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# Effect of Noise on People Residing Near Railway Tracks and Working in Railway Stations

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## ABSTRACT

Noise is one of the most highly found physical contaminants from the trains. Its deleterious effects on human life are a serious concern now days. Besides causing permanent impairment, noise induces blood pressure, birth defects and aggravates aggression. The Jadavpur Railway Station was selected for the research, since it is one of the busiest stations in Kolkata. In the research work, the noise level which the daily passengers, the hawkers, the residents near to the railways tracks are exposed to was studied. 15 subjects were interviewed for the purpose. It was necessary to assess the noise exposure and to develop techniques for studying in various times with preventive solutions. A noise dosimeter was used to calculate the equivalent noise and percentages of noise level in ranges of decibels. Readings were taken for several trains in the peak hours and for different positions of platform and residential areas near the station. This noise has very important effects on the people and those who are continuously exposed to this noise have undergone negative adaptations. The noise level was found to be greater than the maximum noise that a human ear can tolerate without any discomfort. The data has been analyzed and effect of the noise exposure on human beings studied and some general mitigation techniques were discussed. The results provide an indication of present-day rail noise conditions on people working in stations and residing by the railway track.

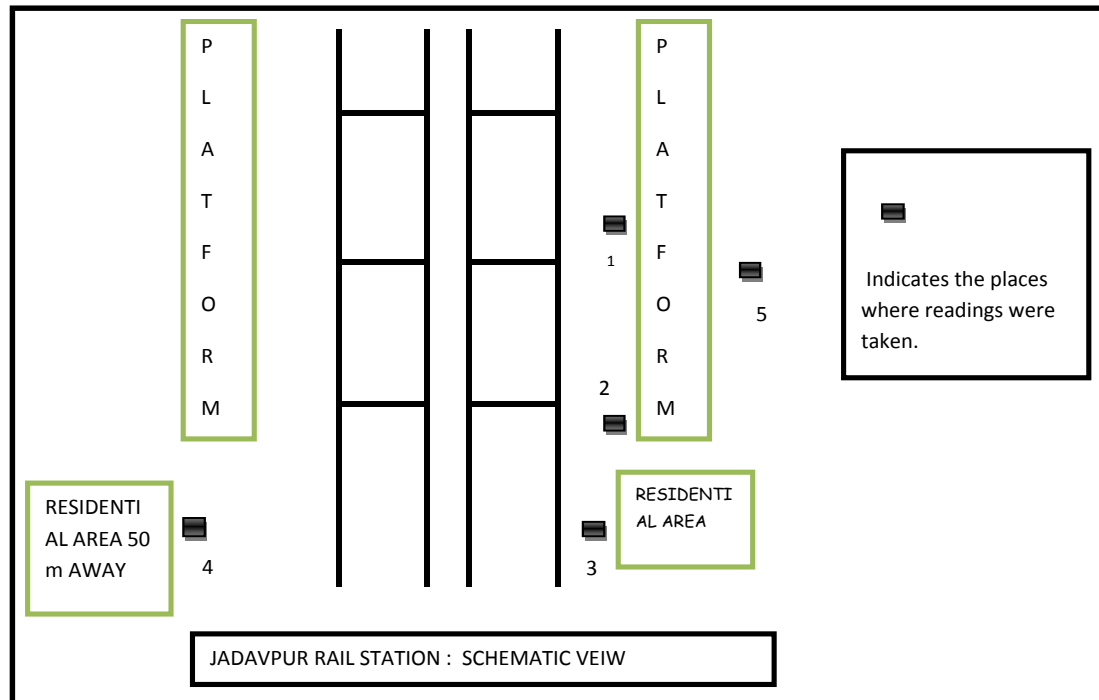
**Key words:** railway noise, noise level, mitigation techniques

## INTRODUCTION

Noise is defined as unwanted sound, that is it exceeds the acceptable level and hence cause disturbances. Sound is a mechanical wave that is an oscillation of pressure transmitted through some medium (like air or water), composed of frequencies within the range of hearing. Humans, animals, plants and even inert objects like buildings and bridges have been victims of the increasing noise pollution caused in the world. Be it human or machine-created, noise disrupts the activity and balance of life. One of the major sources of noise pollution is the railway noise. People living beside railway stations put up with a lot of noise from locomotive engines, horns and whistles and switching and shunting operation in rail yards. Deafness, temporary or permanent, is one of the most prevalent effects of noise pollution. One of the very many ill effects of noise pollutions are deafness permanent and temporary, lack of concentration, irritation, a major source of friction among individuals, many complex medical problems like heart diseases headaches etc.

