



**Monitoring and Assessment of Noise Pollution: Case Study of Cantonment Railway Station Karachi, Pakistan**

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**Abstract:** Noise pollution has become a major hazard to the human health all over the world particularly in the densely populated urban areas. Its major sources also include railway transportation. Besides being an important mean of the transport and economic growth, the railway transportation is also posing a hazard in form of the noise pollution. The purpose of this study is to monitor and analyze the noise level from different sources at cantonment railway station Karachi, Pakistan. A methodology with the help of noise meter and feedback from the general public has been followed and relevant data has been collected. The data analysis was carried out using analytic hierarchical process (AHP) model. The results of the study showed that noise levels are higher than the acceptable standards. Main sources of the noise have been identified. The control measures are also suggested to minimize the higher noise levels and to bring the noise level to the minimum acceptable levels.

**Keywords:** Monitoring Locomotive noise, Analytic hierarchical process, Cantonment Station

**1. INTRODUCTION**

The word 'noise' has originated from a Latin word 'nausea' which means an unpleasant or unexpected sound (Gaur, 2008). Noise pollution is one of the major health problems in big cities of Pakistan even in European countries due to expansion of industries, road traffic especially poor maintenance of loco engines, placement & shunting of loco engines at cantt station Pakistan Railways (Pronello, 2003 and Xiaoan, 2006). Currently it has observed that noise is one of the most important source of disturbance and annoyance that may be emitted from rail traffic, road traffic, air craft and industry which impact the life of human and dwellers in urban areas across the world (Rajiv, 2012 and Knall, 1996). Railway transportation is the most important source for development of country economy with basic principle to provide transport facility for human being and goods (Andersson, 2007). The environmental and occupational noise levels are increasing day by day from their permissible or comfortable limits causing ailment, annoyance, disturbance of sleeping, fatigue, hearing losses, psychological, and disorder of nervous

system (Archana, 2008 and Gaur, 2008). Usually enhancement of science and technology has brought development and unexpected global problems. Thus the high speed of loco engines, workshop machines, compressors, power plants and also maintenances of engines or vehicles are useful for human life but at same time contributing the background of noise problems. Noise generate serious health hazardous and known as silent killer because of noise level is increasing day by day in big cities that's why noise called as a potential pollutant and big threat for living things and over all environmental health (Bhatia, 2007 and Malcolm, 2007).

**2. STUDY AREA**

The cantonment railway station of Karachi is one of the oldest as well as the busiest railway stations in Pakistan and formerly known as Frere Street Station. Constructed in 1998, it has now been declared a 'Protected Heritage' by the Government of Sindh. It is located 24° 50' 39.87" N and 67° 2' 33.21" E and the total area of station is approx. 500 meters sq, shown in (Fig: - 1) (Government of Sindh).

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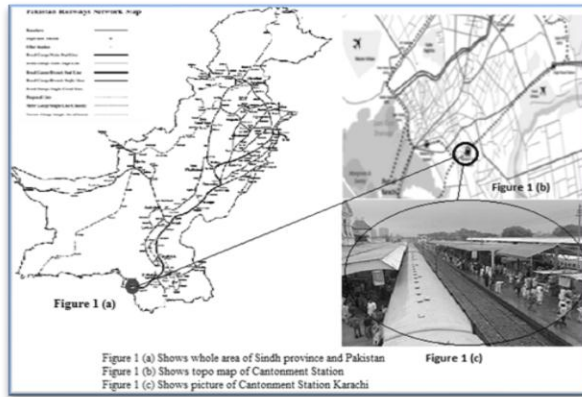


