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Developing Road Traffic Noise Prediction Model for Different Categories of Roads in Vadodara City – A Review

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ABSTRACT

Vehicular noise is one of the most prevalent forms of pollution. Traffic noise annoyance has become a major issue with the advent of fossil fuels and development in vehicle technology. Vehicular noise is dramatically increasing with the increased number of vehicle population, especially due to speeding vehicles. Amongst all the sources of noise pollution, vehicular noise has been identified as the most annoying and health impairing one. Therefore, it had become important to check the traffic noise and enhance the environmental condition along the transportation corridor. This study attempts the development of road traffic noise model for Indian condition. A statistical regression model for predicting road traffic noise is developed based on A-weighted equivalent noise levels.

Keywords: Noise, Noise Prediction Model, Noise Modeling

I. INTRODUCTION

Basically Noise Is an Unwanted Sound

- Especially One That Is Loud or Unpleasant or That Causes Disturbance.
- Noise Is Unwanted Sound. Noise Can Be Produced By Many Sources - Man's Vocal Cord, A Running Engine, A Vibrating Loudspeaker Diaphragm, An Operating Machine Tool, and So On.
- Noise Interfere Communication.

Types of Noise

Types of noise sources	Examples
Transportation	Aircrafts ,trains ,road vehicles, vessels
Industrial buildings	Factories-machineries, air conditioning systems
	Office buildings, air conditioning systems, kitchen ventilation systems
Construction sites	Site formation(e.g. excavation), piling, road work, demolition, renovation
public places	Open markets, street parks

VARIOUS EFFECT OF NOISE POLLUTION

a) Subjective Effects
b) Behavior Effects
c) Physiological Effects

Subjective Effects: - Subjective effects can be described by term such as an annoyance, disturbance, dissatisfaction, bother and noisiness. but these effects are difficult to be measured precisely, because a wide variation can exist among subjects in describing what level of sound causes them annoyance or discomfort. Exposure to high occupational noise which results in health risks is commonly encountered in a variety of industrial processes. Its effects depend not only on the intensity, but also on exposure time, frequency and the type of noise. According to the World Health Organization (WHO, 2011), high levels of noise may lead to speech interference, reduction in productivity, high blood pressure, hearing defects, health disorders, sleep interference, cardiovascular effects, loss of concentration and absenteeism, and fatigue.

Behavior Effects:- Behavior effects cover interference with sleep speech or any general task disturbance in sleep caused by noise is common in high noise area if the noise level is high it takes longer time to fall off to

sleep and there are greater chances of ever awaking noise can cause interference in speech and enjoyment of radio and TV programs it can cause disturbance in studies and intellectual pursuits in classroom considerable districts and can result in the students mind due to high level of traffic noise . The efficiency in performing general task involves mental activity can be impaired by noise.

Physiological Effects:- Physiological effects are those that cause startle or fright phenomena and can result in harmful effect on various parts of the body at extremely high level and for long periods of exposers it may produce deafness but this danger may not be imminent at current level of noise in cities.

II. OBJECTIVES

1) To study the existence status of noise levels in the study area.
2) Developing a multilinear regression model of noise at selected area.
3) Identification and consideration of suitable mitigation measure

III. LITERATURE REVIEW

(Anila Cyril,Bino I.Koshy, 2013) Modelling of Road Traffic Noise. they have developed multi linear regression model for selected stretch NH183 Kottayam Kerala. The site selected represents a typical residential land use pattern. For the study, high traffic, low traffic, curves, straights and intersection were required. By considering the objectives of analysing and modelling vehicular noise, various locations enlisted below are chosen.

In this research, continuous noise recording was used instead of SLM. H4N noise recorder was usedfor recording the noise data continuously. The noise recorder was kept at a distance of 3m from the edge of the pavement and at a height of about 1.5m from the ground level. The height of the recorder was selected as 1.5m to account for the average position of the human ear. The continuous noise recording was carried out for one hour in each location. Simultaneously, video of the traffic stream was also recorded using Sony Handycam. The spot speed of the vehicles was found using a Falcon HR Radar speed gun. The noise and video recording was performed with perfect synchronization so that the preliminary analysis can be done with ease.

In this study, the negative effects of vehicular noise were considered. Considering the negative effect of noise, a road traffic noise model was developed. In Indian Scenario, the major share of noise is made by heavy vehicles and three wheelers. The noise model developed in this study, considered the effect of the shares of different category of vehicles and it was found that the contribution of three wheelers and heavy vehicles are more than that of four wheelers and two wheelers. The model developed was in conformation with the characteristic of the area.