The various causes of the noise produced from the railways are: 1. Wheel rail rolling noise 2. Squealing as wheels traverse curve of tight radius 3. Impact noise generated at discontinuities and severe features in the track or wheel 4. Feel able, low frequency ground-borne vibration. 5. Bowing horns while starting or nearing a signal. 6. Rumbling noise from trains in tunnels (ground-borne noise) - this is generated as vibration of the track is transmitted through the ground and radiated as sound within buildings by vibration of their walls. In the platform and the residential areas the noises they face are due to the honking and the rail-wheel friction. The best of dealing with the railway noise is to forbid constructions in the areas where it is impossible to reduce the amount of noise. The present work discusses the amount of noise exposure of the areas near to a railway station and also on the platforms. Also the mitigation techniques are discussed here.

## MATERIAL AND METHOD



**Fig1: Places where noise readings are taken**

**Places where measurements were taken**

The measuring places were selected as (refer to fig1)

1. The shop near the platform: (fig 2.1) the shops which were near the railway station were occasionally subjected to some noise from the horns of the electric passenger trains.
2. the area near the engine of the train: (fig 2.2) the passengers near the engine of the train were subjected to high amount of noise level.
3. the residential adjoining the rails. (fig 2.3) the areas absolutely near the railways were subjected to exceptionally high amount of noise.
4. the residential area at a distance of 50m from the railways: (fig 2.4) the people of these places are subjected to continuous noise from the trains. Needless to say the effect is more pronounced at night.
5. the noise exactly outside the platform: (fig 2.5) the shop owners just outside the platform as well as the rikshaw pullers are subjected to noise, though comparatively moderate.

**Different standards of noise level for various areas of community [1]**

Residential and mixed area	<u>CPCB INDIA</u> (6.00 am – 9.00 pm) 55 dB(A)	<u>CPCB INDIA</u> (9.00 pm-6.00 am) 45 Db(A)	<u>FHWA</u> 70 Db (A) Interior residential area=55(max)	<u>AASTHO</u> 70 Db(A) Interior residential area=55
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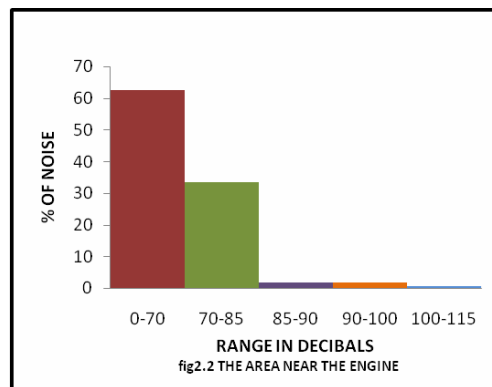
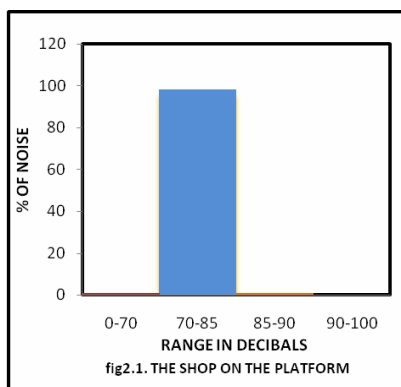
**Instruments used**

