Bhartiya Vidya Bhavan's
SARDAR PATEL COLLEGE OF ENGINEEGING
Andheri W Mumbai

Noise Pollution and Control

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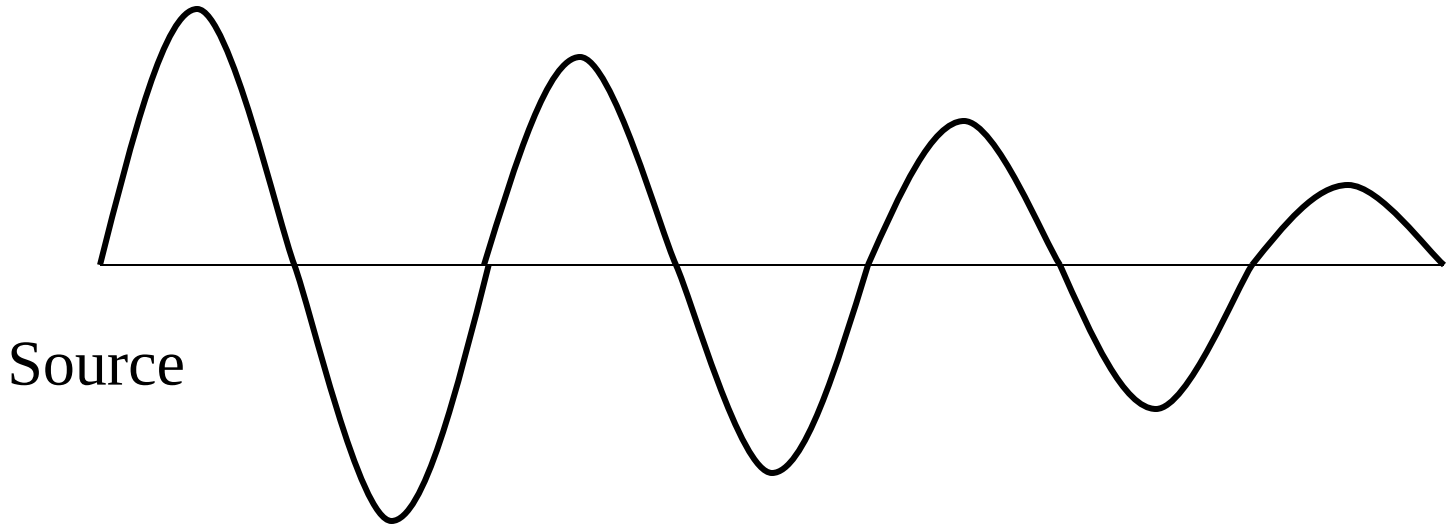
Outline

- What is sound and what is noise?
- Measurement of Sound
- How do we hear?
- Perception of Sound and Noise
- Impact of Noise
- Noise Pollution Control Rules, 2000
- Measures to Control of Noise

Sound

Sound is a form of energy which is emitted by a vibrating body and on reaching the ear causes the sensation of hearing through nerves



What is noise?

- Noise is unwanted sound.
- Sounds produced by all vibrating bodies are not audible. The frequency limits of audibility are from 20 HZ to 20,000 HZ.
- A noise problem generally consists of three inter-related elements- the source, the receiver and the transmission path
- This transmission path is usually the atmosphere through which the sound is propagated, but can include the structural materials of any building containing the receiver (See Fig. 1)

