

# **NOISE POLLUTION & ITS IMPACTS ON HUMAN HEALTH**



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# NOISE

- The word noise is derived from the Latin word nausea.
- Noise is an unwanted, unpleasant and annoying sound caused by vibration of the matter.
- The frequency limits of audibility are from 20 HZ to 20,000 HZ.
- The discrimination and differentiation between sound and noise also depends upon the habit and interest of the person/species receiving it, the ambient conditions and impact of the sound generated during that particular duration of time.
- The intensity of sound is measured in sound pressure levels (SPL).
- Common unit of measurement is decibel, dB.
- The community (ambient) noise levels are measured in the A- weighted SPL, abbreviated dB(A).
- This scale resembles the audible response of human ear.



# CLASSIFICATION OF NOISE POLLUTION

There are 2 kinds of noise pollution.

**A. Community Noise/ Environmental Noise (*non industrial noise pollution*).**

- Air craft noise
- Roadway noise pollution
- Under water noise pollution

**B. Occupational Noise(*industrial noise pollution*)**



# Typical noise levels of various sources of noise

**S.No. Sources of noise pollution Level**

**dB(A)**

<b>1</b>	<b>Air compressors</b>
<b>95-104</b>	
<b>2</b>	<b>110 KVA diesel generator</b>
<b>95</b>	
<b>3</b>	<b>Pulveriser</b>
<b>92</b>	
<b>4</b>	<b>Riveting</b>
<b>95</b>	
<b>5</b>	<b>Steam turbine (12,500 kW)</b>
<b>91</b>	
<b>6</b>	<b>Ticking clock</b>
<b>30</b>	
<b>7</b>	<b>Computer rooms</b>
<b>55-60</b>	
<b>8</b>	<b>Type institute</b>

