgate averages 76.9 dB, vastly exceeding acceptable daytime limits of 45–55 dB (Sanjib et al. 2010). On the other hand, in Khulna, studies show mean noise levels reaching 72.82 dBA city-wide. Extreme hotspots like Shib Bari Mor Bus Stand record equivalent continuous sound pressure levels over 106 dBA. Silent zones near hospitals and educational institutions in Barishal record up to 72.5 dBA, while Rajshahi faces severe traffic and railway-induced stress along institutional corridors (Hossain & Shahriar 2024). Islam et al. (2022) stated that emerging data from growing towns like Noakhali and Patuakhali reveal that commercial and roadside zones regularly breach standard limits (recording max levels above 76–94 dB), proving the crisis extends beyond megacities.

Several studies, e.g., Quader et al. (2024), Majumder et al. (2025), and Islam et al. (2026), have been conducted on the health and social impacts of noise in Bangladesh. Prolonged exposure leads to high rates of hearing impairment, tinnitus, and permanent deafness—notably affecting vulnerable groups like traffic police and rickshaw pullers. Chronic noise triggers hypertension, elevated cardiovascular disease risk, severe headaches, and high blood pressure. Sleep deprivation, insomnia, irritability, and diminished concentration or emotional regulation in children are widespread. Environmental noise is often treated as a minor nuisance rather than a severe public health hazard, reflecting weak enforcement of existing legislative frameworks like the Noise Pollution Control Rule. From the literature review, research questions concerning noise pollution in Bangladesh focus on spatial distribution, health effects, regulatory execution, and mitigation strategies, predominantly in dense cities like Dhaka. Questions are as follows:

1. What are the present ambient and instant noise levels (in dB) across residential, industrial, commercial, and silent regions in the main metropolitan areas of Bangladesh?
2. How do noise pollution levels vary between working days and holidays, during peak traffic hours, and in the context of seasonal social events?
3. To what extent is the prevalence of high blood pressure, sleep disturbances, hearing loss, and mental stress associated with long-term exposure to high levels of traffic congestion and construction noise among city residents?
4. What are the major legal, institutional, and logistical gaps in implementing national regulations on noise pollution control through the Department of Environment (DoE) and metropolitan traffic authorities?

3. Research gap in noise pollution studies in Bangladesh

Research gaps on noise pollution in Bangladesh primarily stem from a lack of long-term spatiotemporal monitoring, inadequate representation of secondary or suburban towns, and a lack of assessments of vulnerable populations and policy implementation. From a massive literature review, several research gaps were found regarding noise pollution in Bangladesh, which are stated below:

a) Most research is confined to megacities like Dhaka or Chittagong; consequently, small municipalities, rural-urban fringe areas, and second-tier industrial hubs remain outside the scope of research.
b) There is a lack of local data on how constant noise distresses vulnerable groups—such as the cognitive development of children, the mental health of psychiatric patients, and academic performance in schools or universities located near busy areas.
c) Existing research relies primarily on short-term, sporadic (spot-check) decibel measurements rather than continuous, automated, real-time monitoring and advanced predictive noise mapping (GIS modeling) conducted throughout the year.
d) Most of the health assessments depend on cross-sectional questionnaires rather than long-term clinical monitoring of cardiovascular, endocrine, and severe hearing impairments caused by chronic exposure.

4. Methodology

A literature search of PubMed, Google Scholar, ResearchGate, and Web of Science databases was carried out from 2000 to 2025. This study included both original and other research evaluating the relationship between various sources of noise pollution and psychological well-being. We included all types of research, both original papers and conference papers, conducted in Bangladesh on assessing noise levels of pollution in various important locations of the metropolitan cities of Bangladesh and their effects on physical and mental health. The study followed the recognized PRISMA Statement for each event of inclusion and exclusion measures (Mengista et al., 2020). The following terms were searched using the Boolean Operators ('and' and 'or'): (a) noise pollution in Bangladesh, (b) noise in urban areas in Bangladesh, (c) sources of noise pollution in Bangladesh, (d) environmental impact of noise pollution, (e) influences of noise pollution on public health, (f) economic impact of noise pollution, (g) global scenarios of noise pollution, (h) mitigation methods of noise hazards, etc. To begin with, the review acknowledged 155 published studies but finally included 51, which are directly linked to and/or support this study's heading. Over 50% of the papers were published between 2020 and 2025. A flow diagram of conditions used to select the articles for this review study is shown in Fig. 1. The methodology used is presented in a PRISMA flow diagram.

