Environment Conservation Journal 24 (4): 264-268, 2023

Journal homepage: https://www.environcj.in/

Environment Conservation Journal

ISSN 0972-3099 (Print) 2278-5124 (Online)

Analysis of noise pollution level in and around SIDCUL area in District Haridwar (Uttarakhand) India

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ARTICLE INFO

Received : 20 May 2023
Revised : 28 July 2023
Accepted : 12 August 2023

Available online: 18 October 2023

Key Words:
Traffic
Industrialization
Noise pollution
Environment

ABSTRACT

The primary objective of this study is to evaluate the issue of noise pollution in the vicinity of the industrial zone of Haridwar city and its correlation with the health of the people in and around the SIDCUL (State Industrial Development Corporation of Uttarakhand Limited). The study revealed that noise pollution levels were above the CPCB Standard for the sound level for industrial zones and residential zones. During the period from January to December 2018, noise levels were observed and monitored in both the industrial zone (Site-I SIDCUL) and the residential zone (Site-II Siwalik Nagar). The average noise levels varied throughout the year. At Site-I (Industrial Zone), during the daytime in July, the maximum average noise level recorded was 89.5 dB, while in April; the minimum average noise level was 81.1 dB. During nighttime, in January, the maximum average noise level reached 84.1 dB, and in May, the minimum average noise level was 76.6 dB. In Site-II Siwalik Nagar (Residential Zone), the daytime noise levels were a maximum average noise level of 61.1 dB in May and a minimum average noise level of 58.8 dB in September. During nighttime, the noise level reached a maximum average of 47.2 dB in October and a minimum average of 44.5 dB in May. Overall, the study revealed that noise levels were generally higher in both zones, except for the average nighttime noise level at Site II (residential zone), which was below the prescribed standard limit for noise.

Introduction

Noise pollution is an unwanted, unpleasant and unexpected sound level and is derived from the Latin word nausea. Anthropogenic activities such as urbanization, industrialization, transportation, other development activities and many types of festivals are key factors that produce different levels of noise pollution in different areas of society. It is very harmful for humans and very hazardous to all biotic components. Nonbiotic components are also affected by noise pollution (Pawar and Joshi 2005). Noise pollution is a pervasive environmental issue that has negative impacts on individuals and the balance of ecosystems. It refers to the presence of excessive or disturbing sounds in the environment that disrupt natural harmony and cause adverse effects on human health, wildlife, and overall quality of life. With the rapid growth of urbanization and industrialization, noise pollution has become a pressing concern in many cities and regions worldwide. From the relentless buzz of traffic to the clamor of industrial machinery, noise pollution infiltrates various aspects of daily life, leading to a range of physical and psychological consequences. Prolonged exposure to high noise levels has been

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Doi: https://doi.org/10.36953/ECJ.25782657

linked to hearing impairment, sleep disturbances, stress, and cognitive impairments. Additionally, wildlife and natural habitats suffer from disruptions in mating, foraging, and communication patterns. Efforts to combat noise pollution encompass a broad spectrum of measures, including urban planning, technological advancements, and awareness campaigns. Striking a balance between development and environmental sustainability becomes crucial to mitigate the adverse effects of noise pollution and foster healthier and more harmonious living conditions for present and future generations.

Noise is one of the hazardous problems in urban and semiurban zones in different parts of the world and is the result of urbanization as well as industrialization or anthropogenic activities by humans (Gangwar *et al.,* 2006). Currently, the many types of vehicles, such as heavy vehicles and modified bikes, create considerable noise in the atmosphere. Traffic noise creates a number of problems, such as chronic effects and sleeping disorders. A high level of noise pollution may also damage hearing capacity at the temporary level as well as the permanent level (Pachpande *et al.,* 2005). Obviously, noise pollution has a very negative effect on living things as well as nonliving things. Failing to take appropriate measures to manage and diminish noise levels may result in the worsening of the problem due to ongoing urbanization and industrialization. This could lead to an irreparable situation. The rising number of complaints filed with the police and administration highlights the growing problems related to noise pollution as a law and order concern. Moreover, there have been reports indicating that noise pollution during pregnancy can give rise to a variety of complications for newborns (Vidya Sagar and Rao 2006).

Material and Methods

To conduct this study, two locations for each zone (Viz. residential and Industrial zone) were selected in Haridwar city. Siwalik Nagar was selected for the residential zone. Both sites are located within the periphery of 5 km. The study on ambient noise monitoring was conducted from January to December 2018. Noise levels were measured for 18 hours of study between 0600- 2400 hrs with the help of a sound level meter. Ambient sound levels were compared with those of the standards prescribed in Environmental Protection Rules, 1986 (Tripathy 2008) and standards of CPCB (Kudesia and Tiwari 2018).

