TRAFFIC IMPACT ANALYSIS IN URBAN AREAS USING GIS

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ABSTRACT: In today's world, due to urban sprawl the usage of vehicles is increasing in that area. So, the people who are living in that area are really affected by noise and air pollution. The objective of this paper is to develop a model for population exposure to traffic air pollution in order to improve assessment of health impacts and in support of risk management. A selected urban area is used as a case study. For analysing the technology is used known as geographic information system. It is a computer system for capturing, storing, checking and displaying data related to positions on earth's surface. Geographic information system can show many different kinds of data on one map. This enables people to more easily see, analyse and understand patterns and relationships. Applying a Geographic Information System, the model combines calculated air pollution data using the Danish Operational Street Pollution Model and available population data from existing administrative databases.

Keywords: Geographic information system, Map, Patterns and relationships Urban Sprawl.

I INTRODUCTION

Geographical Information System (GIS) technology has been a popular tool for visualization of accident data and analysis of hot spots in highways. Many traffic agencies have been using GIS for traffic analysis. Traffic analysis studies aim at the identification of high rate noise and air pollution in urban sprawl areas. So, traffic officials can implement precautionary measures and provisions for traffic safety and also to reduce pollution. Since pollution reports are prepared in textual format, this situation makes it difficult to analyze their results. In our study, the GIS system for analyzing the information about pollution. Then, the hot spots in the traffic area in salem city were explored and determined with two different methods of Kernel Density analysis and repeatability analysis. Subsequently, pollution conditions at these hot spots were examined. We realized that the hot spots determined with two methods reflect really problematic places such as cross roads, junction points etc. Many of previous studies introduced GIS only as a visualization tool for pollution affected locations. The importance of this study was to use GIS as a management systemfor pollution analysis and determination of hot spots in salem with statistical analysis methods.A traffic impact analysis is a study which assesses the effects that a particular development's traffic will have on the transportation network in the community. These studies vary in their range of detail and complexity depending on the type, size and location of the development. Traffic impact studies should accompany developments which have the potential to impact the transportation network. They are important in assisting public agencies in making land use decisions. These studies can be used to help evaluate whether the development is appropriate for a site and what type of transportation improvements may be necessary.

II LITERATURE SURVEY

Noise and air pollution has become an alarming issue due to ever growing population and inevitable developmental activities throughout the globe, which poses cumulative stress to all

biotic entities. The increase in population and the number of circulating vehicles have led to an increase in the urban noise levels. The need for study regarding the urban noise and air pollution and its consequences for the environment have motivated various researchers on the problem in several countries (Burgess, 1977; Zheng, 1996; Yoshida and OsadaEnviromedia Printed in India. All rights reserved Thangadurai*et al.*1997; Ravichandran*etal,* 1997, 1998; Arana and Garcia, 1998; Suksaard *et al,* 1999; Abdel-Raziq *et al,* 2000; Zeid *et al,* 2000; Kanakasabai*et al,* 2002 Jorge *et al,*2004).The continuous exposure of the workers to high noise levels can cause Noise Induced Permanent Threshold Shift (NIPTS) in their hearing (Sharma *et al* .,1998), damages the ear drum and ossiclescausing deafness (Kudesia and Tiwari, 1993). The objective of the present research was to show the noise level measurements in different zones of the city and to bring in focus how far the people are unaware and expose to it.