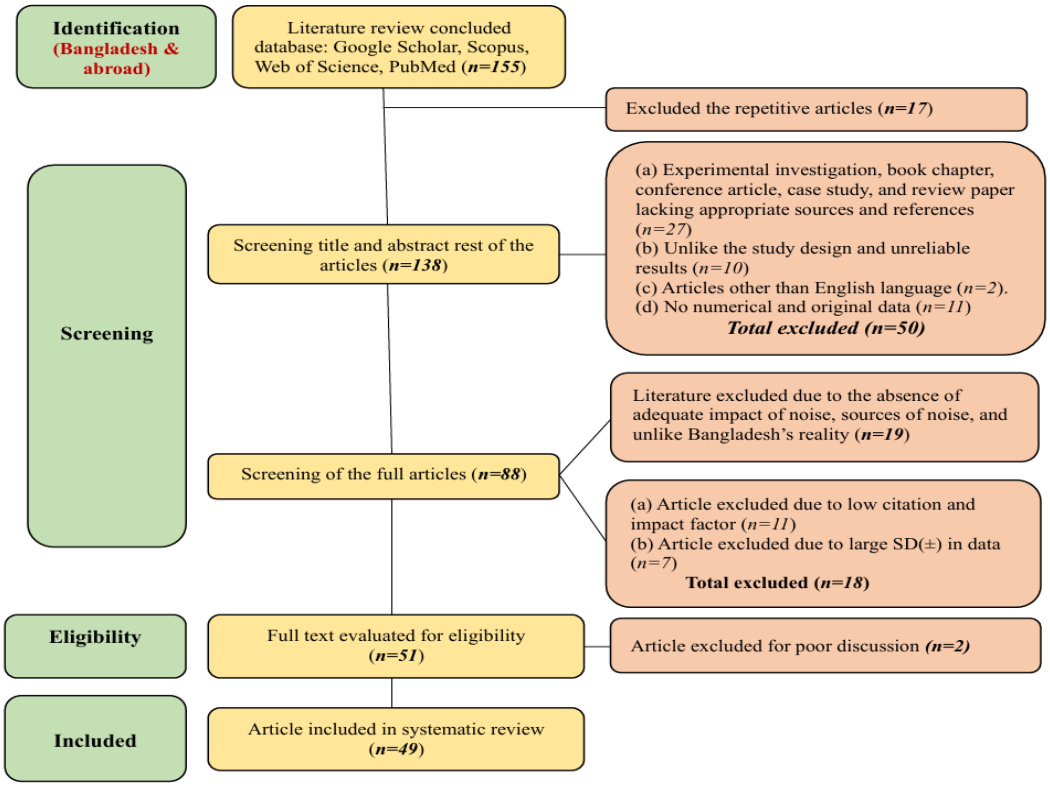

Figure 1. Flow diagram of conditions used to select the literature for review (based on PRISMA method)

Noise levels are mainly expressed in A-weighted decibels (dBA) using logarithmic formulae that associate sound intensity or pressure with a reference threshold of human hearing (10^{-12} W/m^2). The fundamental equation for sound intensity level (β) is:

$\beta(\text{dB}) = 10\log_{10} I/I_0$

Where I is the measured intensity in W/m^2 and $I0$ is the reference intensity (10^{-12} W/m^2).

5. Results and discussion

Overall scenarios - noise and related hazards in Bangladesh

Noise pollution is a serious public health and environmental problem in Bangladesh (Fig. 2a), particularly in Dhaka metropolitan city (Fig. 2b), which has been ranked among the world's noisiest cities with noise levels of 110-132 dBA, often exceeding the recommended 55 dBA limit of the WHO (Masum et al., 2021). Other cities, such as Chittagong, Khulna, and Rajshahi, have faced the same situation. The crisis is mostly driven by approximately 75% of the sound created by traffic, including incessant, illegal hydraulic horn usage, unregulated loudspeaker use in residential areas, crowding due to overpopulation, alongside construction noise and loud music, etc. (Mesene et al., 2022; Karki et al., 2024). Figure 2a illustrates that Bangladesh, along with India, suffers from hearing loss at a considerable level. The hearing index generally refers to a measurement or classification system used to categorize the severity of hearing loss, generally measured in decibels (dBA HL) across different frequencies (Kanu et al., 2022). This index helps audiologists assess hearing capacity and determine required interventions.

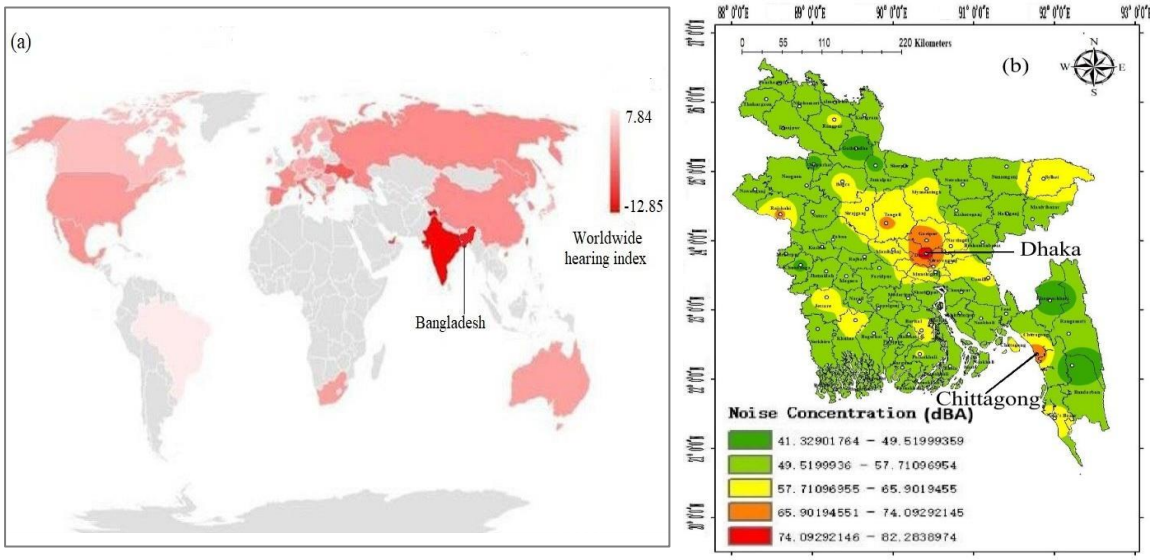

Figure 2. (a) Worldwide hearing index value; deep red indicates more severe hearing loss; (b) noise pollution level in all districts/cities of Bangladesh

Occupational noise hazards are another form of sound pollution in the workplace, which includes unwanted sounds such as machinery, tools, or traffic that exceed safe levels (85 dBA over 8 hours). They cause permanent hearing loss, sensorineural damage, tinnitus, mental stress, and communication issues. Affecting millions of workers, these threats are common in transportation, manufacturing, and construction. Occupational noise-induced hearing loss is the most important worldwide health crisis, causing about 4 million disability-adjusted life years (DALYs) annually and accounting for 16% of adult-onset hearing damage (Wang et al., 2025). Higher in developing regions and among males, the burden is rising quickly, with over 7.8 million years lived with disability (YLDs) reported by 2021, according to Wang et al. (2025), who identify the 10 most vulnerable areas, including Bangladesh, for occupational noise-related disease burden (Fig. 3). The highest value of the estimated annual percentage change (EAPC) in Bangladesh (EAPC = 0.257–1.081) indicates the most affected area by occupational noise exposure.