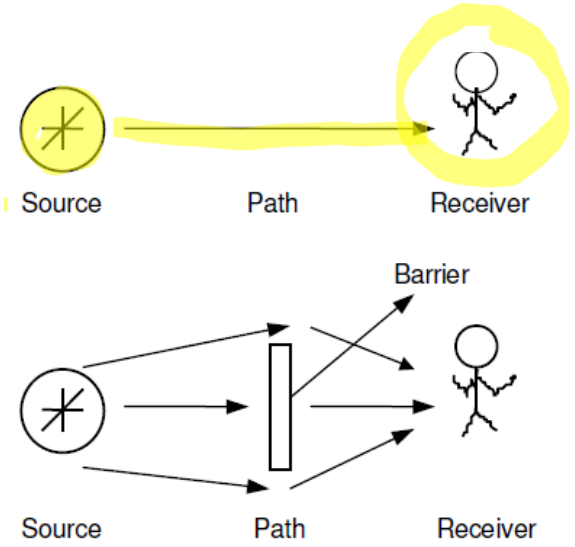
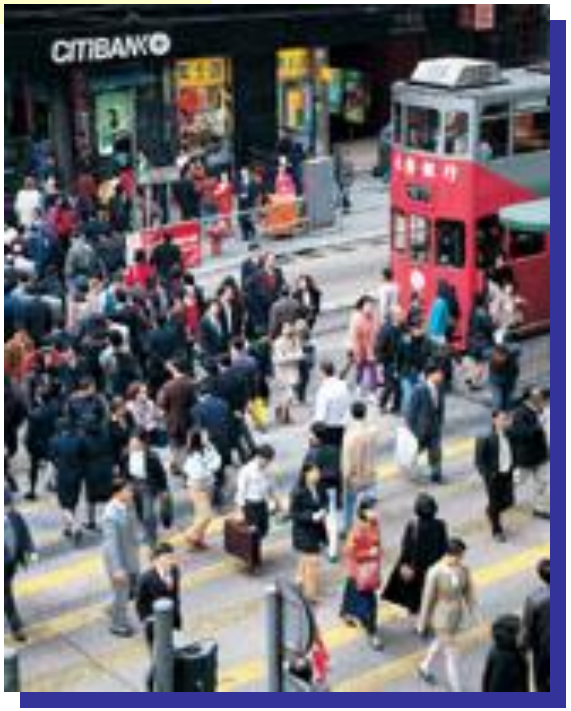


Fig. 1 Inter-relationship between the elements of noise

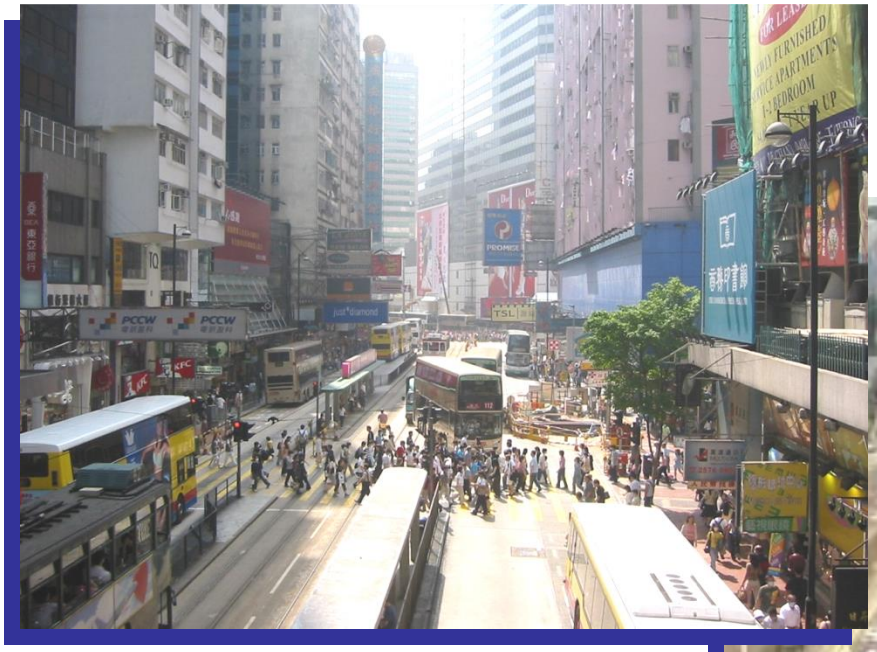
Noise

=> *annoying sound*

- **Noise is a kind of pollution. It is a common problem in crowded cities.**



There are many people but less space in Mumbai. We live in a densely-populated city. Noise pollution is serious.