Health survey in the local community:

An extensive health survey was carried out in the different localities in and around the SIDCUL, Haridwar, to determine the health problems among the local people residing in the concerned area. A survey was carried out during the study period at specific locations, encompassing 600 participants. The survey included various segments of the community, such as local residents, shopkeepers, hawkers, and autorickshaw drivers. Participants were requested to report any health-related issues they experienced, including hearing problems, headaches, stress, sleeping disorders, heart and blood pressure problems, and other diseases. Furthermore, data concerning the respondents' age, gender, occupation, income, place of residence, and dietary habits were collected for later analysis. The results (January to December 2018) of the health survey in and around SIDCUL, Haridwar, are summarized in Figure 1.

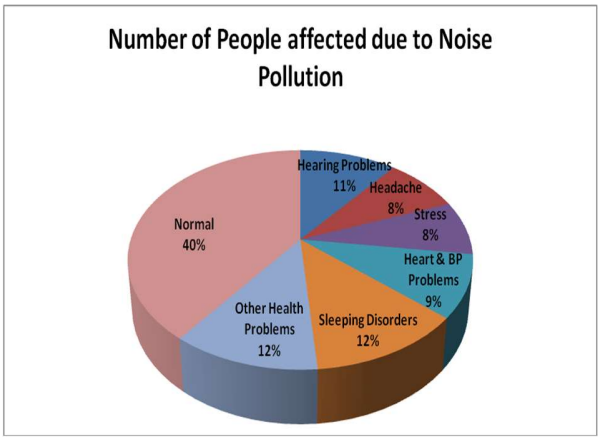

Figure 1: Percentage of noise pollution-oriented diseases among the people in the study area during 2018

Results and Discussion

In the current study, it was observed that the noise levels in both the industrial zone and residential zone exceeded the standard prescribed limits for noise. The study involved monitoring noise levels in these two distinct zones within Haridwar city from January to December 2018. During the period from

January to December 2018, noise levels were observed and monitored in both the industrial zone (Site-I SIDCUL) and the residential zone (Site-II Siwalik Nagar). The average noise levels varied throughout the year. At Site-I (Industrial Zone), during the daytime in July, the maximum average noise level recorded was 89.5 dB, while in April, the minimum average noise level was 81.1 dB. During nighttime, in January, the maximum average noise level reached 84.1 dB, and in May, the minimum average noise level was 76.6 dB. In Site-II Siwalik Nagar (Residential Zone), the daytime noise levels were a maximum average noise level of 61.1 dB in May and a minimum average noise level of 58.8 dB in September. During nighttime, the noise level reached a maximum average of 47.2 dB in October and a minimum average of 44.5 dB in May. Overall, the study revealed that noise levels were generally higher in both zones, except for the average

Table 1: Monthly average noise level (in dB) at two selected sites from Jan to Dec 2018

Months	SITE-I(SIDCUL)		SITE-II (Siwalik Nagar)	
	(Day Time)	**(Night Time)**	**(Day Time)**	**(Night Time)**
January	88.2 (75.2-92.7)	84.1 (80.7-87.5)	59.4 (50.6-65.7)	45.7 (40.5-50.9)
February	89.3 (74.6-93.5)	83.2 (80.3-86.2)	59.0 (51.3-64.4)	46.2 (41.2-51.3)
March	87.9 (74.5-101.2)	81.4 (76.4-86.4)	59.4 (50.3-65.6)	45.8 (41.2-50.4)
April	81.1 (76.4-103.4)	79.4 (73.4-85.4)	59.2 (49.3-65.4)	45.9 (41.4-50.4)
May	88.4 (77.8-99.4)	76.6 (71.8-81.4)	61.1 (44.3-68.9)	44.5 (39.3-49.8)
June	89.2 (77.4-98.4)	80.7 (80.1-81.3)	59.6 (51.3-64.5)	46.6 (42.1-51.2)
July	89.5 (71.4-98.4)	78.7 (76.1-81.4)	58.7 (50.1-65.1)	46.2 (41.2-51.3)
August	86.1 (71.2-95.3)	80.3 (78.2-82.4)	59.2 (48.2-65.5)	44.7 (38.1-51.3)
September	89.3 (78.1-101.4)	77.0 (71.6-82.5)	58.8 (50.1-64.4)	46.4 (41.2-51.6)
October	88.0 (74.3-98.6)	81.7 (80.1-83.4)	57.5 (43.5-64.6)	47.2 (42.3-52.1)
November	88.5 (76.4-99.2)	83.2 (78.2-88.3)	59.8 (51.2-65.1)	46.6 (41.2-52.1)
December	87.9 (76.3-100.3)	82.5 (78.8-86.3)	58.5 (50.1-64.1)	45.5 (40.2-50.8)