(Prof.Baskar Govindraj ,Yugananth pachipappan, 2013) they study Based on the above formula, the equivalent level of noise developed in a four lane uninterrupted traffic flow condition was calculated. Values for Leq (Observed) and Leq (Calculated) for the selected locations are provided in the chi-square test for goodness of fit is used to determine the level of correspondence between the observed sample distribution and calculated distribution. The null hypothesis, $\mu=0$, meaning that the mean value of the differences between the pairs of observed noise and predicted noise is equal to zero, is considered. The calculated value of chi-square is less than the observed value at 5 % level of significance. Hence, the null hypothesis is accepted and it is concluded that there is no significant difference between the observed and predicted noise levels. This model can therefore effectively be used in the prediction of highway traffic noise values in terms of Leq in India along four lane roads with uninterrupted traffic flow. Noise level values observed at four study locations While testing the goodness of the equation, the null hypothesis, $\mu=0$, i.e. the case when the mean value of differences between the pairs of observed noise and predicted noise is equal to zero, was considered. Results of the Chi-square test at the five percentage level of significance shows that the null hypothesis is acceptable, i.e. that the mean value of the difference between the observed and predicted noise levels is zero.

(Bhaven Tandel, Pratik Ruparel, Dr joel Macwan 2013) The Present Study Was Carried Out To Analyse The Present State Of Noise Pollution In Three Major Corridors Of The Surat City And To Develop A Linear

Regression Model To Analyse The Corridors And To Suggest.

The sound level meter used for this study was model no SL-4001. The step wise procedure followed in the study has been illustrated below :

Profile of the road and its surroundings was prepared i.e. height of the building along the road, open spaces along the road. Different main factors affect the traffic noise generation in most of the cities. In study the main factors like traffic flow (vehicles/min), open space, building height along the road were measured. The noise levels were measured at rush hours (5-8 pm). The readings were taken on 3 major corridors of Surat city viz. (i) Kadodara-Sahara Darwaja road (ii) Dumas-Athwa Gate road & (iii) Sachin-Udhna Darwaja road. The readings were taken at an interval of 150m. A total of 32 reading (16 on each side) were taken on 1 corridor. Following this procedure a total of 96 readings were taken on the three corridors. The urban corridor noise model was built on the basis of readings of two corridors-sahara darwaja road & athwa gate road and the model was tested on the third corridor- udhna darwaja road. For a one single corridor, the 1st point was taken as 0 m and the no. of vehicles i.e. no. of 2-wheelers, 3-wheelers, 4-wheelers passing through that section in 5 minutes were counted and a total of 16 readings were taken on one side of the road .Following this procedure, 32 readings on both side of the road were taken for one single corridor. After this the no. of vehicles were converted in Passenger Car Unit i.e. PCU. A factor of 0.75 for 2-w, 1 for 3 & 4 wheelers, 2.8 for buses and trucks respectively was adopted.

(T.Subramani, M.kavitha 2012) Collection of various parameters for this study as follows. Date & Time, Total vehicle count, Q, Average Speed, V (kmph), Atm. Temp., Ta (°C), Surface Temp., Ts (°C), Equivalent noise level, Leq (dB)Relative Humidity, H (%) **Step 2** Analysis of the collected data using DATAFIT (Version 8.10) to find out the correlation between the various parameters and the noise level. A nominal distribution test is also applied to test the model for its goodness of fit. **Step 3** Plotting of graphs for Leq Vs Q, Leq Vs V, Leq Vs Ta, Leq Vs TsQ, and Leq Vs H. From the scatter diagram it is possible to visualize a nature of relationship between variables. Based on the data taken in different days between 6.00A.M. to 6.00 P.M., the data analysis was done using DATAFIT (Version 8.10). The best form of regression equation obtained is given below. Leq = 75.58 + 0.0024Q – 0.0064V + 0.0469Ta – 0.00451Ts + 0.0306H (R2 = 0.523) Where, Q = Total vehicle count in both directions, V = Average speed of vehicles in kmph, Ta = Average atmospheric temperature in °C, Ts = Average Surface temperature in °C, H = Relative humidity in %, and R2 = Coefficient of correleation. This equation can be used for predicting traffic noise in a two lane road.

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