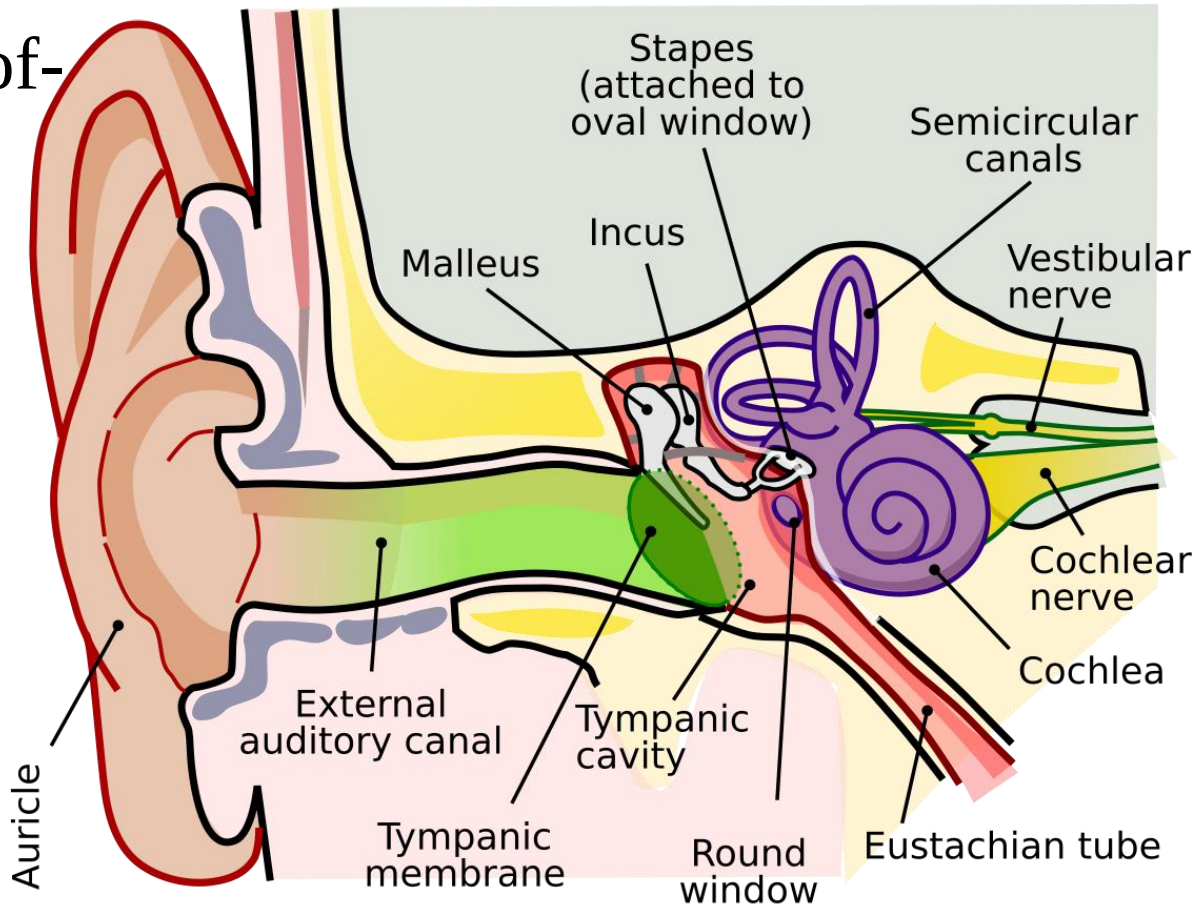


We can enjoy some sounds as music. However, sound can also be annoying noises.



How do we hear?