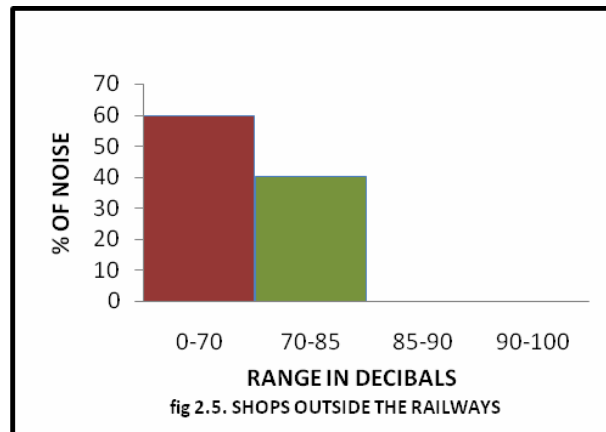
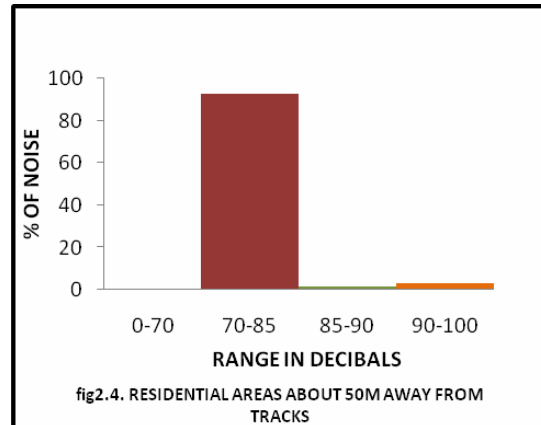
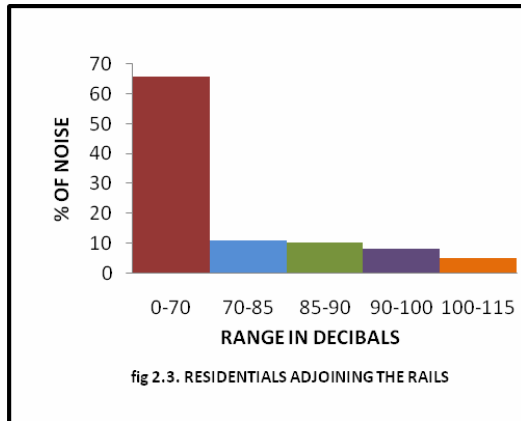
1. Brüel & Kjær - Noise Dose meter Link Software VP 7790.
2. Dosimeter model number Brüel & Kjær-4444
3. Frequency weighting for RMS –A.
4. Frequency weighting for Peak –Linear.
5. Measurement range- 70-140 dB.

**RESULT**

**Experimental data**

The data collected are represented in the form of bar graphs as shown below;





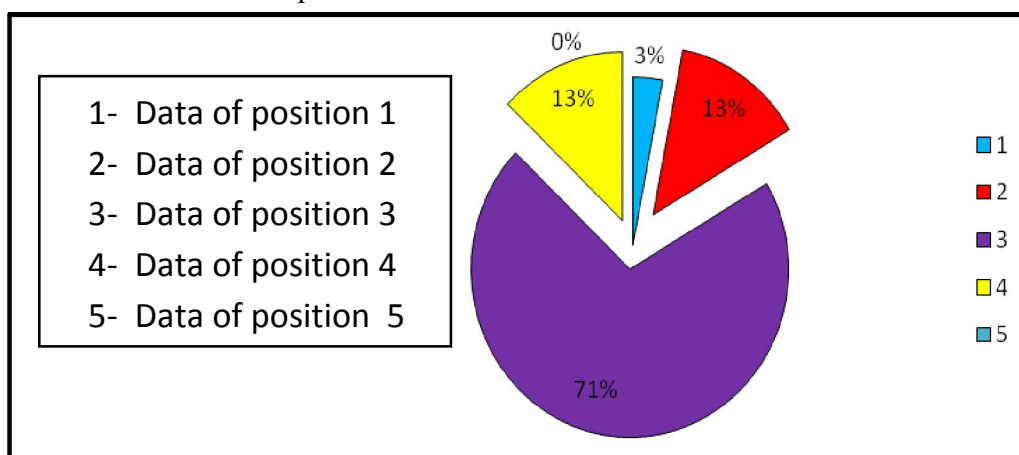
**Fig 2: The area near the engine of train**

## OBSERVATIONS

It is observed from the collected DATA that:

1. It is data collected from the residential areas near the rail tracks (refer to fig1) is subjected to maximum amount of noise. It was observed that the train would honk each time it passed that place. The people residing there informed us that they have got habituated to the noise from which it can be concluded that they have developed some form of negative adaptation.
2. Comparing the data collected from the shop outside the platform and from the residential areas 50m away from the platform it was seen that the latter recorded a higher decibel of noise. This is because there were trees , vendors on platform , ticket counters and rest rooms which helped in damping the noise. However the area between the residential building ( which is 50m away) and the rail tracks is devoid of any such elements. Barren land resides there. Hence the amount of noise is higher.