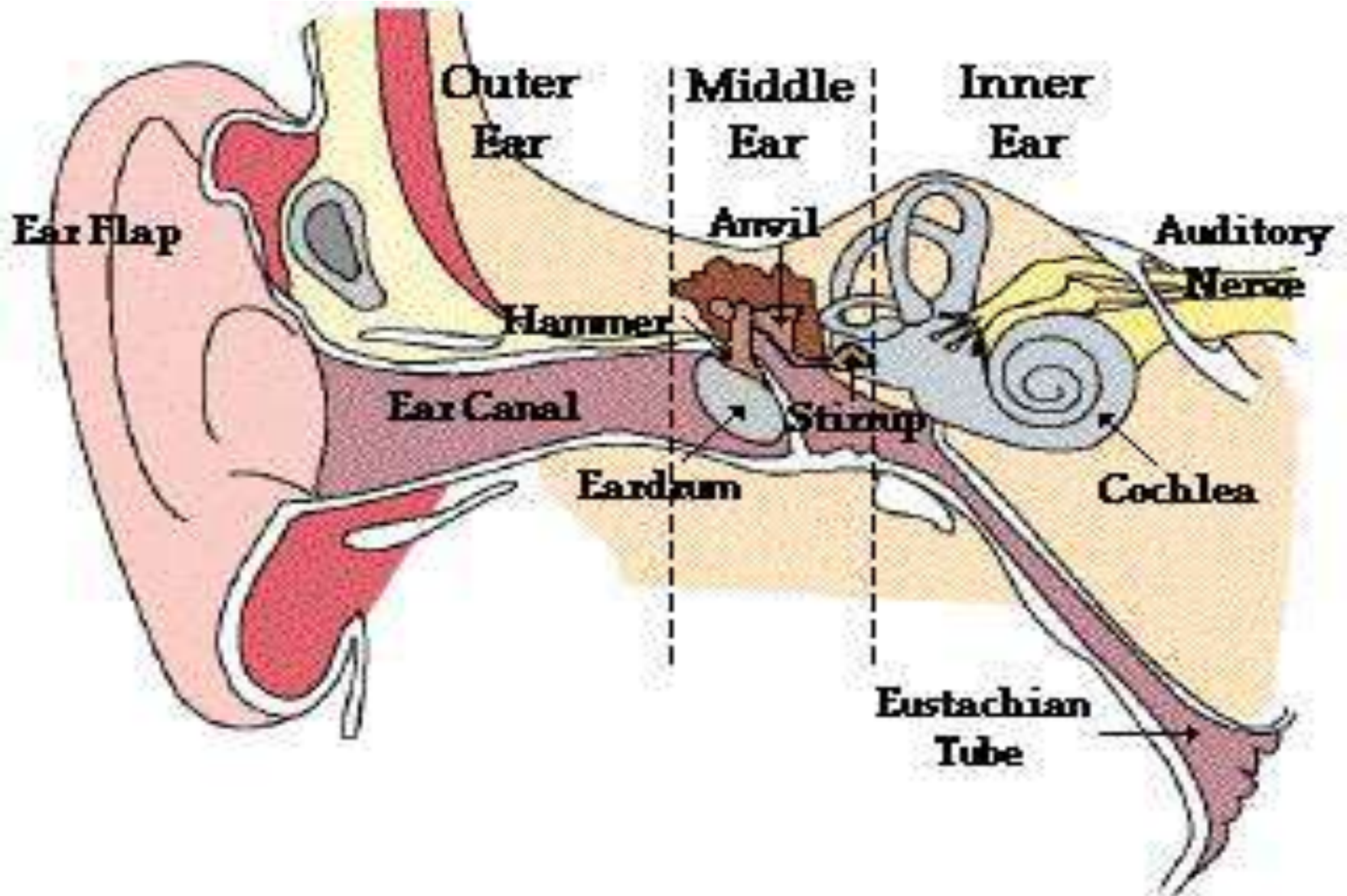


## ***Noise Standards for Ambient Noise Level(CPCB)***

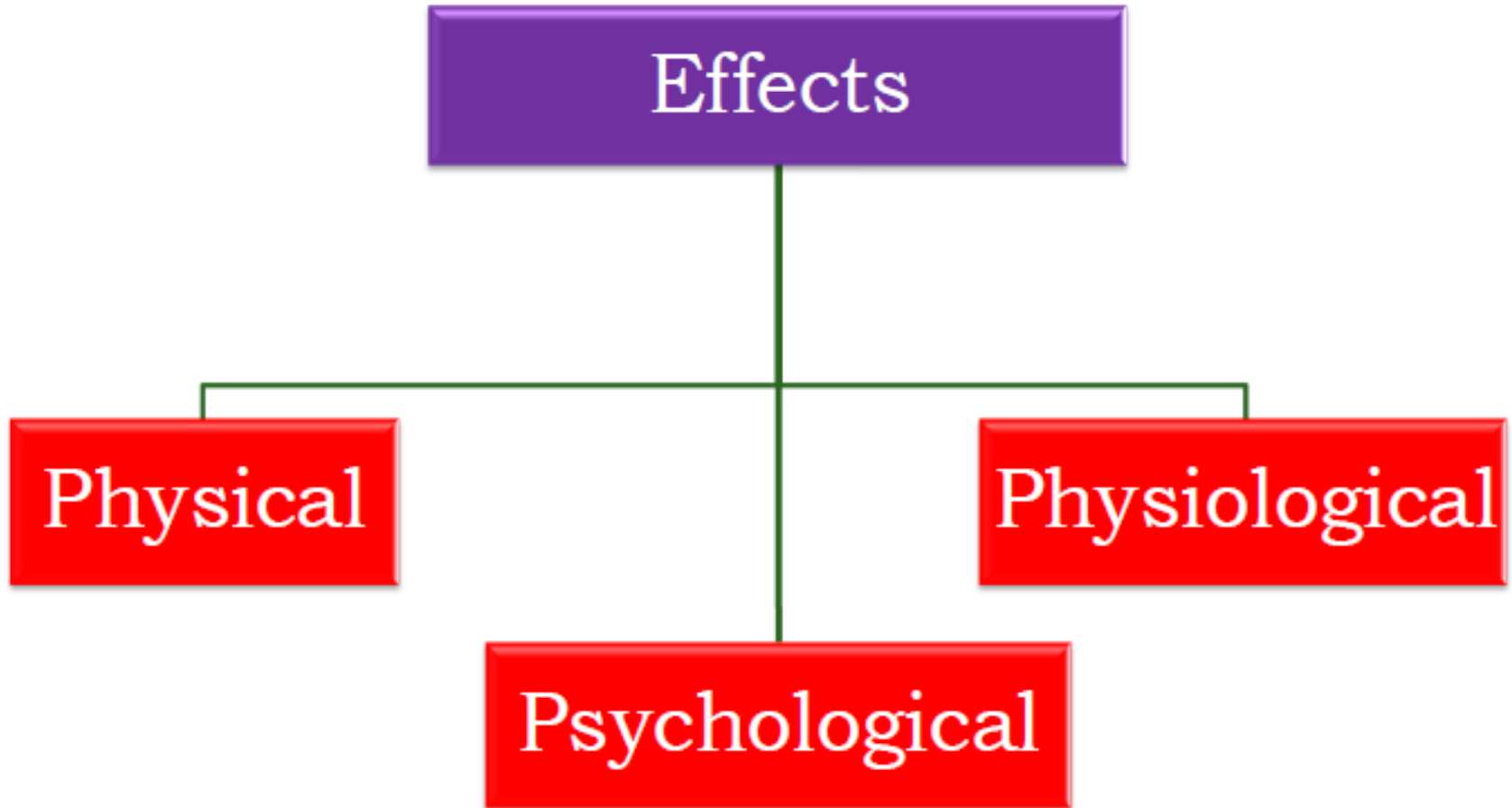
Area code	Category of area	Limits in dB (A)	
		Day time	Night time
A	Industrial	75	70
B	Commercial	65	55
C	Residential	55	45
D	Silence zone	50	40



