

Energy and Environment Engineering

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Energy and Environmental Engineering CEME106

ENVIRONMENT AND ECOSYSTEMS

Introduction: Concept of an ecosystem- structure and functions of ecosystem. Components of ecosystem - producers, consumers, decomposers, Food chains, food webs, ecological pyramids, Energy flow in ecosystem. Bio-geo- chemical cycles, Hydrologic cycle Components of Environment and their relationship, Impact of technology on environment, Environmental degradation. Environmental planning of urban network services such as water supply, sewerage, solid waste management.

ENVIRONMENTAL POLLUTION

Water, air, soil, noise, thermal and radioactive, marine pollution: sources, effects and engineering control strategies. Drinking water quality and standards, Ambient air and noise quality standards

GLOBAL ENVIRONMENTAL ISSUES AND ITS MANAGEMENT

Engineering aspects of climate change. Acid rain, depletion of ozone layer. Concept of carbon credit. Concepts of Environmental impact assessment and Environmental audit. Environmental life cycle assessment

Noise Pollution and Quality Standard

Sound: The particular auditory effect produced by a given cause

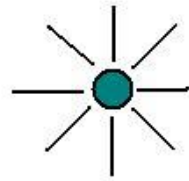
Noise: Sound of any kind (especially unintelligible or dissonant sound), The auditory experience of sound

Physically there is no distinction between sound and noise. Sound is a sensory perception and the complex pattern of sound waves is labelled as noise, music, speech etc. Noise has become a very important "stress factor" in the environment of man.

Noise Pollution: Sound that is unwanted or disrupts one's quality of life is called as noise. When there is lot of noise in the environment, it is termed as noise pollution.

Salient features of noise pollution:

- ✓ Unwanted **sound (noise)** can damage physiological health.
- ✓ **Noise pollution** is associated with several health conditions, including cardiovascular disorders, hypertension, high stress levels, tinnitus, hearing loss, sleep disturbances, and other harmful and disturbing effects.