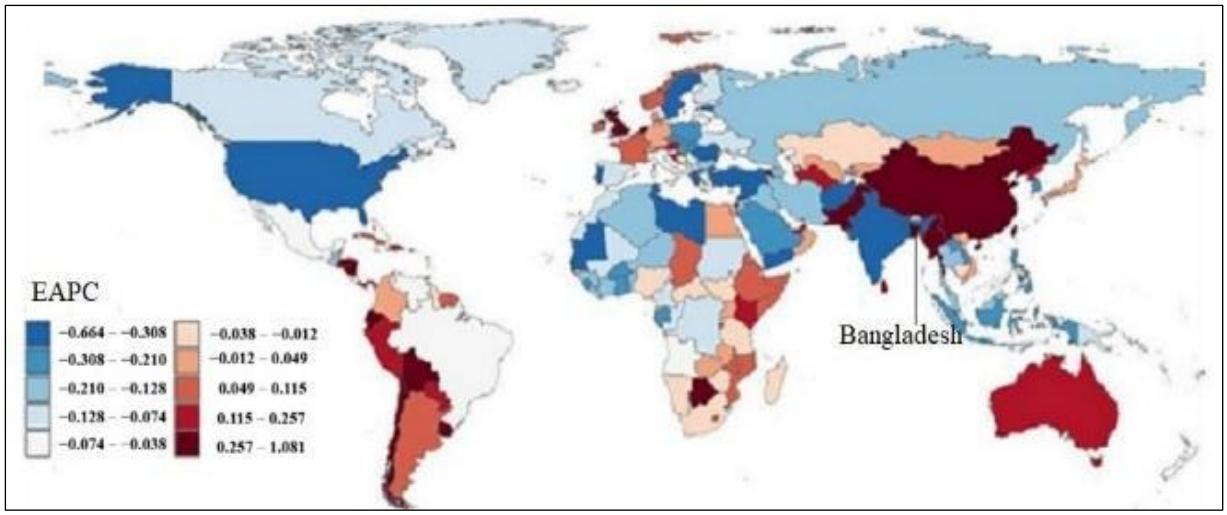

Figure 3. Global distribution of estimated annual percentage change (EAPC) in occupational noise-related disease burden.

Noise pollution in urban areas of Bangladesh

Table 1. Ambient noise quality standards, by zone and time of day/night in Bangladesh (WHO, 1999; Ahamed et al., 2019).

Zone/area class	Daytime (6 am–9 pm) dB(A) L_Aeq	Night-time (9 pm–6 am) dB(A) L_Aeq
Silent area	45	35
Residential area	50	40
Mixed zone (residential/commercial/industrial)	60	50
Commercial area	70	60
Heavy traffic zone (roadside)	70	65
Industrial area	75	70

Note: L_Aeq *denotes the equivalent continuous sound pressure level*

Table 2. Average noise level of different cities in Bangladesh.

City	Zone	dB(A) L_{Aeq}*	Area Class	Year	Difference from WHO standard**	Reference
Dhaka	DMC	52	Silent zone	2023	(+)7	Quader et al. (2024)
	Azimpur	78	Residential area		(+)28	
	Motijheel	83	Commercial area		(+)13	
	Tejgaon	84	Industrial area		(+)9	
	Dhanmondi	78	Mixed-use area	2021	(+)18	Parvin (2021)
	Farmgate, Karwan Bazar, Shahbagh, Gabtoli & Mohakhali	80-110	Mixed-use area	2021-2022	(+)20-50	Jahan (2021)
	Shahbagh	86.5	Silent zone	2023	(+)41.5	Basak et al. (2024)
Gazipur	Joydebpur Junction	100.9	Heavy Traffic	2022	(+)30.9	Nipa et al. (2022)
Chittagong	New market, 2 No gate, & GEC area	109.7	Heavy traffic	2017	(+)39.7	Uddin et al. (2018)
	City corporation area	61	Residential area	2024	(+)11	Alam et al. (2025)
		87	Industrial area		(+)12	
Khulna	City corporation area	76.5	Mixed-use area	2020	(+)16.5	Moniruzzaman et al. (2021)
Rajshahi	University area	77.3	Silent zone	2023	(+)32.3	Hasan et al. (2025)

**Average value/day-time*

***More (+) or less (-) from WHO standard*

The World Health Organization (WHO) and national norms have defined permissible limits for sound levels, and all metropolitan areas in Bangladesh suffer from extreme noise hazards. Sound levels in different cities of Bangladesh exceed the standard noise level. Dhaka is frequently listed as one of the world's noisiest cities. According to the Department of Environment (DoE) assessment, noise levels in all eight metropolitan cities were higher than what is safe for human hearing. The overall standard noise level is 55 dBA, but the WHO has recognized separate guideline values of sound level for different areas in a city. Table 1 shows the ambient noise quality standards, by zone and time of day/night in rural Bangladesh. Although the level of noise pollution in urban areas of Bangladesh is extremely high, not enough critical studies on noise pollution and its impact have been conducted here. However, the outcomes of some studies in different cities are illustrated in Table 2. It was found that the average noise levels in daytime for each class are higher than the WHO standard.

