

POSITION PAPER FOR ENVIRONMENTAL QUALITY STANDARDS OF NOISE IN PAKISTAN



**PAKISTAN ENVIRONMENTAL PROTECTION
AGENCY, ISLAMABAD**

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INTRODUCTION

Noise is an unwanted, unpleasant and annoying sound caused by vibration of the matter. Vibrations impinge on the ear drum of a human or animal and setup a nervous disturbance, which we call sound. When the effects of sound are undesirable that it may be termed as "Noise". Noise from industry, traffic, homes and recreation can cause annoyance, disturb sleep and affect health. Thus, sound is a potentially serious pollutant and threat to environmental health.

The response of the human ear to sound depends both on the sound frequency (measure in Hertz, Hz) and the sound pressure, measured in decibels (dB). A normal ear in healthy young person can detect sounds with frequencies from 20Hz to 20,000 Hz.

Noise measurements are expressed by the term Sound Pressure Level (SPL) which is logarithmic ratio of the sound pressure to a reference pressure and is expressed as a dimensionless unit of power, the decibel (dB). The reference level is 0.0002 microbars, the threshold of human hearing.

$$\text{Decibel } L_{eq} = 10 \log_{10} \frac{L}{L_0}$$

L_{eq} = Equivalent Noise level

L = Sound Intensity

L_0 = Reference level

If a measurement of noise emission is required a sound level meter is used. A measure of the level of sound is called the decibel. The zero of the decibel scale is the hearing threshold. Sounds at 0–10 decibel are so quiet that they are almost impossible to hear, while at the top end of the scale, at around 150 decibel, it can damage your eardrums. (<http://www.epa.vic.gov.au>)

1. CLASSIFICATION OF NOISE

There are two kinds of noise:-

- 1.1 Community Noise/ Environmental Noise
- 1.2 Occupational Noise

1.1. COMMUNITY NOISE

Community noise (also called environmental noise, residential noise or domestic noise) is defined as noise emitted from all sources, except noise at the industrial workplace. Main sources of community noise include road, rail and air traffic, construction and public work, and the neighbourhood (<http://www.who.int>). Typical neighbourhood noise comes from premises and installations related to the catering trade (restaurant, cafeterias, discotheques, etc.); from live or recorded music; from sporting events including motor sports; from playgrounds and car parks; and

from domestic animals such as barking dogs. The main indoor sources are ventilation systems, office machines, home appliances and neighbours.

1.2. OCCUPATIONAL NOISE

The many and varied sources of noise in industrial machinery and processes include: rotors, gears, turbulent fluid flow, impact processes, electrical machines, internal combustion engines, pneumatic equipment, drilling, crushing, blasting, pumps and compressors. Furthermore, the emitted sounds are reflected from floors, ceiling and equipment. Noise is a common occupational hazard in many workplaces. Occupational exposure limits specify the maximum sound pressure levels and exposure times to which nearly all workers may be repeatedly exposed without adverse effect on their ability to hear and understand normal speech. An occupational exposure limit of 85 dB for 8 hours should protect most people against a permanent hearing impairment induced by noise after 40 years of occupational exposure.

Occupational noise can be two of types

1.2.1 CONTINUOUS NOISE

It is produced by machinery that operates without interruption in the same mode e.g. blowers, pumps and processing equipment.

1.2.2 INTERMITTENT NOISE

When machinery operates in cycles or when single vehicles or aeroplanes pass by the noise level increases and decreases rapidly.

2. EFFECT OF NOISE ON PUBLIC HEALTH

The recognition of the noise as a serious health hazard as opposed to a nuisance is a recent development and the health effects of the hazardous noise exposure are now considered to be an increasingly important public health problem, as stated below:-

- Globally, some 120 million people are estimated to have disabling hearing difficulties.
- More than half citizens of Europe live in noisy surroundings; a third experience levels of noise at night that disturbs sleep.
- In the USA in 1990 about 30 million people were daily exposed to a daily occupational noise level above 85 dB, compared with more than nine million people in 1981; these people mostly in the production and manufacturing industries.
- In Germany and other developed countries as many as 4 to 5 million that is 12-15% of all employed people, are exposed to noise levels of 85 dB or more. In Germany, an acquired noise-related hearing impairment that results in 20%

or more reduction in earning ability is compensate-able; in 1993, nearly 12 500 new such cases were registered (<http://www.who.int>).