Source



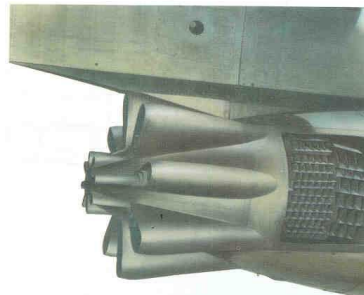
Path



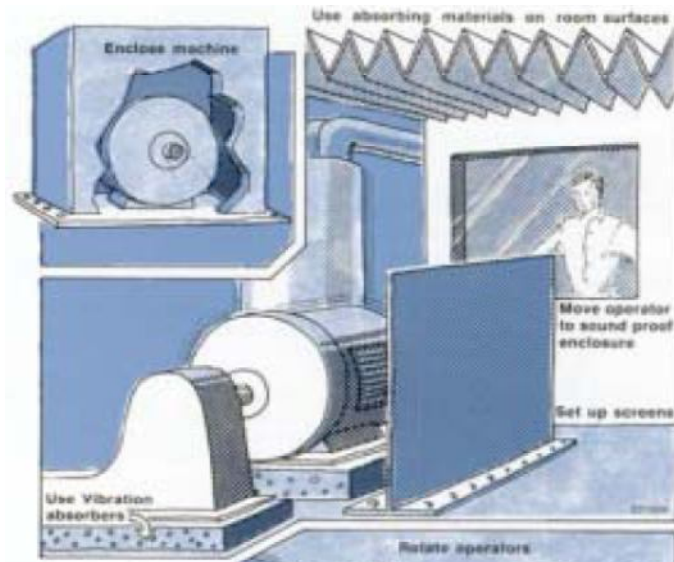
Reciever



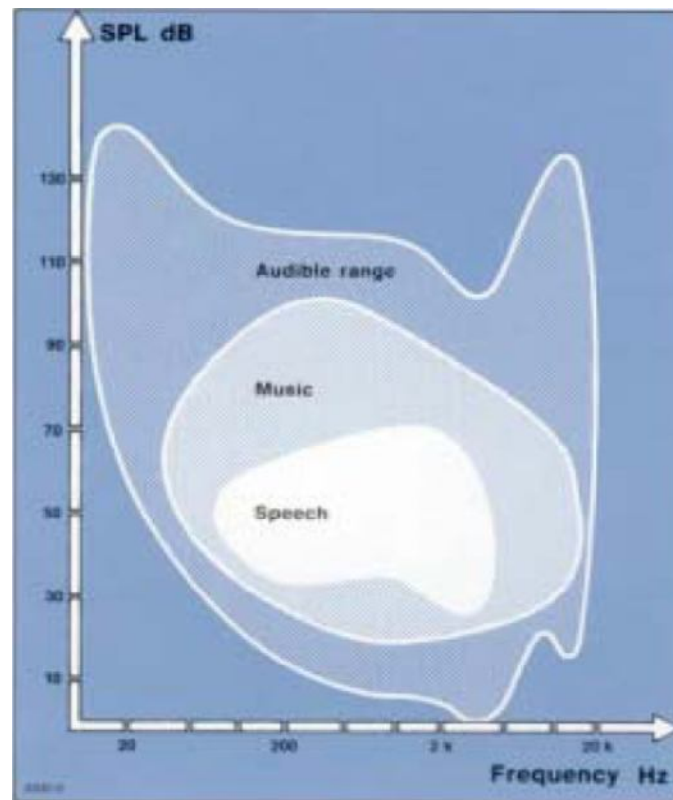
CORRUGATED INTERNAL MIXER



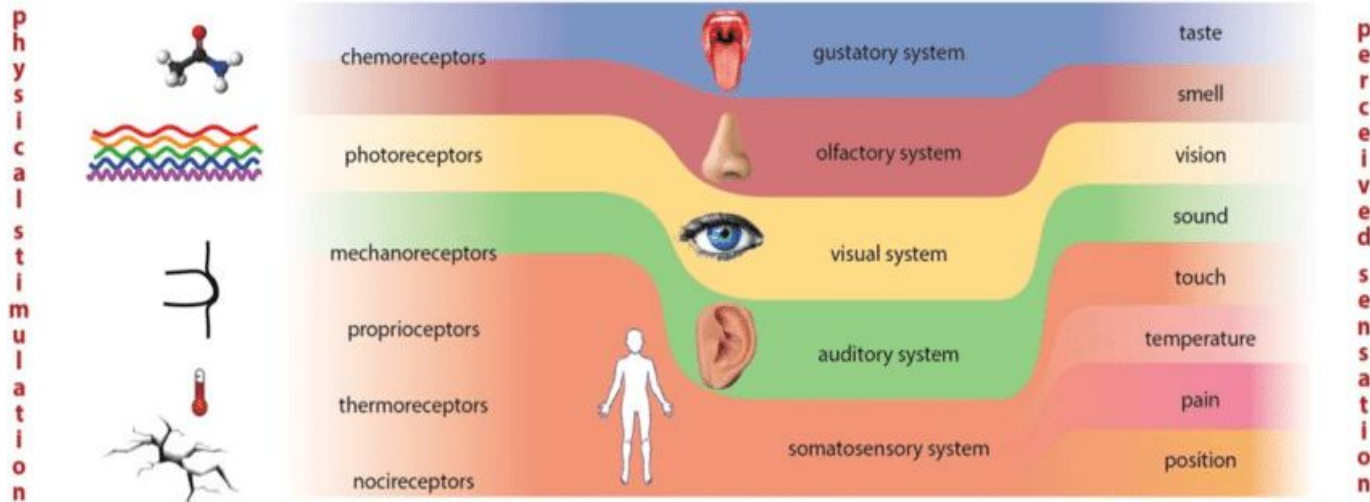
LOBE-TYPE NOZZLE



HUMAN PERCEPTION



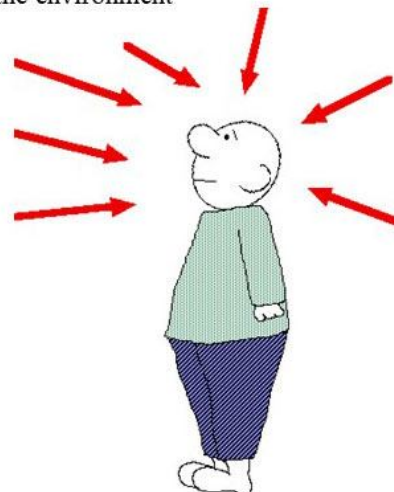
Sound Pressure Level, measured in decibels (dB)