- https://www.noisyplanet.nidcd.nih.gov/kids-preteens/journey-of-sound-video



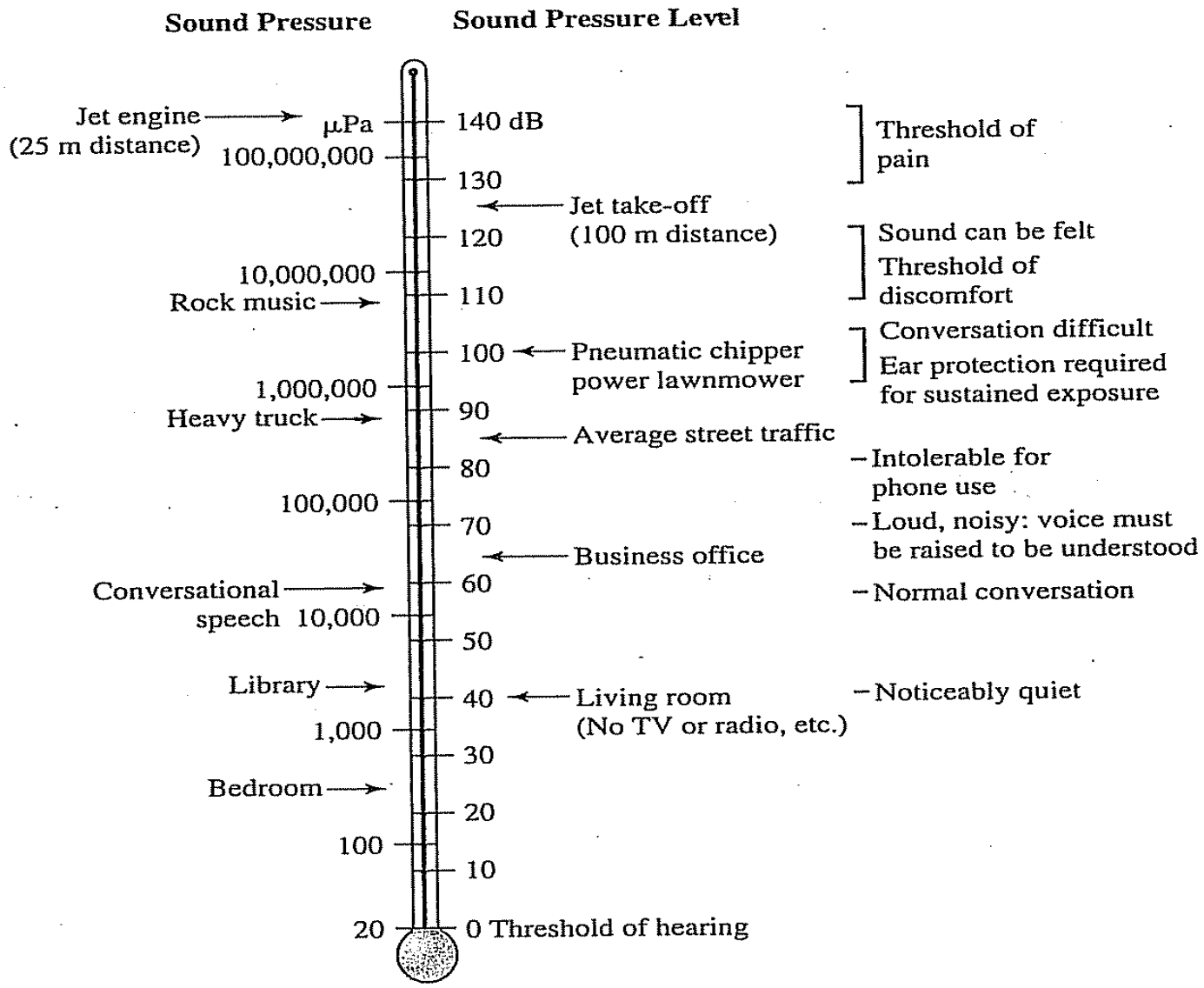
Bels and decibels

- Sound pressure level we can hear ranges from 0.00002 Pa to 200 Pa
- Bel scale is used which is

$$\text{Bel} = log_{10} \frac{P}{P_0}$$

Decibel= 10 (Bel)

Sound pressure for known sounds







Noise Measurement

•A sound level meter consists basically of a microphone and an electronic circuit including
•an attenuator, amplifier, weighting networks or filters and a display unit.
•The microphone converts the sound signal to an equivalent electrical signal.
•The signal is passed through a weighting network which provides a conversion and gives the sound pressure level in dB.
•The instructions laid down by the noise level meter manufacturers shall be followed while using the instruments.
•The time constants used for the sound level meter standards are
    •S (Slow) = 1 second
    •F (Fast) = 125 milli seconds

- The sources of noise may vary according to daily activities.
- Natural
- Anthropogenic
  - Domestic
  - Commercial
  - Industrial

Sound level and human's perception

perception	sound level (dB)	example
	100	
	80	
	60	
	30	soft whisper (25 dB)
quiet very quiet sound	10	breathing sound (10 dB)
	0	the lowest sound level that can be heard



Sound level and human's perception

perception	sound level (dB)	example
	100	
	80	normal conversation (60 dB)
	60	soft raining (50 dB)
acceptable	30	soft conversation in libraries (30 dB)
quiet	10	
	0	

Sound level and human's perception

perception	sound level (dB)	example
annoying	100	
	80	alarm clock (80 dB)
noisy		busy traffic (70 dB)
	60	
acceptable		
	30	
quiet		
	10	
	0	