# PERCEPTION OF SOUND



# NOISE POLLUTION EFFECTS



# AUDITORY EFFECTS

- Acoustic Trauma: Sudden hearing damage
- Tinnitus: Ringing in the Ears
- TTS: Temporary threshold shift
- PTS: Permanent threshold shift
- Interference with Communication





# NON-AUDITORY EFFECTS

- Annoyance
- Loss in working efficiency – tiredness
- Anxiety
- Hypertension
- Nausea
- Visual disturbance
- Headache
- Insomnia
- Depression
- Cardiovascular Effects
- Emotional disturbance



# HEARING IMPAIRMENT

- Hearing impairment is typically defined as an increase in the threshold of hearing as clinically assessed by audiometry.
- Hearing damage is related to duration and intensity of noise exposure.
- Occurs at levels of 80 dB or greater, which is equivalent to the noise of heavy truck traffic.
- Children seem to be more vulnerable than adults.
- Women who were exposed consistently to occupational noise in the range of 85dB during pregnancy gave birth to children with high-frequency hearing loss (Rudolph L, 1990)



# SLEEP DISTURBANCE

- Uninterrupted sleep is known to be a prerequisite for good physiological and mental functioning in healthy individuals.
- Exposure to noise disturbs sleep proportional to the amount of noise experienced in terms an increased rate of changes in sleep stages and in number of awakenings
- Noise exposure during sleep may increase blood pressure, heart rate and finger pulse amplitude as well as uncontrollable body movements.
- Measurable sleep disturbance effects have been observed as levels exceed 35 dB(A) Leq



# CARDIOVASCULAR DISTURBANCES

- Noise pollution may be a risk factor for cardiovascular disease.
- Noise can triggers both endocrine and autonomic nervous system responses that affect the cardiovascular system
- These effects begins with long term daily exposure to noise levels above 65 dB with acute exposure to noise levels above 80 to 85 dB.
- Noise Pollution causes increase in the rate of heart-beat, increased cholesterol level and constriction of blood vessels which leads to blood pressure that resulted in heart attack.
- If the exposure is of sufficient intensity, there is an increase in heart rate and peripheral resistance
- A sudden intense exposure to noise may stimulate catecholamine secretion and precipitate cardiac dysrhythmias.
- An increase in blood pressure, and increased levels of stress hormones (epinephrine, norepinephrine, and cortisol).