Noise hazards in Dhaka

Dhaka is one of the world's most densely populated cities and is ranked as the world's noisiest city, with noise levels often hitting 110−132 dBA, which far exceed the WHO-recommended 55 dBA (Quader et al., 2024; Jahan, 2021). Roughly 75–90% of this pollution stems from disordered traffic, hydraulic horns, and, to a lesser extent, construction activities and loudspeaker instruments (Basak et al., 2024). Despite the existence of noise pollution control laws in Bangladesh, the failure to control this silent killer is widespread, including weak enforcement of laws, rampant corruption, incompetent administrators, and a lack of public awareness. The level of noise pollution is not the same in all areas of Dhaka city. In particular, there are differences in noise levels between business, residential, and silent zones. Table 3 shows the average sound level of some noisy areas of Dhaka city during the day and nighttime. Dhaka South City Corporation includes Dhanmondi, a major residential and business area. That neighbourhood is home to numerous offices, clinics, hospitals, and academic institutions. Other busy locations in Dhaka, such as Shahbagh, Maghbazar, and Farmgate, show average sound levels typically between 80 and 110 dBA, with peak levels as high as 130 dBA. For a mixed area, 60 dBA is the permitted daytime limit (Quader et al., 2024). Several heavy commercial and industrial areas, such as Tejgaon, Motijheel, Shadarghat, etc., of this megacity are highly polluted by excess noise levels (over 80 dBA, Table 3). A high level of interior noise in public transport in city areas is another hearing problem. Ahamed et al. (2019) assessed the interior noise level of buses on 29 routes in Dhaka city and results showed that 15% of the route-segment L_{Aeq} was found to be above 85 dBA. This happens basically due to overloading by passengers and the age of the buses. This severe, chronic noise causes widespread hearing loss, cardiovascular disease, hypertension, and cognitive impairment among residents in the capital city. According to a survey by Jahan (2021) in Dhaka city, approximately 9% of traffic police are at risk of permanent hearing loss, while 20% are suffering from temporary hearing problems and 10% of drivers are at risk of permanent hearing loss, 17% are suffering from temporary hearing problems, and 7% have high blood pressure due to acute noise pollution. However, the same study illustrated that 15% of service-holders and 30% of students are at risk of insomnia and stress-related illnesses, while 24% of both groups are suffering from temporary hearing difficulties due to severe noise hazards. So, policymakers must therefore keep noise pollution at a safe level.

Recently, Quader et al. (2024) conducted an extensive study on noise levels and resident health scores in different areas of Dhaka city. The residential area, Azimpur, had a lower average of 77.76 dB and a typical health score of 3.07, ranking second after the mixed-use area, Shiddheshori, with an average of 84.23 dB and a health score of 4.71. The commercial area, such as Motijheel, served as the reference location for a commercial zone, with an average of 82.75 dB and an average health score of 3.87. The industrial area of Tejgaon had an 83.55 dB noise level and an average health score of 4.31, and was found to be the least affected area in terms of noise exposure. The sensitive area (Dhaka Medical College) reported an average of 77.62 dB noise and a health score of 4.34, which showed a slightly significant positive relationship with health score.

Table 3. Noise levels (dB) in different noisy areas of Dhaka city (Quader et al., 2024; Parvin, 2021; Jahan, 2021).

Area/Zone	Noise level L_Aeq (dB)	Difference from daytime standard level (dBA) (see Table 1)
Farmgate (mixed zone)	104	+44
Maghbazar (mixed zone)	103	+43
Gabtali (heavy traffic zone)	102	+32
Jatrabari (heavy traffic zone)	100	+30
Gulistan (mixed zone)	90	+30
Sadarghat (heavy traffic zone)	87	+17
Mirpur-10 (mixed zone)	86	+26
Tejgaon (industrial area)	85	+10
Motijheel (commercial area)	83	+13
Dhaka Medical College area (silent area)	78	+33
Dhanmondi (residential area)	78	+28
Gulshan (residential area)	70	+20
Banani and Baridhara (residential area)	68	+18

Noise hazards in other cities of Bangladesh

Besides Dhaka city, other highly populated and crowded metropolitan areas like Chittagong, Khulna, Rajshahi, Sylhet, Barisal, Rangpur, etc., are also highly polluted by high levels of sound (Table 2). Several studies reported that Bhodra More, Rail Station, Talaimari More, Rail Gate, and Kashiyadanga, even inside the hospital, are the most noise-polluted areas in Rajshahi City (Sarker et al., 2023; Hasan et al., 2025). Studies conducted in Chittagong, Khulna, Barisal, Rangpur, Mymensingh, and Sylhet regularly reveal noise levels in all zones (residential, commercial, industrial, and silent regions) that are far higher than the national average (Islam et al., 2015; Bari et al., 2017; Sultana et al., 2020). When Amin et al. (2014) examined the noise levels of a few fuel stations in Sylhet at various times, they discovered that the noise levels exceeded what was allowed. Sultana et al. (2022), Moniruzzaman et al. (2021), and Majumder et al. (2025) evaluated the level of noise pollution at the main intersections in the Khulna metropolitan area. Diverse areas were found to have higher noise levels than commercial areas in Khulna. From numerous studies like Parvin (2021); Jahan (2021); Quader et al. (2024); Basak et al. (2021) for Dhaka city; Uddin et al. (2021); Alam et al. (2024) for Chittagong city; Bari et al. (2017); Sharker et al. (2023); Hasan et al. (2025) for Rajshahi city; Sultana et al. (2022); Moniruzzaman et al. (2021); Majumder et al. (2025) for Khulna city, the average highest and lowest values (dB) of noise level are included in Fig. 3. The noise levels with the highest values, which all cross the threshold level, of all cities of Bangladesh show the serious hazards for local public health and the environment.