nighttime noise level at Site II (residential zone). Similar findings have been observed by different researchers in different parts of the world. Singh *et al.* (2011) conducted a study evaluating the ambient noise levels in the city of Bareilly, Uttar Pradesh. They have a positive correlation of noise pollution with human health problems. Vidya sagar and Rao (2006) have also studied noise pollution with special reference to hospitals, residential zones, etc., in the city of Visakhapatnam. Sharma *et al.* (2015) assessed the noise pollution in some industrial, commercial, residential and silence zones within Jagiroad town in Assam. He also found a positive correlation between noise pollution and human health problems related to noise.

Correlation between noise pollution and human health:

During the present study, the observation indicated that noise pollution contributes to health problems related to hearing problems, headache, stress, sleeping disorders, heart and BP problems and other diseases among society. It was also observed that health problems related to noise pollution have

increased. Among the total respondents, 11% had hearing problems, 8% had headache, 8% had stress problems, 12% had sleeping disorders, 9% had heart and BP problems, and 12% had other diseases.

Table 2: Standards for noise level in different zones [Source: Uttarakhand Pollution Control Board]

Noise Level Zone	(Limits in dB)	
	(Day time)	(Night time)
Industrial zone	75	70
Commercial zone	65	55
Residential zone	55	45
Silence Zone	50	40

related to water pollution and air pollution in the year of the study period. In all total respondents of the study period, 60% suffered from various diseases related to noise pollution as well as industrial pollution. Most of the people were disturbed by noise pollution as well as traffic noise, and approximately 60% of the people suffered from various problems related to noise pollution, such as high blood pressure (HBP), stress problems, headache, sleeping disorders, and hearing problems. Pathak *et al.* (2008) described noise pollution in Varanasi city with special reference to health problems related to higher noise levels. He also found a negative effect of noise pollution on human health in the area of concern of Varanasi city of India. Mangalekar *et al.* (2012) reported the noise level of Kolhapur City in Maharashtra, India, and found a high level of noise than the prescribed limit of noise by the Central Pollution Control Board. According to the survey conducted by Pachpande *et al.* (2005), approximately 84% of teachers and 92% of students experienced a reduction in their hearing capacity as a result of regular exposure to noise pollution from highway traffic. Sharma *et al.* (2010) reported a positive correlation between traffic noise and various health issues in individuals working in different workplaces in Haridwar City. The health problems identified included headaches, high blood pressure, and stress. In his study, Deka (2000) assessed the average noise level in Guwahati City, Assam, which was found to be 83 dB in the commercial zone and 68 dB in the residential zone. These levels were 27.7% and 23.6% higher than the standard noise limits for commercial and residential areas, respectively. In the present study, it can be confirmed that the primary cause of the increased noise levels in and around SIDCUL, Haridwar, is the growing number of traffic vehicles. Therefore, it is imperative to raise awareness among the public, including the management of SIDCUL officials, to effectively mitigate and prevent the long-term health risks associated with noise pollution. In conclusion, the examination of noise pollution levels in and around SIDCUL, Haridwar, Uttarakhand, India, has brought attention to the significant impact of industrialization and urbanization on both the environment and human well-being. The study uncovered that noise levels in both the industrial and residential zones surpassed the standard prescribed limits, indicating a growing concern for public health and overall quality of life. The results strongly suggest that the increase in traffic vehicles significantly contributes to the elevated noise levels in the area. Such heightened noise pollution poses potential long-term health risks for residents and workers in the region, leading to hearing problems, headaches, stress, and other related health issues, which necessitate immediate attention and remedial actions.

Conclusion

Considering the implications for human health and the ecosystem, there is an urgent requirement for raising awareness among all stakeholders, including the public, authorities, and management of SIDCUL. Collaborative efforts should be initiated to implement effective strategies for noise reduction while adhering to the prescribed noise standards. Regulating noise levels, adopting noise control technologies, and promoting sustainable urban planning are critical steps toward mitigating noise pollution in and around SIDCUL. By addressing this pressing issue, we can foster a healthier and more conducive living and working environment for current and future generations. Moreover, such measures will play a pivotal role in preserving the ecological balance and ensuring the overall well-being of the community.

Conflict of interest

The authors declare that they have no conflicts of interest.

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