# DISTURBANCES IN MENTAL HEALTH

- Noise pollution is assumed to accelerate and intensify the development of latent mental disorders.
- Noise pollution may cause or contribute to the following adverse effects:
  - anxiety, stress, nervousness, nausea, headache, emotional instability, argumentativeness, sexual impotence, changes in mood, increase in social conflicts, neurosis, hysteria, and psychosis.
- Children, the elderly, and those with underlying depression are particularly susceptible to these effects.



# IMPAIRED TASK PERFORMANCE

- Noise pollution impairs task performance, increases errors, and decreases motivation.
- Reading attention, problem solving, and memory are most strongly affected by noise.
- Noise produces negative after-effects on performance, particularly in children
- Noise exposure may also slow rehearsal in memory, influence processes of selectivity in memory, and choice of strategies for carrying out tasks.
- There is also evidence that noise may reduce helping behaviour, increase aggression and reduce the processing of social cues seen as irrelevant to task performance.

# NEGATIVE SOCIAL BEHAVIOR AND ANNOYANCE REACTIONS

- Annoyance is defined as a feeling of displeasure
- Annoyance increases significantly when noise is accompanied by vibration or by low frequency components.
- The term annoyance include anger, disappointment, dissatisfaction, withdrawal, helplessness, depression, anxiety, distraction, agitation, or exhaustion.
- Changes in social behavior (aggressiveness or disengagement), and changes in social indicators (residential mobility, hospital admissions, drug consumption, and accident rates), and changes in mood (increased reports of depression).
- Noise above 80 dB is consistently associated with decreased helping behavior and increased aggressiveness.

## NOISE POLLUTION LEVEL & ITS HARMFUL EFFECTS

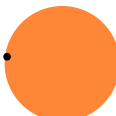
Level (in dB)	Effects
up to 23	No disturbance
30—60	Stress, tension, psychological (illness, heart attack) effects, especially at upper range.
60—90	Damage to health, psychological and vegetative (disturbance in stomach gall function, pains in muscles, high blood pressure, disturbance in sleeping)
60—120	Damages to health and ontological (ear diseases) effects
Above 120	Painful effects in long run.



# CASE STUDY

## **Environmental noise assessment and its effect on human health in an urban area**

Srimanta Gupta, Chitralkha Ghatak

- The study focuses on the traffic noise assessment and its negative health effect on road side residents.
  - Five different locations were selected along a National Highway of Burdwan having a day time Leq level of 60 to 89.5 dBA.
  - Assessment of health effects among the 52 peoples of 10 families residing in the study areas for long time was conducted through a questionnaire based survey.
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# NOISE DESCRIPTORS

- **L10**: Defined as the level in dB (A) exceeded over 10% of the time, during every hour period of 18hours from 6a.m to midnight on a typical working day.
- **L50**: Defined as the level in dB (A) exceeded for 50% of time.
- **L90**: It is the level exceeded for 90% of the time; it is often referred to background noise level.
- **Leq**: The constant level that would produce the same amount of energy at the measuring point as the actual fluctuating level during the measuring period.
- **LNP**: It takes account the variations in the sound signal
- **TNI**: The traffic noise index (TNI) is a method used to estimate annoyance responses due to traffic noise