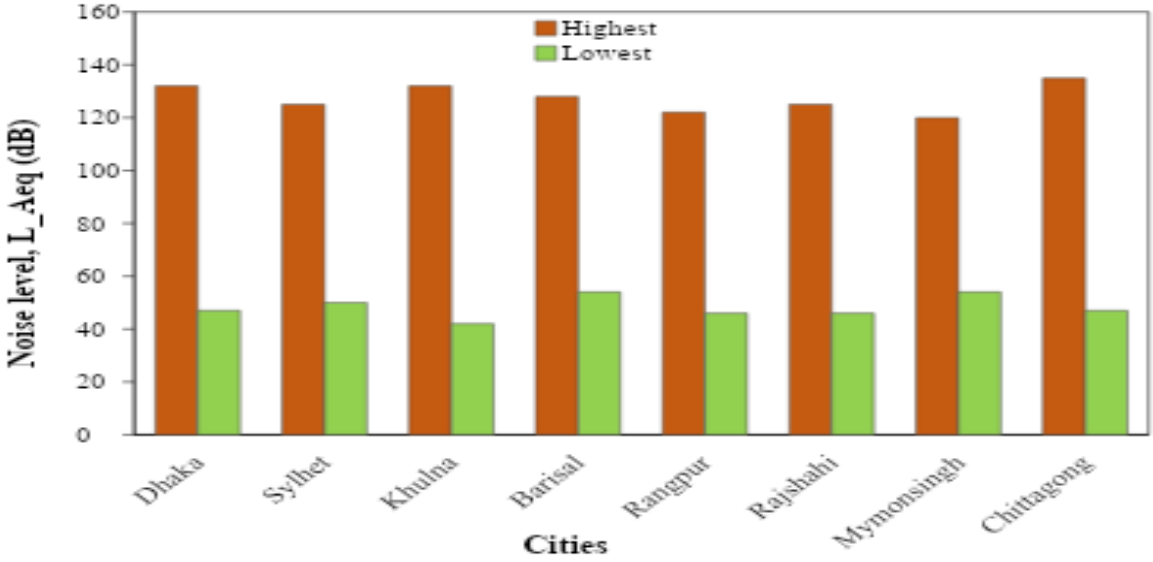

Figure 4. Range of reported daytime noise levels (L_Aeq) in major metropolitan cities of Bangladesh. Highest and lowest bars represent the maximum and minimum values reported in published studies.

Noise pollution and public health

Noise pollution, recognized as a major environmental health risk after air pollution, contributes to chronic problems by causing sustained physiological stress (Sultana et al., 2022). Overexposure to noise has a variety of negative effects on the environment, human quality of life, wildlife, and people's physical and mental health in a number of ways (Nwe, 2019). The effects of noise exposure on public health can be categorized as short-term (acute) and long-term (chronic). Additionally, these effects can be grouped into three classes: auditory, physiological, and psychological impacts. The auditory impacts of noise exposure can vary from temporary alterations in hearing to lasting, irreversible harm caused by damage to the hair cells in the inner ear (Nwe, 2019). Notable consequences include noise-induced hearing loss (NIHL), temporary and permanent threshold shifts, acoustic trauma, chronic ringing in the ears (tinnitus), and heightened sound sensitivity (hyperacusis). It is essential to focus on prevention, as the affected structures are irreparable. The biological effects of being exposed to noise involve permanent, irreversible hearing loss, tinnitus, and heightened stress reactions like increased blood pressure, a faster heart rate, and elevated cortisol levels (Mesene et al., 2022; Thompson et al., 2022). Prolonged exposure can lead to cardiovascular diseases, metabolic syndromes, sleep disruptions, and issues with the immune system, posing a significant non-auditory health risk. Noise exposure leads to considerable psychological distress, resulting in heightened annoyance, increased stress (with elevated cortisol levels), anxiety, and depression (Sarker et al., 2023). It negatively affects cognitive abilities, diminishing concentration, focus, and productivity while contributing to fatigue and disturbances in sleep. Prolonged and intense exposure is linked to a rise in mental health conditions and even suicidal tendencies. In Switzerland, Wicky *et al.* (2023) stated that road traffic and railway noise were associated with a total of 11265 suicide deaths (hazard ratios: 1.040; 95% confidence level per 10 dB day-evening-night level), whereas for aircraft noise, a risk increase starting from 50 dB was masked by an inverse association in the very low exposure range (30–40 dB). Min and Min (2018) also showed that the adjusted hazard ratios for suicide death steadily increased with environmental noise levels in the metropolitan area of South Korea, and the risk was the highest for adults with mental illness. No data has been found regarding suicidal tendencies for noise exposure in Bangladesh.

Long-term exposure to loud noise can result in permanent deafness or hearing loss, among other common effects (Sultana et al., 2022). According to Rahman et al. (2022), Baudin et al. (2021), and Ma et al. (2018), prolonged exposure to loud or undesired noise can lead to a variety of health issues, including stress, anxiety, sadness, irritability, and feelings of hopelessness. Fatigue and a decline in productivity may result from noise pollution's disruption of sleep patterns and insomnia (Ma et al., 2018). It can raise the risk of cardiovascular disease by increasing blood pressure, heart rate, and the risk of heart attack and stroke (Rahman et al., 2022; Banerjee, 2014). Additionally, it can make animals anxious and confused, which can result in behavioral disturbances (Kattakayam et al., 2022). Noise pollution can lower land values, making it more difficult to rent or sell properties. Workplace noise can hinder concentration and reduce productivity (Rahman et al., 2022). Numerous detrimental consequences on mental health, such as elevated stress, anxiety, insomnia, and a higher risk of depression, have been connected to noise pollution (Sultana et al., 2022; Ma et al., 2018). Excessive noise exposure has been shown in studies to interfere with the body's stress response and raise cortisol and other stress hormone levels. Particularly for young children, noise pollution can impair focus and memory, making it challenging to finish tasks or remember information. The brain's neurotransmitter balance can be upset by noise pollution, which can alter behaviour and mood. According to Lim et al. (2018) and Hahad et al. (2025), it was found that exposure to noise pollution may raise the risk of schizophrenia and other mental illnesses. In general, noise pollution can significantly affect mental health, resulting in mood disorders, sleep disruptions, and elevated levels of stress and anxiety (Yao et al., 2021).