Many medical investigations have proved that noise can cause physiological stress reaction such as blood pressure and increased heart rate. Noise also causes speech interference and disturbs sleep and rest. Human ear as a sound receiver has to operate under a wide range of conditions. Under favorable conditions like excessive noise, its hearing mechanism could damage permanently or temporary, depending on type, intensity and time of exposure to noise (PEPC Draft report).

- Noise can adversely affect performance, for example in reading, attentiveness, problem solving and memory. Deficits in performance can lead to accidents.
- Noise above 80 dB may increase aggressive behavior.
- A link between community noise and mental health problems is suggested by the demand for tranquillizers and sleeping pills, the incidence of psychiatric symptoms and the number of admissions to mental hospitals.

3. NOISE STANDARDS IN DIFFERENT COUNTRIES

Man works and lives under various types of noise environment and today all countries of the world are aware of the ill-effects of noise on human health. To save him from the hazard as also for his comfort and convenience, many countries of the world have carried out the exercise of finding out the most suitable ambient noise levels to which a human being can be exposed with the least harm in that particular environment. Consequently, national standards have been adopted by many countries laying down maximum permissible noise level for environment and occupational noise exposure to give relief to the people working or living in those environments. These standards vary from country to country and have laid in the form of recommendations, guidelines or statutory requirements as per the economic conditions, advancement of technology and burden on industry.

Some countries have their specific legislation on noise. For instance, in the United States of America, the Noise Control Code, 1972 (Federal), New York Noise Control Code, 1972 and Chicago Noise Control Regulations, 1971, in Great Britain, the Control of Pollution Act, 1974, in Japan, Noise Control Laws of 1968, are the specific laws to control the growing problem of noise pollution (Agarwal, 2002).

3.1 ENVIRONMENTAL QUALITY STANDARDS OF NOISE IN UNITED STATES OF AMERICA

In United States absolute criteria for noise exposure to a community do not exist, instead there are guidelines (USEPA, 1974), published by the US Environment Protection Agency in 1974 as follow up of the Noise Control Act of 1972. These guidelines prohibit excessive noise in general terms but do not forbid construction or

operation of other facilities on the basis of the effects of anticipated noise emissions in nearby communities. However, regulations restricting new housings in certain areas imposed by the US Department of Housing and Urban Development do exist. As per these regulations, housing is not acceptable in areas where noise levels exceeds 80 dB (A) for one hour or more during the day or 75 dB (A) for 8 hours in a day and it is normally unacceptable (discretionary) if noise exceeds 65 dB (A) for 8 hours in a day or is subjected to loud repetitive noise (Agarwal, 2002).

Table 1: Equivalent sound levels identified as requisite to public health and welfare by the US Environment Protection Agency

S. No	Area	Measure dB (A)	Indoor		Outdoor	
			Activity Influence	Hearing Loss Consideration	Activity Influence	Hearing Loss Consideration
1	Residential	L_{dn}^*	45	-	55	-
2	Hospital	$L_{eq}(24)**$	-	70	-	70
3	Educational	$L_{eq}(24)$	45	70	55	70
4	Commercial / Traffic	$L_{eq}(24)$	-	70	-	70
5	Industrial Recreational Area	$L_{eq}(24)$	-	70	-	70
6	Farmland/ General un populated land	$L_{eq}(24)$	-	-	-	70

Source: Pollution Management Vol. 5 by S. K. Agarwal

* L_{dn} It is day-night average sound level.

** L_{eq} (24) It is a 24 hour equivalent or average A- weighted sound level.

3.2 WHO GUIDELINE VALUES

The role of World Health Organization (WHO) about the control of noise pollution is also noteworthy (Kamboj, 1999). It is to raise the standard of health of the people which can adversely be affected by noise. Although, WHO is not an authority to prescribe the limits of noise, it recommends some permissible limits of noise which are just advisory for its member-states. The WHO guideline values in Table are organized according to specific environments. When multiple adverse health effects are identified for a given environment, the guideline values are set at the level of the lowest adverse health effect (the critical health effect). The guideline values represent the sound pressure levels that affect the most exposed receiver in the listed environment.

Table 2: Guideline values for community noise in specific environments.