Sensory information from the environment

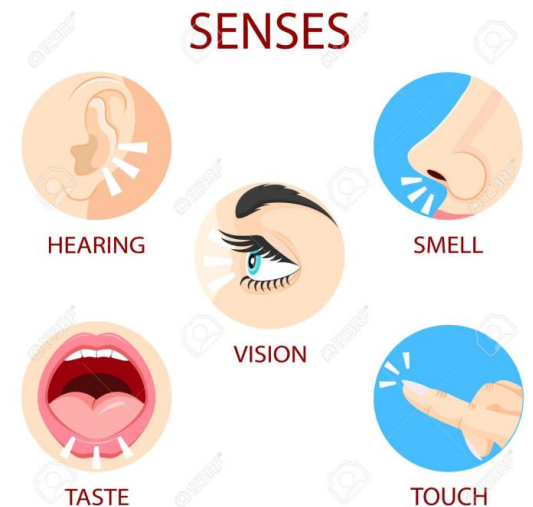
5 senses

1. Visual (sight)
2. Auditory (sound)
3. Olfaction (Smell)
4. Taste
5. Touch



Sensation refers to the physical stimulation of the sensory receptors.

Perception involves interpreting this sensory information.



Sound pressure:

It is the pressure that reaches the timpano of human and animal ears, caused by the oscillating movement of the medium molecules (generally the air). It is given in Pascal (Pa).

Sound pressure level:

It is given by the formula below, where the reference sound pressure is the minimum sound pressure that can be perceived by the human ear. Its value is equivalent to 20 μPa ($20 \times 10^{-6} \text{ Pa}$)

$$\text{SPL} = 10\log\left(\frac{\text{pres}^2}{\text{refpres}^2}\right)$$

Where,

pres = sound pressure;

refpres = reference sound pressure.

The unit used is the decibel (dB), submultiple of the bel (B).

dB(A):

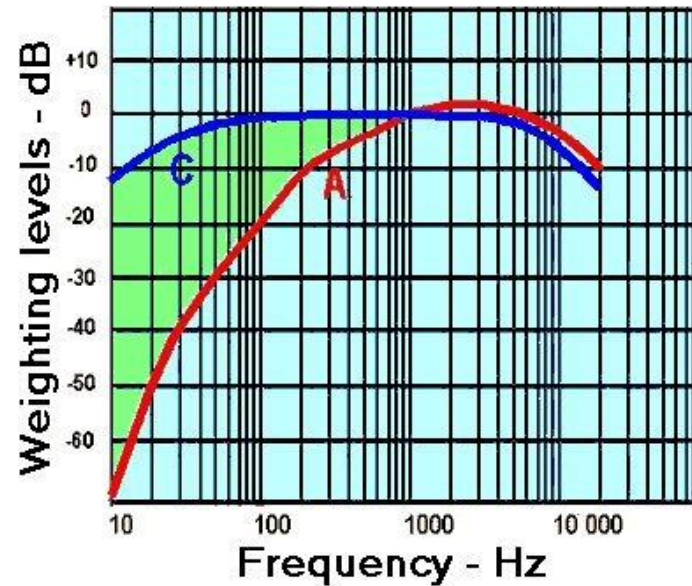
The ear sensitivity to sound is dependent on the frequency of the sound being detected. Frequencies at the extreme of the hearing frequency range are not detected as well as frequencies in the middle of the range.

To account for this, when measuring sound, a weighting curve is used to place more emphasis on frequencies to which humans are more sensible.

The “A” weighting curve is generally used for the purpose of measuring sound levels.

