

REVIEW PAPER**OPEN ACCESS****Noise pollution in the urban environment and its impact on human health: A review****Israa Radhi Khudhair*, Bushra Hameed Rasheed, Rana Ihssan Hamad***College of Pure Sciences (Ibn- al Haytham), Department of Biology, University of Baghdad, Baghdad, Iraq***Key words:** Noise, Hearing loss, Public health, Annoyance, UrbanizationDOI: <https://dx.doi.org/10.12692/jbes/27.4.28-31>**[Published: October 08, 2025]****ABSTRACT**

Noise pollution, also known as environmental noise or sound pollution, refers to the presence of excessive or disturbing sounds in the environment. Unlike many other pollutants, noise does not accumulate in the environment; rather, it has direct and immediate effects on human well-being. It is a major problem in cities around the world. It is a form of air pollution, posing a threat to health and well-being. Noise pollution is becoming more prevalent due to population growth and urbanization, which increase the use of noise sources of varying intensity and impact. The main sources of noise are transportation (air traffic, highways, and railways), industrial activities, construction work, and loudspeakers. Noise produces both direct and cumulative adverse health effects, potentially harming human health, wildlife, and the overall quality of the environment. Prolonged exposure to high levels of noise is associated with a range of health problems, including hearing loss, sleep disturbances, and cardiovascular disease. It can also impair the ability to enjoy leisure time and increase the incidence of antisocial behavior. Noise negatively impacts overall health and well-being in the same way that chronic stress does. Noise pollution also degrades social and work environments, reduces productivity, and leads to negative social behavior, along with corresponding economic losses. It also negatively impacts future generations through the deterioration of residential, social, and educational environments. The goal should be to protect citizens from the harmful effects of air pollution, including those caused by noise.

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INTRODUCTION

Unnecessary noise is the most severe abuse of human beings, potentially harming both the healthy and the sick. As Florence Nightingale noted in 1859, noise is a health hazard (Hsu *et al.*, 2012). Noise comes from various sources, including transportation systems (traffic, trains, and aircraft), industrial activities, construction work, and urban environments it is increasingly recognized as a serious environmental stressor, not just a nuisance (Marquis-Favre *et al.*, 2021). Noise pollution; an urban territorial phenomenon is assuming serious proportions in every city (Yuan *et al.*, 2019). Noise pollution is an annoyance to human beings. The noise is usually machine-created sound that disrupts activity or balance of human's way of life. It is a growing environmental problem that is increasingly becoming an omnipresent, yet unnoticed form of pollution not only in developed countries but also in the developing countries (Marquis-Favre *et al.*, 2021).

Sources of noise pollution

Transportation: Road traffic is the leading source in urban areas. Aircraft and railway noise are also significant (Marquis-Favre *et al.*, 2021).

Industrial activities: Factories, construction equipment, and machinery contribute to high noise levels (Yuan *et al.*, 2019). Urbanization Increasing urban density and infrastructure development elevate noise levels (Pienkowski, 2021).

Social and recreational activities: Loud music, events, and gatherings can cause acute noise exposure (Śliwińska-Kowalska and Zaborowski, 2017).

Mechanisms of impact on human health

Noise pollution primarily affects health through two mechanisms.

A. Auditory effects: Direct impact on the hearing system.

Hearing loss and tinnitus: Prolonged exposure to noise levels above ~ 85 dB (A) cause's permanent hearing loss and tinnitus (Dzhambov and Dimitrova, 2017). Occupational noise remains one of the most common work-related illnesses worldwide (Wirtz and von Kanel, 2017).

B. Non-auditory effects

Cardiovascular and metabolic health: Increased risk of myocardial infarction and other cardiovascular disorders due to stress-induced physiological changes (Daiber *et al.*, 2019). Hypertension and ischemic heart disease long-term noise exposure elevates stress hormones (cortisol, adrenaline), induces oxidative stress, and contributes to hypertension, coronary disease, stroke, and heart failure (Clark and Paunovic, 2018).

Quantified risks: A landmark meta-analysis shows that each 10 dB (A) rise in traffic noise increases cardiovascular disease risk by $\sim 3.2\%$ (Hsu *et al.*, 2012).

Occupational data: A WHO/ILO-coordinated systematic review found workplace noise (≥ 85 dB (A)) increases ischemic heart disease risk by $\sim 29\%$ (Clark and Paunovic, 2018).

Sleep disruption and stress: Night-time noise undermines sleep quality and depth, leading to fatigue, elevated stress hormone levels, and poor cardiovascular recovery (Clark and Paunovic, 2018).

Cognitive development and performance: Children: Exposure to traffic and aircraft noise impairs memory, reading comprehension, and learning outcomes (Alimohammadi *et al.*, 2019). Adults: Chronic noise annoyance is linked to impaired concentration and a decline in cognitive performance (Alimohammadi *et al.*, 2019; Dzhambov and Lercher, 2019).

Mental health and well-being: Stress and anxiety: Continuous noise increases cortisol levels, contributing to chronic stress. Annoyance from noise is itself a stress response that fuels mental health burdens (Dzhambov and Lercher, 2019). Depression: Long-term exposure, especially to unpredictable noise, may elevate the risk. Increased exposure to road and aircraft noise correlates with elevated depression ($\approx 4\%$) and anxiety ($\approx 12\%$) per 10 dB (A) increase (Zhang and Ma, 2022). Cognitive Impairment: Especially in children, noise can hinder memory, attention, and learning (Alves *et al.*, 2015).

Productivity and quality of life: Reduced work efficiency, especially in concentration-intensive tasks. Diminished overall well-being and increased annoyance (Eibich *et al.*, 2015).

Additional risks: Recent reports also link prolonged noise exposure with obesity, type 2 diabetes, and dementia—likely through sleep disruption and chronic inflammation (Zhang and Ma, 2022).

Vulnerable populations

Children and students: Particularly susceptible to cognitive and developmental effects and learning impairments under noisy environments (Dzhambov and Lercher, 2019).

Older adults: More prone to cardiovascular and sleep disturbance -related consequences (Basner and McGuire, 2018).

Low-income and marginalized communities: Often located near high-noise zones (e.g., highways, airports) and lack adequate soundproofing. Exposed to higher noise levels and fewer mitigation resources (Dzhambov and Lercher, 2019; Zhang and Ma, 2022).

Regulatory guidelines

According to the World Health Organization (WHO), recommended noise levels for residential areas should not exceed 55 dB (daytime) to prevent serious annoyance in outdoor living spaces and 40 dB (nighttime) to avoid sleep disturbance and related health effects (WHO, 1999; WHO, 2018). These thresholds serve as international benchmarks for community and environmental noise management.

Within the European Union (EU), noise management policies are guided by the environmental noise directive (2002/49/EC), which establishes requirements for noise mapping, reporting, and public information. However, specific noise limits and enforcement mechanisms vary significantly among member states, reflecting national policy differences regarding industrial, traffic, and urban noise regulation (European Environment Agency, 2020; European Commission, 2002).

Prevention and mitigation

Urban planning: Buffer zones, green spaces, and noise barriers.

Building design: Use of soundproof materials and double-glazed windows.

Technological solutions: Quieter engines, electric vehicles, and noise control in machinery.

Policy interventions: Noise zoning, regulation of night-time activity, public awareness campaigns.

CONCLUSION

Noise pollution is a pervasive environmental issue with significant and well-documented impacts on human health. Its effects go beyond mere annoyance and include severe consequences such as cardiovascular disease, mental health issues, and cognitive decline. Addressing noise pollution requires a multidisciplinary approach involving urban design, technological innovation, policy regulation, and public education.

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