Fig .1. Study Area

3. **MATERIALS AND METHODS**

**Step -1** the noise levels of loco engines were measured using a sound level meter CR: 262A. It was placed 1.2 meters above the ground level and was kept at a distance of about 3 to 5 meters from the source. The meter was frequently calibrated with acoustic calibrator standard at 93.7 dB after each set of measurement. Noise levels were also recorded throughout the survey at “Fast” response of meter; throughout survey (Cirrus Manual, 2008). The readings were made minimum, maximum, average and peak dB (A). **Step -2** the flow density of engines was calculated as the number of engines passed during the assessment time from 8 a.m. to 8 p.m. at survey site. The flow of loco engines was further categorized with respect to the type of engine, times of arrival and departure as well as duration of the stay (Memon, 1999). **Step-3** A prescribed interview questionnaire was used to collect the opinion of passengers, tea stall vendors and coolies at site about loco engine noise annoyance (Ahmed, 2012, Aslam et al., 2008 & Clark, 1989). **Step -4** an analytic hierarchical process (AHP) model (Expert Choice 11.5) was used to evaluate the impact of loco engine noise on the passengers, coolies and tea stall vendors. AHP is a decision formulating model as well as technique which employ for calculation of risk hazards assessment (William, 2008). As regards, the complex number of problems could be resolved through this model. In this connection four criteria and three alternatives were developed in AHP model; details are shown in (Fig: 3).

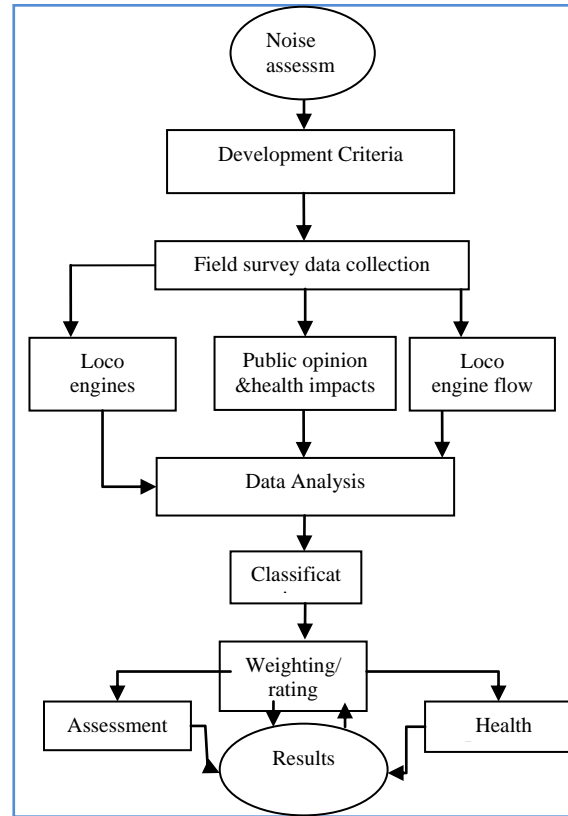


Fig: 2 Methodology for identifying noise impact

The alternatives and input variables used in AHP Model are shown in (Fig. 3).

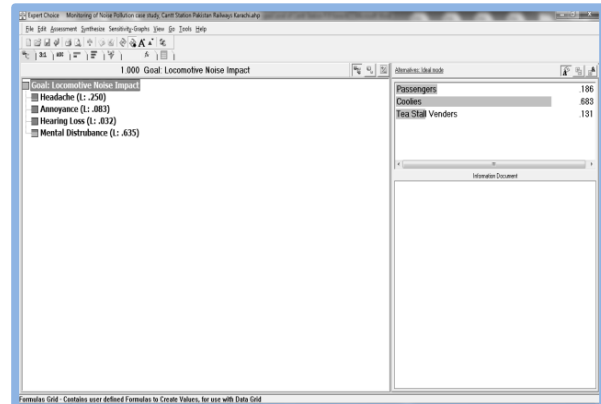


Fig. 3. AHP Model Inputs

**4. RESULTS AND DISCUSSION**

The noise found, max 112.8 dB (A) and peak 122.9 dB (A) shown in (Fig: 4).