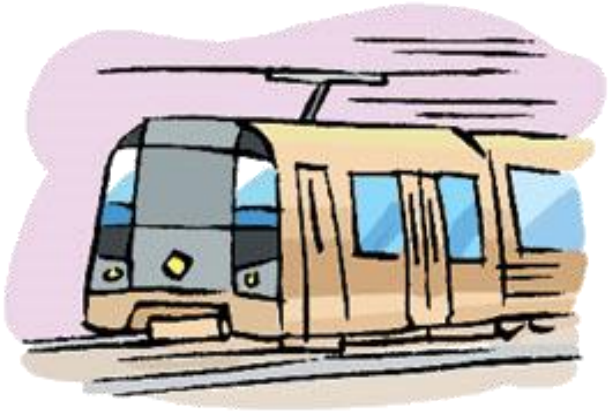
Sound level and human's perception

perception	sound level (dB)	example
very noisy damage our ears	100	road drilling (120 dB)
annoying	80	disco (110 dB)
noisy	60	
acceptable	30	
quiet	10	
	0	



Sound level and human's perception

perception	sound level (dB)	example
very noisy damage our ears	100	crying baby (100 dB)
annoying	80	passing train (90 dB)
noisy	60	
acceptable	30	
quiet	10	
	0	



Sound level and human's perception

perception	sound level (dB)	example

very noisy damage our ears

annoying

noisy

acceptable

quiet

100

80

60

30

10

0

rocket taking off (190 dB)

jet plane taking off (130 dB)



Do you know ?

Can you give some examples of sources of noise in Mumbai?

- construction site
- busy traffic
- road drill
- taking off and landing of plane
- repairing house
- burglar alarm



Impacts of noise (Humans)

- **Annoyance:**
- **Physiological effects:**
  - breathing amplitude, blood pressure, heart-beat rate, pulse rate, blood cholesterol are effected.
- **Loss of hearing:**.
- **Human performance:** ·
- **Nervous system:**
  - It causes pain, ringing in the ears, feeling of tiredness, thereby effecting the functioning of human system.
- **Sleeplessness:**
- **Damage to material**
  - The buildings and materials may get damaged by exposure to infrasonic / ultrasonic waves and even get collapsed.

Impacts of Noise on Animals

- **Disrupted communication:**
- Loud noises can interfere with animal communication, making it difficult for them to find mates or warn each other of danger
- **Altered migration patterns:**
- Noise pollution can disrupt migration routes, causing animals to stray from their usual paths
- **Reduced breeding success:**
- Loud noises can negatively impact breeding behaviors, leading to reduced reproductive rates
- **Stress and altered behavior:**
- Chronic exposure to noise can cause stress in animals, leading to changes in feeding patterns, social interactions, and overall behavior

Impacts of Noise on Plants

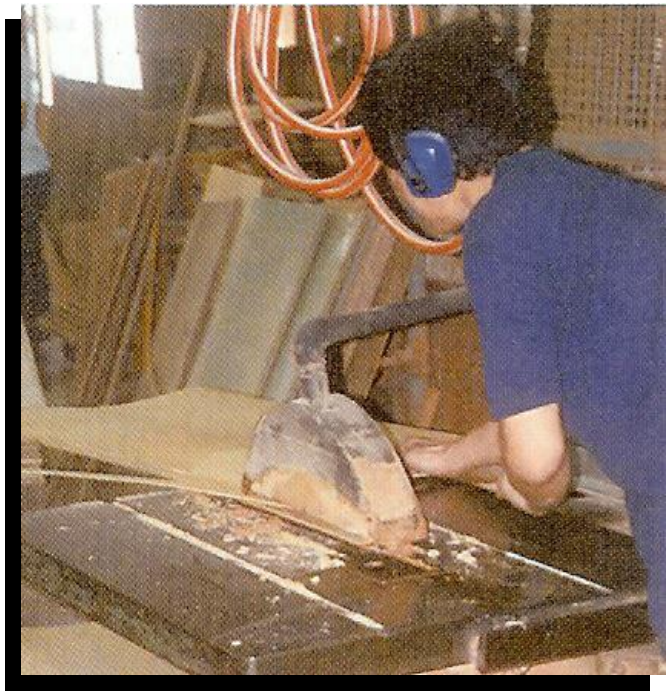
- **Stunted growth:** Noise can cause plants to grow more slowly.
- **Oxidative damage:** Noise can cause oxidative stress, which damages plant membranes.
- **Changes in plant community:** Noise can change the types of plants that grow in an area, and reduce the number of seedlings.
- **Pollination issues:** Noise can affect animals that pollinate plants, such as birds and hummingbirds.
- **Seed dispersal:** Noise can affect animals that spread plant seeds, such as small mammals.