III STUDY AREA

Salem district is geographically situated at about 11°39' N Latitude and 78°12'E Longitude is about 241m above the mean sea level except Yercaud hills. It has an area of about 7905.38 Km2 with 38,96,388 inhabitants. Entire district comprises of a hard rock terrain of Archean age with the principal rock type of granite and a semi-arid weather. It is assessable by National Highways 7 and 47, that connects major part of the state and the country. It has major industrial units like Steel Authority of India Limited (SAIL), Tamil Nadu Magnesite Limited (TANMAG) and many Sago units. Because of such importance, population rapidly increases and flooded with vehicular traffic throughout the day. As a result, noise has become a part of the city. spite of wide range of functions, which are implemented in the GIS for spatial data management, existing GIS do not offer effective programming environment for implementation of time and capacity consuming calculations in the frame of dynamic modelling. On the opposite site the GIS offer far more functions for storage and visualisation of data. So the GIS are mostly used in the frame of dynamic modelling of air pollution for pre-processing (data input, data analysisprinting maps, presentation of results on the Internet).
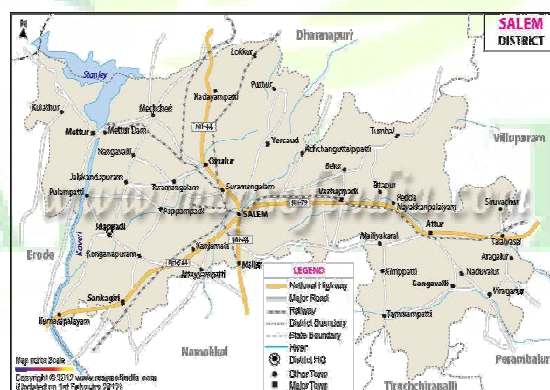
Fig 1: Outline of salem city

Air pollution

Monitoring of air pollution in larger urban areas belongs to standard routines of environmental assessment. The systems are usually divided on registering of sources of air pollution (emissions), assessment of air quality on the basis of monitoring (emissions) and other relevant information (smog regulation system, meteorological measurements and forecast). The sources of atmospheric pollution are registered into four categories in the REZZO Register. The first three classes comprise stationary sources. The fourth class contains mobile sources. The assessment of air pollution situation is based on data stored in central databases. Mostly monitored pollutants represent sulphur dioxide, nitrogen oxides, ground-level ozone, carbon monoxide, suspended particulate matter and aromatic hydrocarbons. The primary data have to be processed and analysed to derive specific characteristic for decision-making processes. The basic level covers geo statistical procedures (spatial correlation and regression, factor analysis, interpolation). In the frame of the GIS, the map algebra can be applied to estimate more complex -, estimation of model parameters) and post-processing (data management and visualisation, temporal spatio characteristics (risk assessment). The superstructure represents dynamic models that are focused on transport of air pollution and possibly chemical interaction in the urban environment.
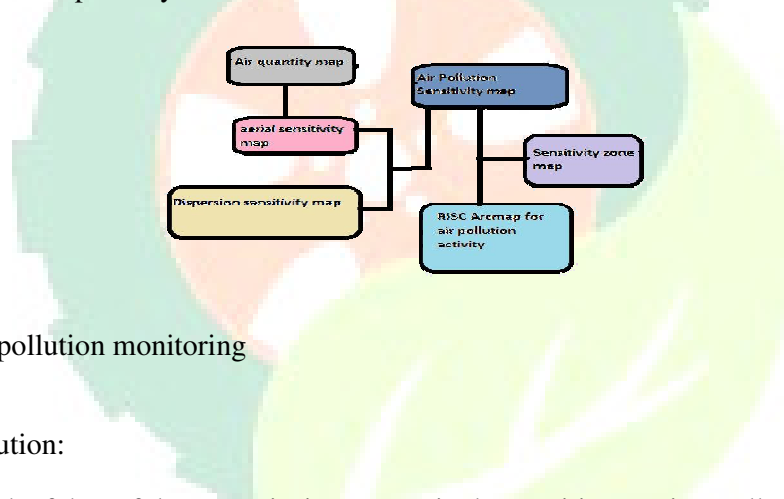
Fig 2: Air pollution monitoring

Noise Pollution:

Sound of harmful agents is important in large cities. Noise pollution an important environmental pollutants in urban areas of product development technology. The most important sources of traffic and traffic pollution are cars and forms of noise pollution are considered as linear. salem, as one of the most populous cities in the tamilnadu has been identified with low capacity and capacity than its current high population and increase in irregular vehicles required to conduct such research seems. In this study, the priority for the nearby 83 stations to measure the amount of noise pollution were selected and values level equivalent Sound pressure (dB) Networks A weight two times a day and night at intervals of 0.5 , 20 and 40 meters was measured highway. The results showed that the average level equivalent to a day with average level equivalent to night difference has little, so measuring future noise levels (dB), Lmax (dB) and Lmin (dB) at different times day Networks a weight at all stations were assessed. Also in this paper models and analysis of spatial analysis in GIS environment using three dimensional distributions and highway noise pollution and the amount of assistance within the detection method on the map for analysis and conclusion is shown. Average level equivalent is 24 dB over the standard value defined by the Department of Environment for residential areas surrounding highway. The substantial amounts of sound pressure levels measured around highwaysound statistical indicators highways were calculated. Finally, the results are in accordance with recommendations on how to reduce noise pollution and proper engineering methods in reducing their undesirable effects are

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presented.