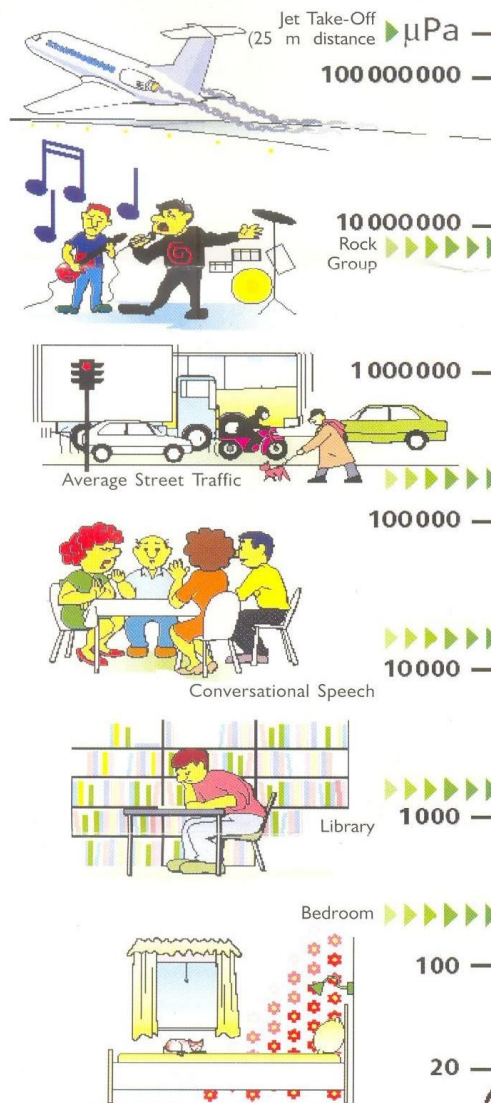
The sound weighted by the “A” curve approaches the perception of the human ear and its value is given by dB(A).

A & C weighted frequencies

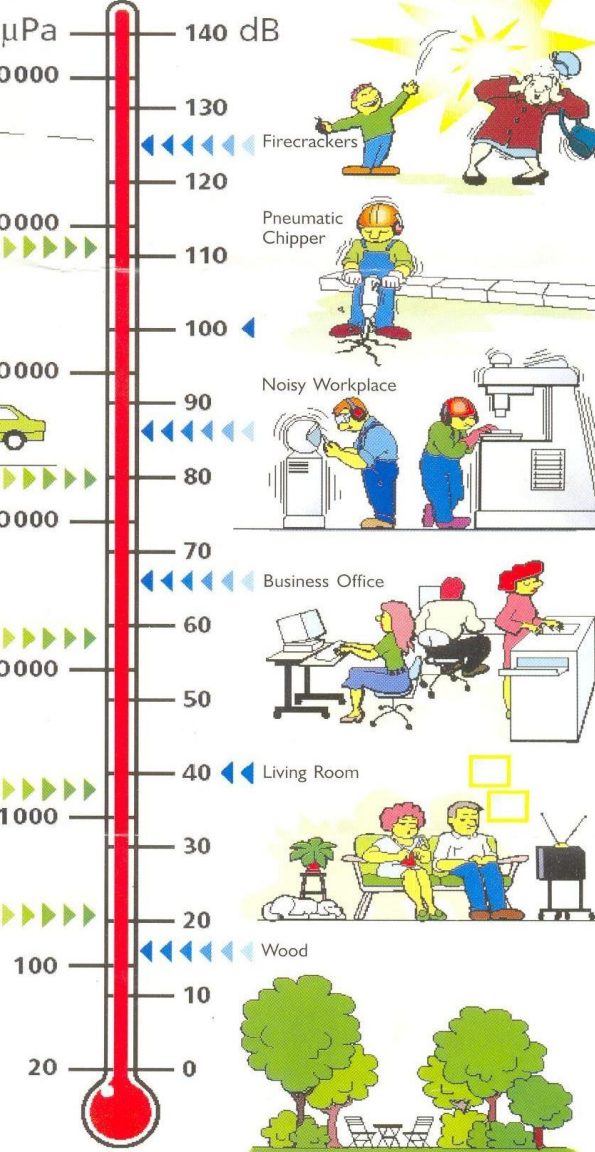


- Several different weighting networks have been developed over the years. The one which has been found to best describe the damaging effect of noise is the **A-weighting network**.
- The sound level meter replicates the human response of the ear by using an electronic filter which is called “A” filter.
- The sound pressure level in dB (A) gives a close indication of the subjective loudness of the noise.