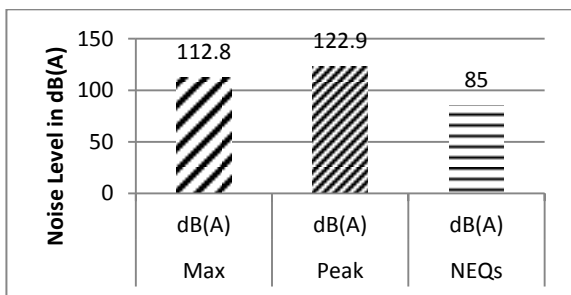


Fig: No.4 Loco Engine Noise recorded at cantonment station Pakistan Railways Karachi

At Cantonment Station, noise level found increasing from noise standards due to pressure horn of engines, passenger crowds at plat forms, wheel brakes, luggage trolleys, shunting of train racks and announcement about the information of trains. The highest noise level recorded max 112.8 dB (A) and peak 122.9 dB (A), which created intensive environmental pollution in the area and recorded noise found above the noise standard 85 dB (A) (PEPA, 2013). Many times observed echo on station due to offices, tea stalls etc constructed at north side of station as well as covered plat forms creating more noise. Flow density of engines was also calculated on hourly bases, with respect to type of engines, time reached and left the survey site. Mostly 12 hrs daily right from 8 am to 8 pm was recorded, over all flow of Loco engines at cantonment station. Comparatively the higher engine flow found 27 no's due to shunting of engines, placement of passenger train racks at platforms, arrival & departure of passenger trains at Cantonment Station. A questionnaire was used to collect the opinion of passengers, tea stall venders and coolies at Cantonment Station, Pakistan Railways Karachi about loco engine noise annoyance. So analytic hierarchy process was used to estimate the noise inconsistency, therefore three alternatives and four criteria were selected as regards the judgment for alternatives and criteria were based on approx. (150 sample size) people. The significant statistic data has been controlled through sensitivity analysis shown in (Fig. 5 & 6). Analysis shows that passengers are at high risk due to noise exposure at station then other alternatives like; (coolies and tea stall venders) shown in and an inconsistency found IC= 0.41, mentioned in (Fig: 5 and 6).

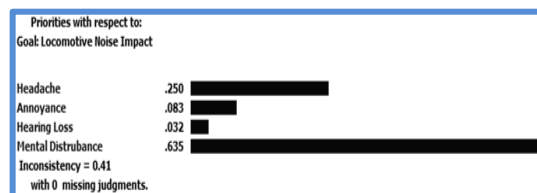


Fig: 5 Criteria priorities

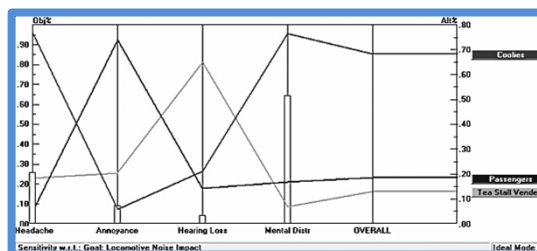


Fig: 6 Criteria priorities

**5. CONCLUSION**

Locomotive noise found max 112.8 dB (A) and peak 122.9 dB (A) at Cantonment Station Pakistan Railways Karachi. The engine flow density found that 27 engines under operation at station. Analytical Hierarchy Process (AHP) was used to record the inconsistency of loco engine noise impact and found 0.41.

**6. SUGGESTIONS**

Based upon the monitoring and assessment of the noise levels at cantonment railway station of Karachi, the following control measures are suggested to minimum the level and bring it to the minimum acceptable levels.

- A noise assessment and management system (NAMS) is required to be introduced in the busiest railway stations in Pakistan like Karachi. As an initial step, the sound meters must be installed for the recording and monitoring the noise.
- The present wheel brake must be replaced with pressure operating disc brakes.
- The use of pressure horns at railway stations should be controlled immediately.
- The periodic maintenance and repair of loco engines on regular basis.
- It is proposed that sufficient barriers may be arranged there to reduce noise intensity.
- The rubber soled luggage carts be used on plat forms instead of iron wheels to reduce noise nuisance.

## 7. ACKNOWLEDGMENT

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