## Noise descriptors in the study area

<b>Location No</b>	<b>L10</b>	<b>L50</b>	<b>L90</b>	<b>Leq</b>	<b>LNP</b>	<b>TNI</b>
Site 1	78.52	77.36	76.7	75.52	77.34	53.98
Site 2	72.55	72.44	72.35	69.55	69.55	43.15
Site 3	74.77	74.13	74.07	71.77	72.47	46.87
Site 4	72.95	72.05	71.97	69.95	70.93	45.89
Site 5	87.01	86.88	86.54	84.01	84.14	57.06

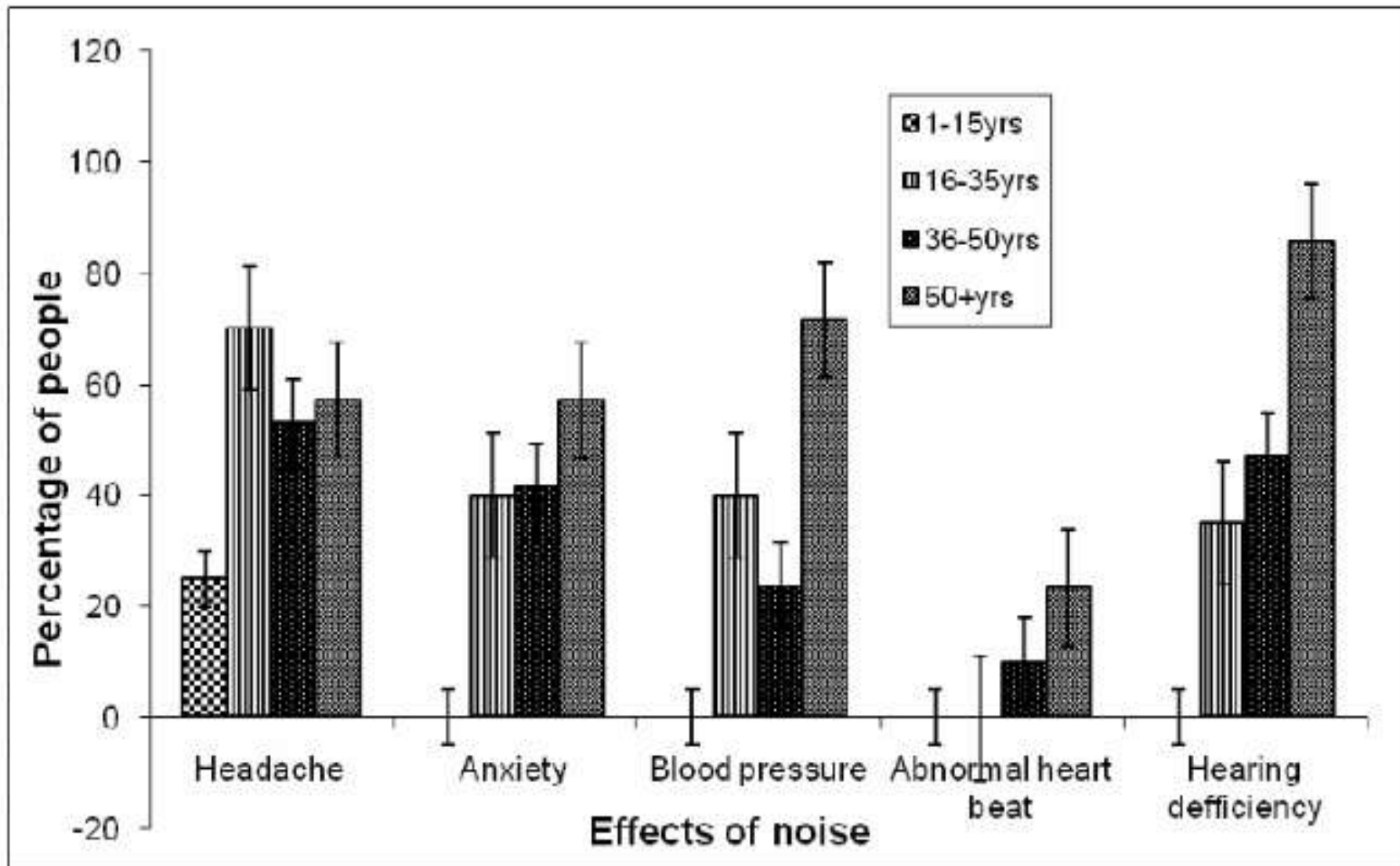
**Prohibited levels of Environmental Traffic Noise indices  
(Rao and Rao, 1992)**