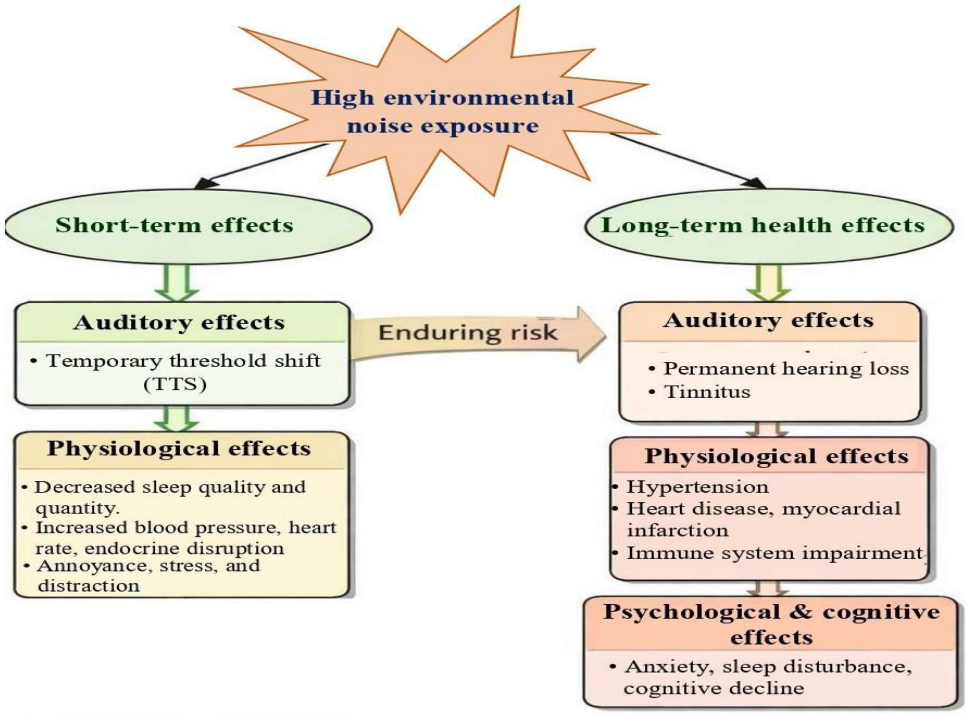

Figure 4. Major auditory and non-auditory health effects associated with high environmental noise exposure.

An increasing threat that poses major health and well-being hazards and disrupts public life is still present in Bangladesh's busy cities. With rapid urbanization, increasing motorization, and unregulated construction activities, noise levels in city areas have surpassed safe limits, affecting millions of people every day.

Economic Impact

Noise-related health costs and losses of property values (down 0.4%–1.1% per dB) place a significant strain on the country's economy (Hahad et al., 2025). Increased healthcare costs (stress and cardiovascular issues) and lost productivity (poor concentration, sleep loss, lower property values in noisy areas, and high costs for mitigation measures like noise barriers and sound insulation) have a considerable financial impact on people's finances, businesses, and public budgets worldwide. Noise is a negative externality affecting tourism and requiring significant public investment in noise mitigation. Environmental pollution (including noise) is linked to a significant portion of the country's GDP loss (Ahmed et al., 2025). It is very difficult to determine how and to what extent noise pollution affects a country's economy. However, some research has been done in this regard in different countries. For example, Swinburn et al. (2015) conducted a survey in the USA that showed that a 5 dBA noise reduction scenario would decrease the occurrence of hypertension by 1.4% and coronary heart disease by 1.8%. For this reason, the annual economic benefit is estimated at $3.9 billion. On the other hand, Hammer et al. (2014) projected that 104 million individuals had annual $L_{Aeq(24)}$ levels >70 dBA (equal to a continuous usual exposure level of >70 dBA over 24 hrs.) in 2013 and were at risk of noise-induced hearing loss in the USA. Heart disease and other health consequences linked to noise exposure could threaten tens of millions more people.

Due to its geographical location, Bangladesh suffers from various natural disasters and faces billions of dollars in losses. Noise pollution in Bangladesh, particularly in cities, causes significant economic losses, estimated in the billions of dollars annually due to reduced productivity, increased healthcare costs for stress-related illnesses, hearing loss in ~12% of the population, and decreased property values (Quader et al., 2024). Jahan (2021) and De (2016) stated that high

noise levels, often exceeding 120-130 dBA, disrupt sleep, lower work efficiency, and increase absenteeism, severely hindering economic growth. Sleep deprivation, mental fatigue, and stress from constant noise reduce the efficiency of workers and students in a loud place. Chronic noise exposure leads to illnesses that strain public health resources. Approximately 12% of the population suffers from hearing impairment in Dhaka city, creating long-term medical costs (Quader et al., 2024). In industrial settings, high-intensity noise (>90 dBA) interferes with operations and can impact profitability. Traffic noise reduces the desirability and value of residential areas. In 2019, numerous causes of pollution, including noise, contributed to 55% of premature deaths in Bangladesh, accounting for nearly 8.32% of the nation's GDP, of which 1.5% is due to noise pollution (Quader et al., 2024). Effective enforcement of regulations, such as creating silent zones around schools and hospitals, is necessary to mitigate these economic damages.

Housing properties near noisy areas, such as highways or airports, experience significant value reductions. A study by Razzaque et al. (2010) shows property values can decrease by 8% to 10% near highways and up to 1.9% per additional decibel in Dhaka city. Chronic exposure also causes stress-related diseases, including hypertension and heart disease, leading to higher medical treatment costs. Noise pollution interferes with concentration, causing lower effectiveness in workers and reduced intellectual development in students. In addition, noisy environments reduce the attractiveness of urban zones for tourists and can negatively affect commercial activity. Nath et al. (2024) surveyed Cox's Bazar, a famous tourist place in Bangladesh, and the results showed that over 95% of respondents perceived increased noise pollution during peak tourist seasons, with 87.11% describing it as "extremely" or "very" noisy. It reduces the attraction of natural spots, causes substantial stress and health issues for tourists, and disrupts eco-tourism, which is central to the country's tourism appeal. Governments, NGOs, and companies spend substantially on sound insulation, noise barriers, and urban planning/zoning to decrease noise exposure. There are many laws in the country to control noise pollution, but due to the lack of enforcement of the laws, it is not possible to control this pollution.