Specific Environment	Critical health effect(s)	LA _{eq} [dB]	Time base [hours]	LA max fast [dB]
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling, indoors Inside bedrooms	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
	Sleep disturbance, night-time	30	8	45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60
School class rooms and pre-schools, indoors	Speech intelligibility, disturbance of information extraction, message communication	35	During Class	-
Pre-school Bedrooms, indoors	Sleep disturbance	30	Sleeping time	45
School, playground outdoor	Annoyance (external source)	55	During Play	-
Hospital, Ward rooms, indoors	Sleep disturbance, night-time	30	8	40
	Sleep disturbance, daytime and evenings	30	16	-
Hospitals, Treatment rooms, indoors	Interference with rest and recovery	#1		
Industrial, commercial, shopping and traffic areas, indoors and Outdoors	Hearing impairment	70	24	110
Ceremonies, festivals and entertainment events	Hearing impairment (patrons:<5 times/year)	100	4	110
Public addresses, indoors and outdoors	Hearing impairment	85	1	110
Music through headphones/ Earphones	Hearing impairment (free-field value)	85 # 4	1	110

Impulse sounds from toys, fireworks and firearms	Hearing impairment (adults) Hearing impairment (children)	- -	- -	140 # 2 140 # 2
Outdoors in parkland and conservation areas	Disruption of tranquility	# 3		

#1: as low as possible;

#2: peak sound pressure (not L_Amax, fast), measured 100 mm from the ear;

#3: existing quiet outdoor areas should be preserved and the ratio of intruding noise to natural background sound should be kept low;

#4: under headphones, adapted to free-field values

Source: www.who.int (Guideline Values)

3.3 ENVIRONMENTAL QUALITY STANDARDS OF NOISE IN JAPAN

Under the Japanese Noise Regulation, the perfectural governors have been empowered to designate residential areas, schools of preserving living environment through prevention of noise, while designation such areas perfectural governors shall establish “regulatory standard” (maximum permissible level of noise) for specified hours in respective zones within the standards set forth by the Director General of the Environmental Agency (Kamboj, 1999).

Japanese Environmental Quality Standards for Noise in different areas and for various sources of noise, the maintenance of which is desirable for preservation of the living environment and conductive to the protection of human health are shown in table.

Table: 3 Environmental Quality Standards for Noise (Japan)

Category	Area Affected		Sound Level (dB)	
			Day time 6~22	Night time 22~6
AA	Areas, which require particular quietness. For instance areas where medical facilities are concentrated.		50 or less	40 or less
A	Exclusively residential area	General area	55 or less	45 or less
		Area facing roads with two lanes or more	60 or less	55 or less
B	Area which is used mainly for residence	General area	55 or less	45 or less
		Area facing roads with two lanes or more	65 or less	60 or less

C	Commercial & Industrial areas	General area	60 or less	50 or less
Special case	Area facing trunk road (heavy Traffic lanes)		70 or less	65 or less

Source: <http://www.env.go.jp>

3.4 ENVIRONMENTAL QUALITY STANDARDS OF NOISE IN INDIA

Through the promulgation of the comprehensive Air Act of 1986, noise pollution has become an offence in India (Agarwal, 2002). The various limits for the urban environmental ambient noise in Leq issued in 1989 vide notification from the Ministry of Environment and forests have been shown in Table. These standards have been defined taking into account the international standards and local weather conditions and customs etc. table 4 reflects these standards.

Table 4: Ambient Noise levels (Leq) Applicable in India

Area Code	Category of Area	Environmental Noise standards Leq dB(A)	
		Day Time	Night Time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone	50	40

Day time: 6.00 am- 9.00pm

Night Time: 9.00 pm – 6.00 am

Source: Pollution Management Book by S. K. Agarwal

4. NOISE STANDARDS IN PAKISTAN

Noise is a disturbance to the human environment that is escalating at such a high rate that it will become a major threat to the quality of human lives. In the past thirty years, noise in all areas, especially in urban areas, has been increasing rapidly. In Pakistan, there is no legislation to deal with noise emanating from railway engines, air crafts, airport or industrial or construction activities. Public complaints on noise pollution are often received in the federal and provincial environmental protection agencies, but in the absence of national standards for noise, these agencies are handicapped to take any legal action. Aircraft noise is another source of pollution which has so far remained unchecked (PEPC Draft report). In Pakistan, where most major civil airports lie in heavily populated areas, no such precautionary measures have been taken. Airlines, other than PIA, continue to operate old Russian commercial aircrafts which are exceptionally noisy (<http://www.pakistantimes.net>). Road Traffic Noise is another most widespread source of noise nuisance in the urban

areas of Pakistan. The situation is getting alarming with increase in traffic density on city roads, particularly in Karachi.

The Pakistan Environmental Protection Agency (Pak-EPA) exercising its power under clause (d) of Section 6(1) of the Pakistan Environmental Protection Ordinance (PEPO), 1983 with the approval of the Pakistan Environmental Protection Council(PEPC) established National Environmental Quality Standards(NEQS), inter alia, for motor vehicle exhaust and noise. Pakistan NEQS for motor vehicle noise allows the maximum permissible noise emission limit of 85 dB (A) for new vehicles at a distance of 7.5 meters from the source without specifying the type of motor vehicle and measuring technique (Shaikh, *et al.*, 1997).