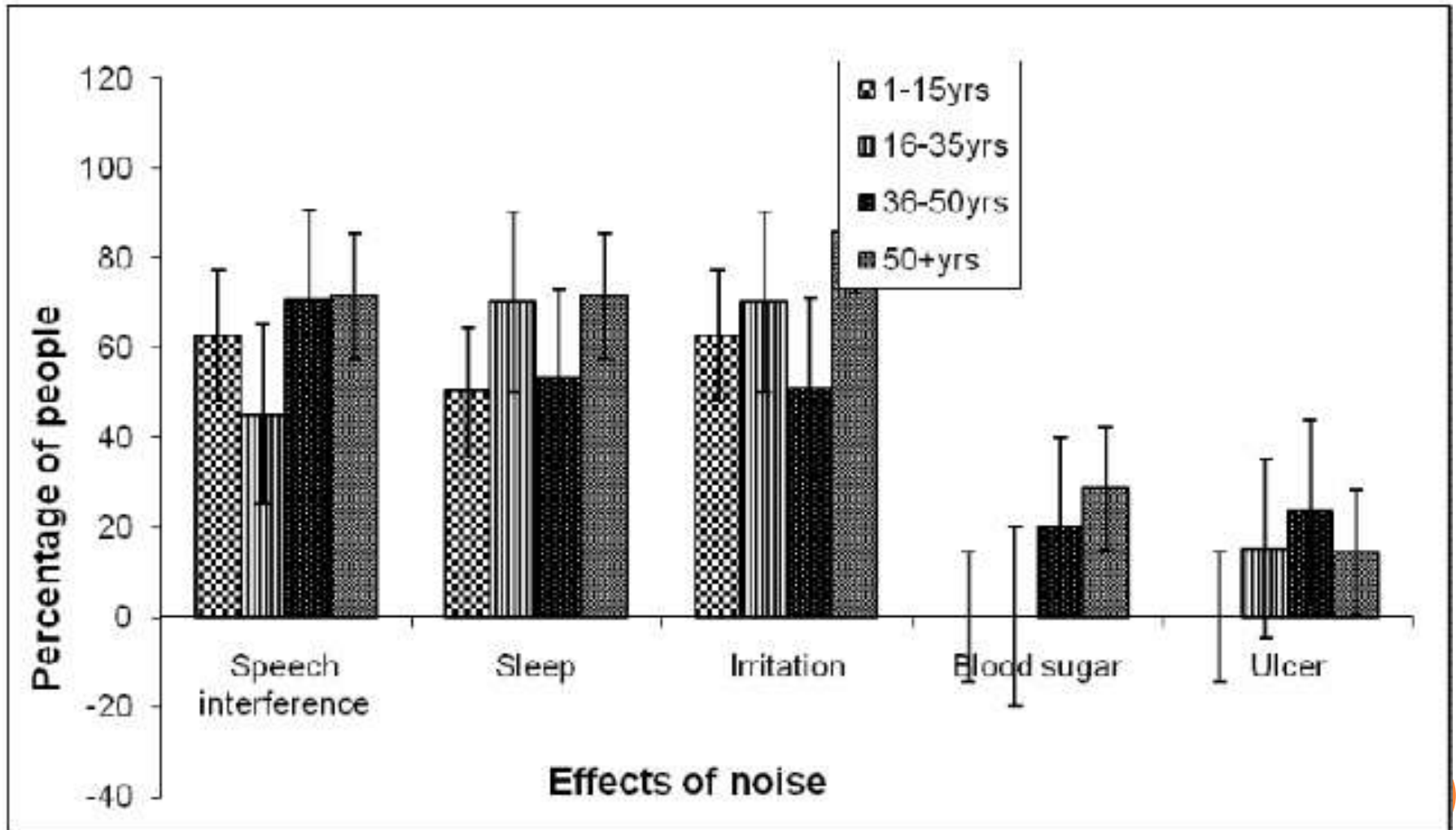
Noise index	Upper limits for Noise levels in dBA		
	<i>Desirable Prohibitive</i>		
	Dissatisfaction	Dissatisfaction	Dissatisfaction
	Score 2	Score 3	Score 5
L <sub>10</sub>	64	74	93
L <sub>50</sub>	58	67	85
L <sub>90</sub>	52	61	79
L <sub>Aeq</sub>	58	68	89
L <sub>NP</sub>	69	82	111