SOUND PRESSURE

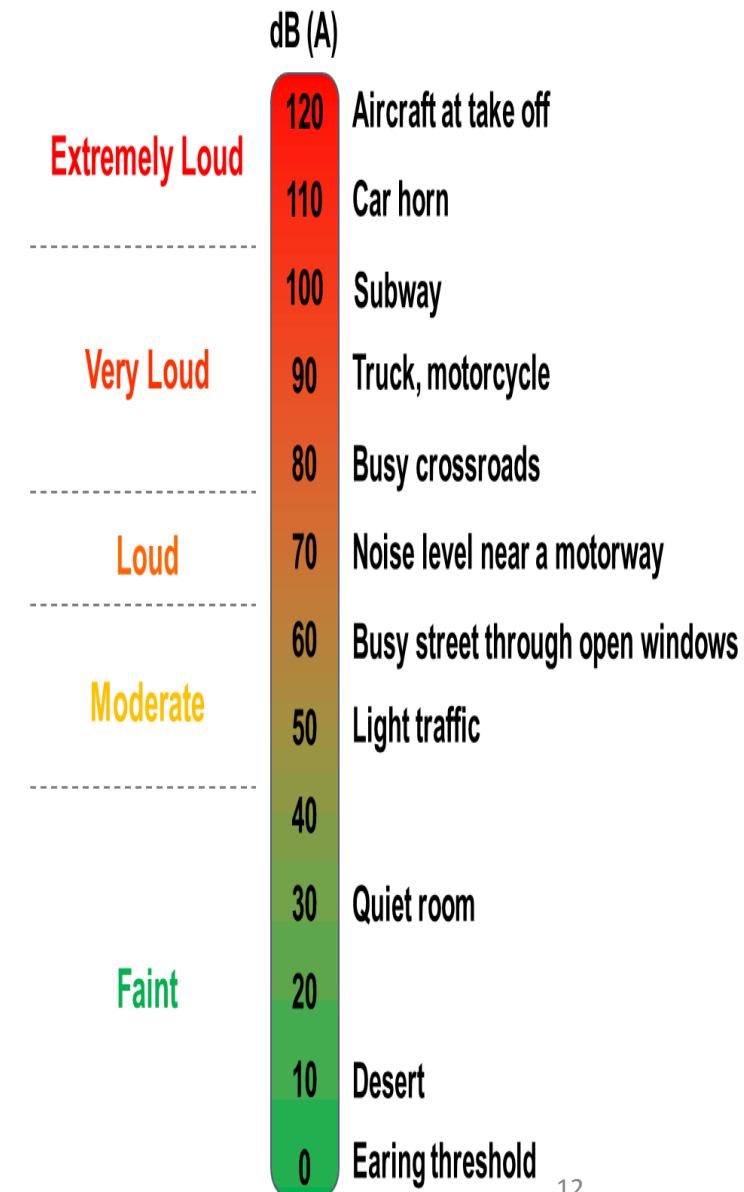


SOUND PRESSURE LEVEL



Measurement of Noise

- “A decibel is the standard for the measurement of noise”
 - 20 db is whisper.
 - 40 db the noise in a quiet office.
 - 60 db is normal conversation.
 - 80 db is the level at which sound becomes physically painful and can be termed as noise.



Types of Noise

External Noise

- Atmospheric noise
- Extra-terrestrial noise
- Industrial noise
- Man made noise

Internal Noise

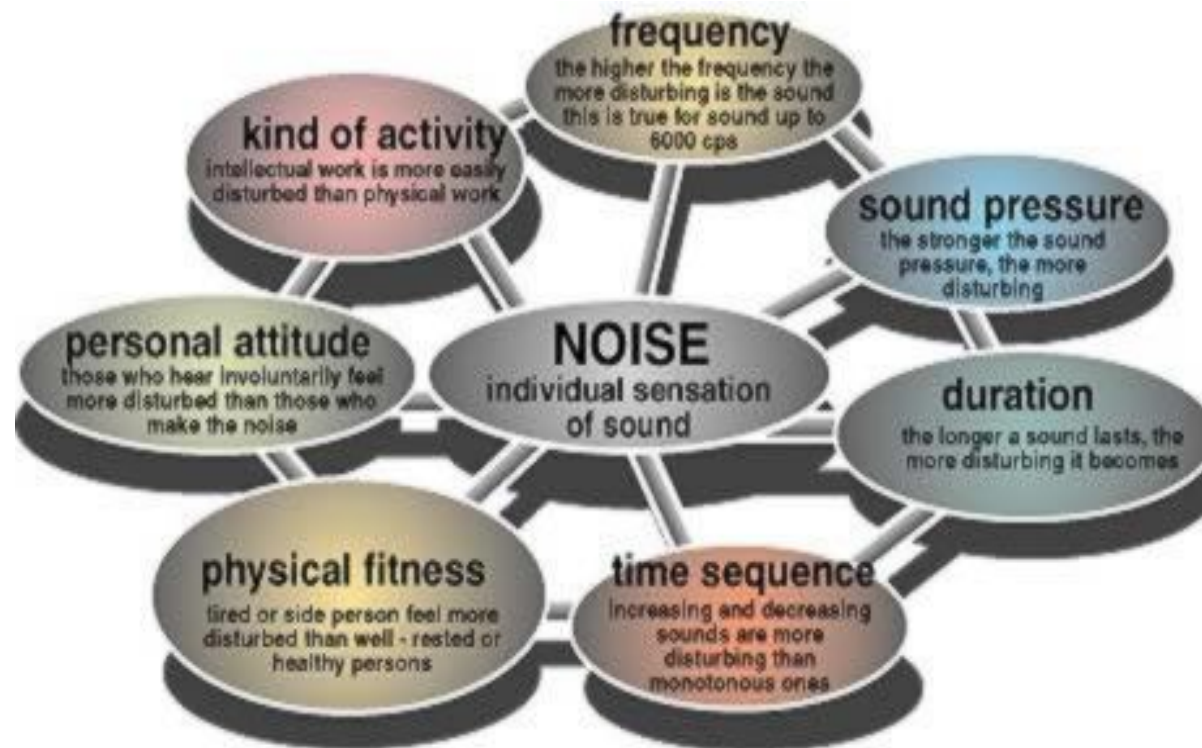
- Thermal noise
- Shot noise
- Transit time noise
- Miscellaneous noise