Table 5: National Environmental Quality Standards for Motor Vehicle Exhaust and Noise

S. No	Parameter	Standards (maximum permissible limit)	Measuring Method
1	Smoke	40% or 2 on the Ringelmann scale during engine acceleration mode	To compared with Ringelmann Chart at distance of 6 meters or more.
2	Carbon monoxide	Emission Standards: New Vehicles Used Vehicles 4.5% 6%	Under idling conditions: Non dispersive infrared detection through gas analyzer.
3	Noise	85 dB (A)	Sound meter at 7.5 meters from the source.

Source: National Environmental Quality Standards (S.R.O 742(I)/93), 29th August 1993

At present there exist no national standards for prescribing noise limits for residential areas, industrial areas, commercial areas or silence zones. Most of the areas particularly to the urban side are subjected to unacceptable noise conditions due to construction, manufacturing, traffic and recreational activities. No national survey has been conducted to assess noise level in cities. However, random tests in different cities showed that the noise level in most of areas was as high as 70-90 dB (A) which is much higher than the acceptable limits.

4.1. NOISE STUDIES CONDUCTED IN DIFFERENT CITIES OF PAKISTAN

In developing countries such as Pakistan the growth of their mega cities had been unplanned and haphazard resulted in many environmental hazards. One of the growing threats is noise pollution (Hardoy, *et al.*, 1992), which is damaging human health like a silent killer. The impact of noise varies from zone to zone depending on

the source of emission. Recently conducted surveys of noise pollution in different cities of Pakistan are illustrated in Table 7:-

Table: 7 A Scenario of Noise levels in Different Cities of Pakistan.

S.No	Cities Name	Max. Recorded Noise level dB(A)	Min. Recorded Noise level dB(A)	Average
1	Gujranwala ¹	100	41	72.5
2	Faisalabad ¹	100	47	72
3	Islamabad ²	104.5	47	72.5
4	Rawalpindi ³	108.5	48	72.5
5	Karachi ⁴	88.9	62.4	76.5
6	Peshawar ⁵	708.5	68.2	86

Source:

1. [JICA Report 2003](#)
2. [Irfan, L. 2002](#)
3. [Shaukat, N. 2002](#)
4. [Mehdi, M. R. et al., 2002](#)
5. [Tajik, S. H. 2001](#)

5. CONTROL OF NOISE POLLUTION

5.1. SPOTTING NOISE RISK ZONES

In developing countries such as Pakistan the growth of their mega cities such as Karachi had been unplanned and haphazard resulted in many environmental hazards. One of the growing threats is noise pollution, which is damaging human health like a silent killer. Global, or strategic, noise planning tries to prevent noise issue arising and to optimize the use of limited resources by mapping and managing the noise environment of a large area such as a city.

Geographical Information System, GIS is being used to monitor and forecast noise pollution patterns in many countries around the globe. It has been widely used in environmental modeling and analysis including noise pollution monitoring in the western hemisphere of the world. GIS could be an indispensable tool for noise analysis and management even in developing countries as Pakistan (Mehdi, *et al.*, 2002). In addition to its powerful capabilities in spatial database development, spatial data processing, managing and modeling, it provides visualization and map-making tools that can be used to effectively present the spatial variability of noise intensity.

5.2. AN URGENT NEED FOR LEGISLATION TO CONTROL NOISE POLLUTION

As present, there is no specific and detailed legislation to control noise pollution. Government should pass the “Noise Pollution Control Act” to meet special Pakistan condition. Apart from such kind of central legislation, there should be a city noise control code for all major cities in Pakistan. Creation of unnecessary noise has to be prohibited and should be punishable under law.

5.3. PUBLIC AWAKENING AND THE CONTROL

It is also important that public awakening is also very essential for the control and prevention of the noise pollution. In Pakistan, most of the persons lack any idea about the ways in which noise pollution could be controlled. Very few scientists are aware of the problem and its control. Masses are still ignorant of the grave effects of the noise pollution. In this regard television, radio, internet, and newspapers should give a campaign for wide publicity (<http://darwin.bio.uci.edu>).

5.4. BY PLANTATION

Plants are efficient absorbers of noise, especially noise of high frequency. A dense ever green hedge can reduce the noise of microphones by 20dB. Therefore plantation on both sides of street or highways can curb the noise pollution effectively. A green belt of short to medium height around the airport can reduce the noise of jets.