<b>Location No.</b>	<b>L10</b>	<b>L50</b>	<b>L90</b>	<b>Leq</b>	<b>LNP</b>
Site 1	>Score3	>Score3	>Score3	>Score3	>Score2
Site 2	>Score3	>Score3	>Score3	>Score3	>Score2
Site 3	>Score3	>Score3	>Score3	>Score3	>Score2
Site 4	>Score2	>Score3	>Score3	>Score3	>Score2
Site 5	>Score3	>Score5	>Score5	>Score3	>Score3







# STATISTICAL INTERPRETATIONS

- *H0: Effects of noise on road side people are independent of types of location.*
- *H1: Effects of noise road side people depend on the types of location.*





## TOTAL CHI-SQUARE VALUE OF DIFFERENT TYPES OF EFFECT OF NOISE OBTAINED FROM FIVE LOCATIONS

Noise related complaints of the respondents	Total chi square value obtained from five locations
Headache	6.63
Anxiety	1.31
Elevated blood pressure	2.60
Abnormal heart beat rate	20.91
Hearing deficiency	9.62
Blood sugar	2.11
Problem in speech communication	13.69
Interference with sleep	13.25
Irritation	4.04
Disturb stomach or ulcer	4.99

# RELATIONSHIP BETWEEN THE TYPES OF EFFECT AT DIFFERENT SITES

Type of Effect	Relationship between the type of effect at different sites $\alpha = 0.05$
Headache	Not significant
Anxiety	Not significant
Elevated blood pressure	Not significant
Abnormal heart beat rate	Significant
Hearing deficiency	Significant
Blood sugar	Not significant
Problem in speech communication	Significant
Interference with sleep	Significant
Irritation	Not significant
Disturb stomach or ulcer	Not significant

# REFERENCES

- Banerjee, D. (2012). Research on road traffic noise and human health in India: Review of literature from 1991 to current. *Noise & Health, Volume 14:58* , 113-118.
- E. Atmaca, I. P. (2005). Industrial Noise and Its Effects on Humans. *Polish Journal of Environmental Studies Vol. 14 No 6* , 721-726.
- Matheson, S. A. (2003). Noise pollution: non-auditory effects on health. *British Medical Bulletin, Vol. 68* , 243–257.
- Mondal, N. K. (2013). Vehicle noise interference and its impact on the community. *INT J CURR SCI Vol. 5* , 161-169.
- Samuel Melamed, Y. F. (2001). The Interactive Effect of Chronic Exposure to Noise and Job Complexity on Changes in Blood Pressure and Job Satisfaction: A Longitudinal Study of Industrial Employees. *Journal of Occupational Health Psychology, Vol. 6, No. 3* , 182-195.
- Savale, P. (2014). Effect Of Noise Pollution On Human Being :Its Prevention And Control. *Journal of Environmental Research And Development, Vol. 8 No. 4* , 1026-1036.
- Srimanta Gupta, C. G. (2011). Environmental noise assessment and its effect on human health in an urban area. *International Journal Of Environmental Sciences Volume 1, No 7* , 1954-1964.

**THANK YOU**