Major challenges and mitigation measures

The legal framework for pollution control in Bangladesh is anchored in the Environment Conservation Act (ECA), 1995, which empowers the Department of Environment (DoE) to regulate air, water, and soil pollution. Specifically for noise, the Noise Pollution Control Rules were approved in 2025. Best practices from India, Nepal, Sri Lanka, Malaysia, Kenya, and South Africa were reviewed to identify weaknesses in the 2006 Rules and refine the new framework accordingly. It is expected that the revised rules (Act 2025) will serve as a landmark step toward effective noise management in Bangladesh. The new rules also introduce clear punitive measures for the import, manufacture, storage, and sale of horns, an area previously unregulated despite being one of the major sources of noise pollution. Authorities believe this rule helps bring uncontrolled horn use under effective control. Several additional directives have been included in the updated rules, such as a ban on the use of loudspeakers, microphones, amplifiers, or musical instruments in public places without written permission; prohibition of picnics in natural forests and wildlife habitats; a maximum noise limit of 90 dBA for social events, which must end by 9 PM; a complete ban on fireworks, horns, or similar noise-generating items in silence zones; restrictions on night-time construction; new provisions for controlling noise from industrial establishments and generators; and alignment of penalties with the Road Transport Act, 2018 (BDLex, 2025). According to this Act, traffic police can impose instant fines to stop honking loudly.

Despite strong legal provisions, enforcement is often hampered by limited manpower and monitoring resources, leading to reliance on sporadic drives by the DoE and police. Enforcement of the law requires motivation, proper monitoring, and effective penalties when breaches of the law are discovered. These conditions are not easily found in Bangladesh. Enforcement requires many resources and frequently subjective assessments of irritation, as well as real-time surveillance. It is challenging to control many social noise sources that involve a large number of

people. Additionally, large-scale mitigation, such as noise barriers, is either unfeasible or prohibitively expensive in established locations because of existing infrastructure. A survey indicates that the following percentages of persons are unaware of the regulations on noise pollution: 66% in Barisal, 55% in Rangpur, 55% in Rajshahi, 54% in Mymensingh, 49% in Sylhet, 48% in Chittagong, 48% in Khulna, and 46% in Dhaka (Chakma, 2023).

Noise pollution in urban Bangladesh is an environmental and health problem that requires coordinated efforts to achieve solutions. Because of recent political turmoil, viz., the Monsoon Revolution and the departure of Sheikh Hasina to India in 2024, these changes are difficult to bring about. Figure 5 shows the key components of a mitigation strategy to reduce environmental noise in Bangladesh. Trained manpower should be used for continuous monitoring, and local authorities need to be provided with the necessary resources and training. Bangladesh's path towards sustainable urban living includes the issue of noise pollution. Implementing the Noise Pollution Control Rules 2025, which establish zone-specific limitations, and prohibiting hydraulic horns and, in certain situations, overnight construction are the main strategies for mitigating noise pollution in Bangladesh. This means applying the law and enforcing it without fear or favour. Designating quiet areas, using traffic control to ease congestion, encouraging soundproof urban development, and raising public awareness are important tactics. Figure 5 shows the general idea, but the present researchers realize how fluid the situation in Bangladesh is and how complicated all such initiatives will be.

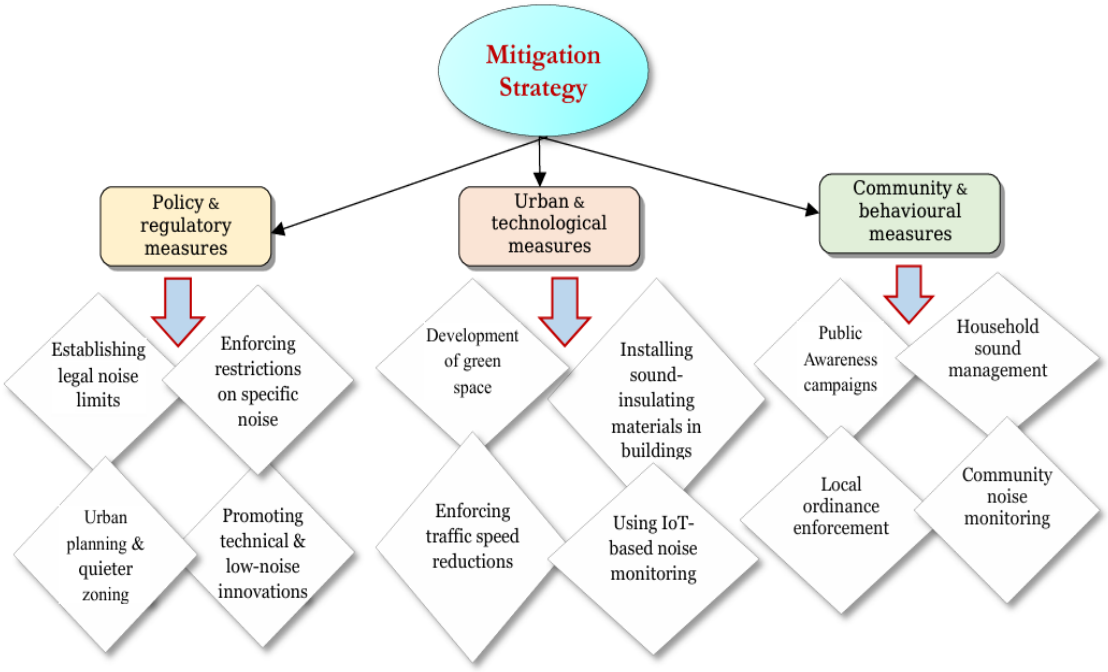

Figure 5. Key components of a mitigation strategy to reduce environmental noise in Bangladesh

Bangladesh has implemented various laws and regulations to tackle noise pollution, particularly the Noise Pollution Control Rules 2006, established under the Environment Conservation Act 1995. These regulations define permissible noise levels for various areas and establish fines for breaches. Nevertheless, the implementation is still inadequate. The absence of cooperation between agencies like the police, city corporations, and the DoE obstructs successful execution. In recent years, several efforts have been made to manage noise levels. The Dhaka Metropolitan Police (DMP) has carried out operations against unlawful horn usage, and the DoE has sent notices to construction companies. Yet, these attempts are irregular and inadequate. The outlook is not positive at all. Accordingly, efforts must be renewed and must be prolonged.