Do you know ?

According to an investigation done by a group of Australian scientists in 1998:

Wear headphones to listen to music for more than 6 hours a week, the sense of hearing will decrease by 30 years.





We should wear an ear protector when working at a noisy place

- **Prescribed by the laws in India:**

The employer cannot request employees to work in a place at sound level higher than 90 dB for more than 8 hours without break.

Noise control

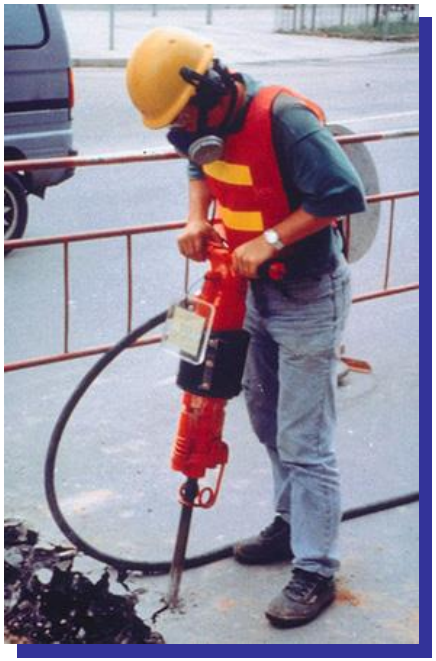
- Indian government has taken some measures to control noise:

- It is an offence to make loud noise between 10 p.m. and 6 a.m.