5.5. REDUCE THE NOISE AT SOURCE LEVEL

Steps should be taken to reduce the noise at source level. Industrial areas, aerodromes and highways should be located outside the city limits.

5.6. EXCHANGE OF SCIENTIFIC KNOWLEDGE

Scientific knowledge regarding the pollutants and control of environmental pollution may be exchanged internationally so that the developing and under developed countries may also be able to control the ever increasing problem of pollution.

6 REPORT OF PEPC COMMITTEE ON NOISE STANDARDS

The Pakistan Environmental Protection Council's (PEPC) meeting held on 19th September, 1995 constituted a committee on Vehicular Emission and Noise headed by Mr. Salmaan Taseer. The Committee was mandated to draft national Standards on noise (PEPC Draft report).

6.1. MAJOR SOURCES OF NOISE

The Committee identified the following major sources of noise which needs to be addressed to reduced noise levels:-

- i. Transport pressure horns, silencers, ratting noise engines.
- ii. Industry Boilers, lowers, forging, mechanical movement of machine parts and other unit operations
- iii. Recreational activities, marriage Halls, Clubs, Hotels, Musical Shows, Musical Shops, fairs/exhibitions, fire works.
- iv. Use of Loudspeakers, Public/ religion gatherings, commercial announcements.
- v. Airports and Railways engine Noise.
- vi. Construction Mixers, compressors, compactors, drills
- vii. Workshop Denting, Mechanical processing.

6.2. RECOMMENDATIONS

The committee proposes that the following National Standard on noise may be forwarded to the Expert Advisory Committee on NEQS consultation and vetting before approval by the council:

Table 6: National Standard on Noise

S.No	Category of Area	Standard Upto 30 th June1997 Limits in dB(A)		Standard from 1 st July 1997 Limits in dB(A)	
		Day Time	Night Time	Day Time	Night Time
(A)	Residential area	55-60	45-50	55	45
(B)	Commercial area	65-70	55-60	65	55
(C)	Industrial area	75-80	70-75	75	70
(D)	Silence zone	50-55	40-45	50	40

Source: Draft “Vehicular Environmental Issues and Noise Standards” by PEPC

1. Day time will be considered between 6 am and 9 pm.
2. Night time will be considered between 9 pm and 6 am.
3. Silence zone shall be the area up to 100 meters around such premises and may be prescribed.
4. Mixed category of areas shall be declared as one of the four above mentioned categories may be prescribed.

In order to achieve the proposed noise standards, the following recommendations are made:

- i. Social consciousness on noise may be raised through a nationwide awareness campaign. For this electronic media in particular and print

- media in general may be utilized. Programme on the pattern of EARTH LIFE from BBC may be telecast from PTV on regular basis.
- ii. Awareness about harmful effects of noise pollution may be created among students at all levels through curriculum.
- iii. Noise Monitoring Stations one in each federal and provincial capital cities may be established at central public places with display signs.
- iv. Zoning of areas may be done after carrying out National Noise Levels Survey in cities and towns during various time intervals.
- v. Ban on use of pressure horn should be strictly implemented. Police Department may be assisted by NGOs students and General Public.
- vi. Pakistan Standards Institute may develop standards for indigenous manufacturing of silencers. Manufacturing of silencers without standards should be banned.
- vii. Mandatory annual inspection of public and private vehicles may be introduced and Motor Vehicle Examiner may be directed to carry out Noise tests on vehicles and affix fitness certificate thereof.
- viii. Blowing of horns at Bus/Wagon/Taxi stands may be banned.
- ix. Zebra crossing may be introduced in all cities and masses may be educated for its appropriate use.
- x. All kinds of workshop may not be allowed in residential areas.
- xi. Wherever needed, environment laws may be formulated for modified as the case may be for effective implementation of these recommendations.

7. CONCLUSION

As present, there is no specific and detailed legislation to control the noise pollution except Pakistan National Environmental Quality Standards which are only for motor vehicle noise and allow the maximum permissible noise emission limit of 85 dB (A). There is no standard to deal with noise emanating from the activities of industrial, commercial and residential areas. Therefore, there is an urgent need that:

1. Pakistan standards for noise emission for motor vehicle should be revised.
2. Recommendations and draft on national standards of noise prepared by PEPC in 1995, mentioned in Table 6 may be made applicable.
3. All EPAs coordinates the control of environmental noise. EPA should run campaign against noise pollution in collaboration with traffic police. It will require a combined effort of the relevant Government departments, NGOs, transporters and general public to control the deafening noise that have made life living hell.

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