6. Applications of This Review

Firstly, this review gives real evidence for enforcing noise limits that differ from zone to zone in Bangladesh. Table 1 sets the permissible standards, but Table 3 shows how badly Dhaka's hotspots break them—Farmgate exceeds the limit by +44 dBA and the Dhaka Medical College silent zone by +33 dBA (Quader et al., 2024; Jahan, 2021). These numbers can help the Department of Environment and traffic police decide where to focus their enforcement under the Noise Pollution Control Rules 2025 (BDLex, 2025). Secondly, the spatial data gathered in this review can help city planners design quieter urban spaces. The GIS-based noise maps from Basak et al. (2024) and Alam et al. (2025) can guide city corporations in creating buffer zones between busy roads and residential areas. The finding that 15% of Dhaka bus route segments go above 85 dBA (Ahamed et al., 2019) makes a strong case for stricter vehicle standards and mandatory sound insulation. The fact that property values drop by 8–10% near highways (Razzaque et al., 2010) gives further reason to invest in noise barriers. Thirdly, this review supports health interventions for people in high-risk jobs like traffic police, drivers, and factory workers. Jahan (2021) found that 9% of Dhaka traffic police are at risk of permanent hearing loss, and Fig. 3 shows Bangladesh among the ten most vulnerable regions in the world (Wang et al., 2025). These findings make it clear that hearing protection and regular hearing tests should be mandatory in noisy workplaces. Fourthly, the health effects shown in Fig. 4—such as high blood pressure, sleep problems, and heart disease—have direct meaning for doctors. Healthcare providers in urban Bangladesh should think about noise exposure when they see patients with unexplained hypertension or insomnia. The finding that 12% of Dhaka's population has hearing impairment (Quader et al., 2024) supports the need for community hearing screening programs. Fifthly, the economic evidence in this review can help justify spending on noise reduction. Noise pollution causes about 1.5% of Bangladesh's GDP loss (Quader et al., 2024), and cutting noise by just 5 dBA could save billions in health costs (Swinburn et al., 2015). The tourism losses in Cox's Bazar due to noise (Nath et al., 2024) also show that noise control matters for the economy. Finally, this review points out a serious gap in public awareness. Chakma (2023) reported that 46–66% of urban residents do not know about existing noise regulations. This clearly supports the need for community awareness programs and school education. The mitigation framework in Fig. 5—which focuses on continuous monitoring, coordination between agencies, and public participation—gives local authorities and NGOs a practical roadmap to follow.

7. Conclusion

One of the most significant environmental pollutants that negatively impacts the quality of life in metropolitan areas is noise pollution. Now, noise hazards are a major problem in urban Bangladesh. Most studies identify road traffic and loud industrial plants as the main contributors in metropolitan cities of Bangladesh, with the highest average levels (132.5 dBA) at daytime, far exceeding the threshold limit of the WHO average standard (55 dBA). There are many laws in the country to control noise hazards, but this study identifies the lack of enforcement of these laws. The majority of residents and enforcement authorities in Dhaka and other metropolitan cities are unaware of the negative consequences of noise pollution. Loud or undesired noise can lead to a variety of health issues, including stress, anxiety, sadness, irritability, and hopelessness. Noise pollution has a significant financial impact on people's finances, businesses, and public budgets in Bangladesh. People are becoming more conscious of the negative effects of noise pollution and the importance of controlling it. The existing legal framework must confront the actual facts and must be used so that change is made as required and the whole country benefits as it should. Bangladesh has highlighted significant existing gaps regarding long-term health monitoring, policy implementation, and regional oversight. Although numerous studies have been conducted to measure noise levels in major hubs like Dhaka and Chattogram, certain critical areas still remain outside the scope of research. To curb noise pollution in urban Bangladesh, the government and citizens must strictly enforce up-to-date noise control laws, regulate excessive vehicle horn usage, and foster widespread public awareness.

8. Limitations and Future Research Directions

Firstly, this review relied only on selected databases, so local journals, government reports, and Bengali-language studies may have been missed. Therefore, future research should include these sources to capture a more complete picture of noise pollution across Bangladesh. Secondly, most included studies used short-term spot measurements rather than continuous monitoring. Therefore, future studies should establish long-term continuous noise monitoring with automated sensors and real-time data systems in major cities and secondary towns. Thirdly, many health findings came from questionnaires rather than long-term clinical data. Therefore, future research should conduct long-term clinical and epidemiological studies to properly measure cardiovascular, endocrine, and hearing effects of chronic noise exposure. Fourthly, there was little data on vulnerable groups such as children, psychiatric patients, and the elderly, and no data from Bangladesh on suicide risk linked to noise (Wicki et al., 2023; Min & Min, 2018). Therefore, future research should focus on these groups and explore severe mental health outcomes in the Bangladeshi context. Fifthly, enforcement data were unavailable, so the real impact of noise laws could not be measured. Therefore, future research should evaluate the effectiveness of fines, silent zone rules, and horn bans to see what actually works in Bangladesh. Finally, this review could not compare Bangladesh with other South Asian countries in detail. Therefore, future research should conduct comparative studies to identify best practices and region-specific solutions.

Declaration of competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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