Sources of Noise Pollution

- Household
- Transportation
- commercial and industrial activities
- Social events
- Transportation systems are the main source of noise pollution in urban areas.
- Construction of buildings, highways, and streets cause a lot of noise, due to the usage of air compressors, bulldozers, loaders, dump trucks, and pavement breakers.
- Industrial noise also adds to the already unfavourable state of noise pollution.
- Loud speakers, plumbing, boilers, generators, air conditioners, fans, and vacuum cleaners add to the existing noise pollution.



Sources of Noise Pollution



Factors Influencing Noise

Effects of Noise Pollution

On Human Health

- Hearing impairment
- Nervous disorder
- Headache
- High blood pressure
- Short memory
- Depression and fatigue
- Deafness
- Sleep disturbance

On Environment

- Detrimental effects on the growth of some plant
- Damage buildings, bridges and monuments

On animals

- Damages nervous system
- problems in Navigation
- Reduction of useable habitat
- Death of certain species
- Genetic and evolutionary problems

Prevention of Noise Pollution

There are a variety of effective strategies for mitigating adverse sound levels

- Use of noise barriers.
- Limitation of vehicle speeds
- Alteration of roadway surface texture.
- Limitation of heavy duty vehicles
- Use of traffic controls that smooth vehicle flow to reduce braking and acceleration, innovative tire design and other
- Do not use car horns unnecessarily. Areas like hospitals and campuses are silence zones and horning is prohibited there.
- Motors, machines and vehicles also produce loud noises when not maintained properly. Proper maintenance should be carried out for better performance.
- Turn off the engine of your car or motorbike when you are not using it. It stops the annoying hum, and reduces air pollution also.

Solutions for Noise Pollution

- Planting bushes and trees in and around sound generating sources is an effective solution for noise pollution.
- Regular servicing and tuning of automobiles can effectively reduce the noise pollution.
- Buildings can be designed with suitable noise absorbing material for the walls, windows, and ceilings.
- Workers should be provided with equipment's such as ear plugs and earmuffs for hearing protection.

- Similar to automobiles, lubrication of the machinery and servicing should be done to minimize noise generation.
- Soundproof doors and windows can be installed to block unwanted noise from outside.
- Regulations should be imposed to restrict the usage of play loudspeakers in crowded areas and public places.
- Factories and industries should be located far from the residential areas.
- Community development or urban management should be done with long-term planning, along with an aim to reduce noise pollution.
- Social awareness programs should be taken up to educate the public about the causes and effects of noise pollution

Legislation: The Noise Pollution (Regulation And Control) Rules, 2000

Ambient Air Quality Standards in respect of Noise

Area Code	Category of Area / Zone	Limits in dB(A) Leq*	
		Day Time	Night Time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

- Note:-
1. Day time shall mean from 6.00 a.m. to 10.00 p.m.
 2. Night time shall mean from 10.00 p.m. to 6.00 a.m.
 3. Silence zone is an area comprising not less than 100 metres around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority
 4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

Thank You