DATA above 85 dBs are represented in the chart below:



**Fig 3: amount of noise level above 85 dB**

Thus we see that a most of the areas are above 85 dB s which is way beyond the noise limit set by the standards. Thus it is essential that immediate measures should be taken to minimize the noise as much as possible.

## DISCUSSION

### Effects of noise on local health

“Calling noise a nuisance is like calling smog an inconvenience. Noise must be considered a hazard to the health of people everywhere.” Dr. William H. Stewart, former U.S. Surgeon General. Because noise often does not produce visible effects, and because there is usually not a distinct cause-and-effect (“dose-response” in medical terms) relationship between a single noise event and a clear adverse health effect, some people believe noise does not pose a serious risk to human health. But evidence from a number of recent studies, especially on children, provides ample proof that noise harms human health and decreases quality of life. some important effects are as follows:

1. Affect human health, comfort and efficiency 2. Impair hearing 3. Cause Psychological and Pathological disorder 4. Causes boiler makers deficiency syndrome 5. Causes acoustic trauma 6. Causes hyper glycaemia. Among the chief source of noise pollution, railway sources require some special mention. Research reveals that a train while entering and leaving a station honks which emits sound of intensity of more than 100 decibel at times. Not only that, its vibration of railway tracks also has a considerable contribution. Apart measuring the noise levels at Jadavpur Station, we also carried out few questionnaires sessions with the people who spend a considerable time in the station. Many people told that they are accustomed with the situation. Hence it led to Negative Adaptation. This negative adaptation has many adverse effects on

human health. Noise in uncontrolled stage causes PTS (Permanent Threshold Shift) and TTS (Temporary Threshold Shift). Temporary threshold shift (TTS), as well as, permanent threshold shift (PTS) represent the most common hearing defects of acute and chronic high level acoustic stimulation. TTS is typically related to the traumatizing stimulus spectrum and to the exposure level and duration. The stapelial acoustic reflex, as well as, the repetition rate of the exposure may influence TTS. PTS is related to a number of factors including exposure duration, subject's age, exposure to other toxic factors, presence of impulse noise components, etc. PTS is usually accompanied with alterations of several cochlear functions leading to altered speech discrimination mostly in presence of background noise.

### **Remedial measures to be taken**

Unlike the European countries, India takes minimum measure in alleviating those causes which leads to production of large sounds. Here minimum effort is taken to reduce the intensity of the sound affecting the neighboring region. In European countries there exists "Buffer zone" in between locality and the railway tracks. Buffer zone is dominated by huge trees which absorb the noise before reaching the locality. Railway noise not only emerges due to the noise due to the whistling of the train but also due to rolling between the rail and the track. The noise reduction techniques that can be taken are: NOISE BARRIER: A noise barrier (also called a sound wall, sound barrier, or acoustical barrier) is an exterior structure designed to protect inhabitants of sensitive land use areas from noise pollution. Noise barriers are the most effective method of mitigating roadway, railway, and industrial noise sources – other than cessation of the source activity or use of source controls. A wide range of measures can be employed to reduce the effects of noise caused by railway traffic on the living environment:

1. Reduction of the level of noise emitted by means of transport as a source of noise;
2. Employment of screens;
3. Installation of railroads in tunnels;
4. Usage of special windows containing glass packages;
5. Usage of noise screens [1]

The effect of noise due to railway tracks can be minimized as:

1. Replacement of metal shoes of carriage brakes with composite ones, installation of lubricating Systems of wheel rims of locomotives, polishing of rails, turning of car and diesel-powered locomotive wheels, welding of rails to eliminate joints, etc. [4].

### **STATEMENT OF RELEVANCE**

Local railways are the most common and frequent transport availed by an average Indian. Thus they are continuously exposed to noise that is caused by the railways. However very few initiatives are ever taken to look into the matter. Thus it is important to study the level of noise prevailing in these areas and suggest the mitigation techniques.

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