Pile drive



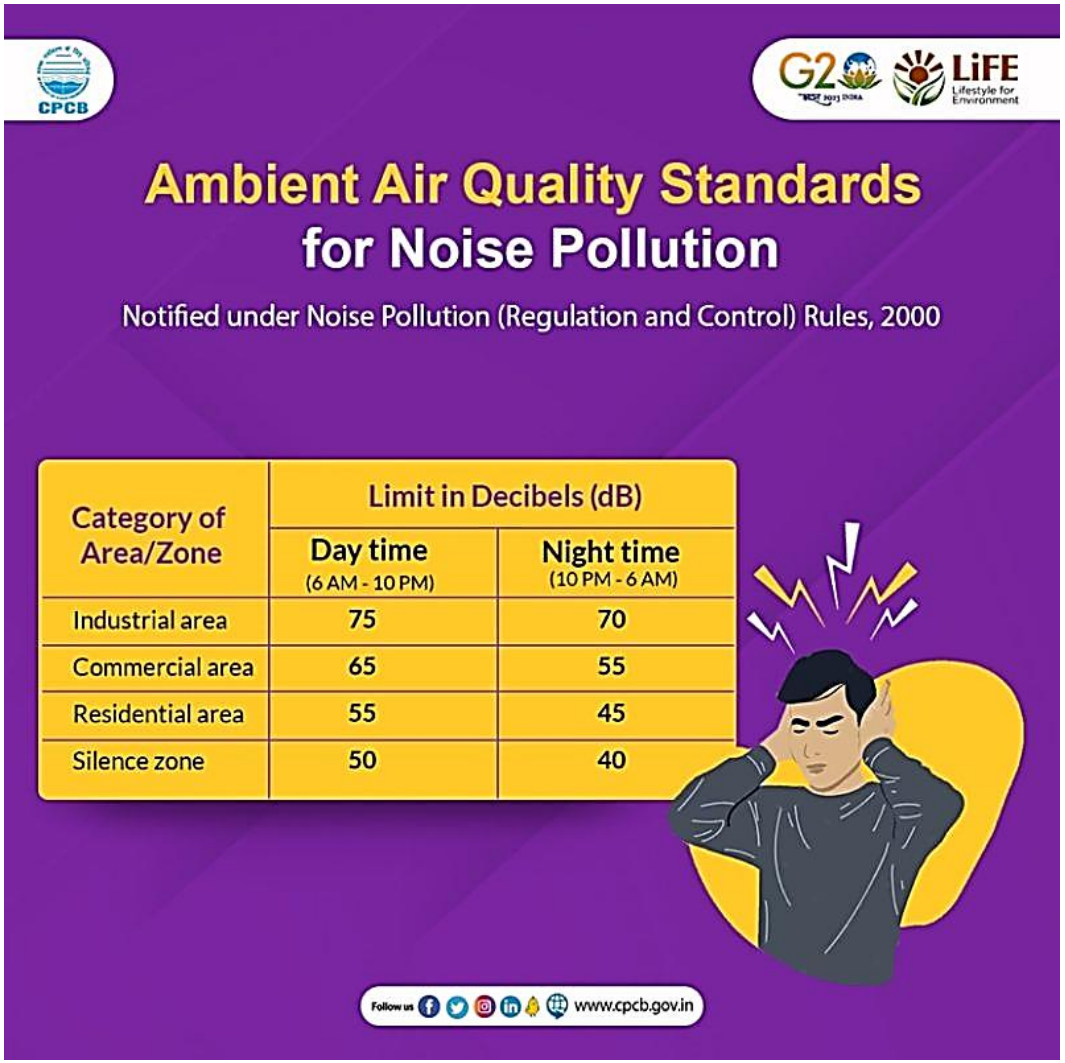
Road drill

public holidays

between 7 p.m. and 7 a.m. on weekdays

Noisy construction works (including pile drive and road drill) are not allowed without a permit.

Noise Pollution Control Rules, 2000



Category of Area/Zone	Limit in Decibels (dB)	
	Day time (6 AM - 10 PM)	Night time (10 PM - 6 AM)
Industrial area	75	70
Commercial area	65	55
Residential area	55	45
Silence zone	50	40

Noise Pollution Control

- The techniques employed for noise control can be broadly classified as
  - Control at source
  - Control in the transmission path
  - Using protective equipment.

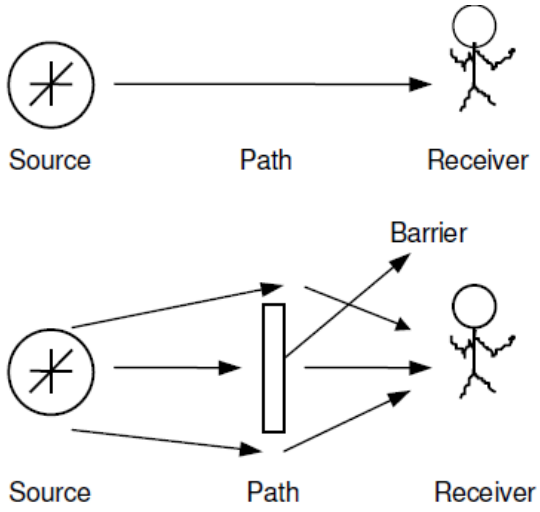


Fig. 1 Inter-relationship between the elements of noise

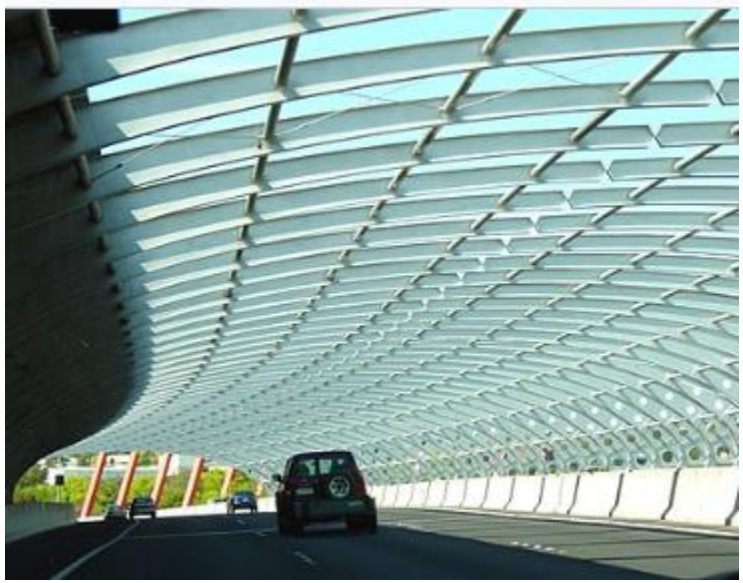
Control at Source

- Reducing the noise levels from domestic sector
- Maintenance of automobiles
- Control of vibrations
- Prohibition on usage of loud speakers
- Selection of machinery
- Maintenance of machines

Control during Transmission

- Installation of barriers
  - Installation of panels or enclosures
  - Green belt development
- Design of building







At Receiver

- Job rotation
- Exposure reduction
- Hearing protection

THANK YOU

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