Vehicular Emissions:

The density of motor vehicles per sq.km has increased from 22 in 1996 to 52 in 2004. This has led to traffic congestion and release of many toxic air pollutants into the atmosphere. Particularly, the growth of two wheelers is increasing in a steep manner, contributing to about 50.6 percent of the pollution load. Poor maintenance of vehicles results in the spewing out of noxious fumes into the atmosphere. Roughly 400 tones of smoke units are being discharged into the atmosphere every day by the vehicles is salem. Adulterated fuel adds another dimension to the problem of pollution. Apart from the concentration of vehicles in urban areas, other reasons for increasing vehicular pollution are the types of engines used, age of vehicles, congested traffic, poor road conditions, and outdated automotive technologies and traffic management systems. Vehicles are a major source of pollutants in major cities. The quantum of vehicular pollutants emitted is highest in salem followed by Coimbatore,Madurai,Trichy and Tirunelveli. Carbon monoxide (CO) and Hydrocarbons (HC) account for 64 per cent and 23 percent, respectively, of the total emission load due to vehicles.

The salient features of action taken to control vehicular pollution are as follow
Bharat Stage –II norms have been implemented for the registration of new passenger car from 1-7-2011. Catalytic Converter fitted passenger car have been registered since, 1997.Periodic inspection of in use vehicles in Chennai is conducted by the officials of transport Department and Police Department. Supply of Unleaded petrol from February 2000.In Chennai City Low sulphur diesel (0.05%) is supplied since 1-7-2001.Supply of Pre-mixed 2T oil since 1-4-2002 Entry of heavy vehicles is restricted by the road in Chennai city during peak hours. Ring Road have been constructed to avoid the entry of intercity vehicles in the city.

IV METHODOLOGY
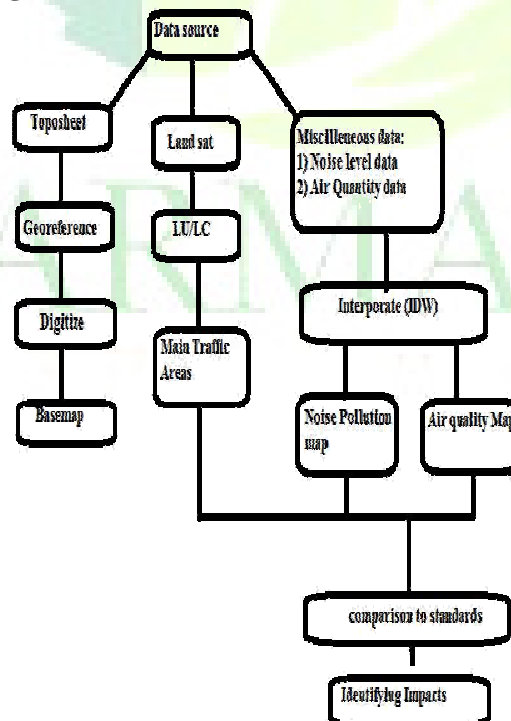
Fig 3: Block diagram of traffic Impact analysis

An existing digital map containing road network of the study area was used as a background on which GIS related results were displayed since one of the key successful components for real-time GPS mapping is a background map. After all the GPS data had been corrected and combined, it was then converted intoa block format (jpeg files) with the Total Trimble Control software. Data recorded by the GPS receiver was according to the World Grid System of 1984 (WGS84) reference system. Therefore the image data was first geo-referenced in the Arc Map to the world transformation system. The Arc Map then gave the possibility to visualize, explore, query, and analyze data spatially and to carry out a network analysis.

V RESULTS AND DISCUSSION

It is clear that the environmental impacts of road traffic can be modelled, analysed and mapped and that these processes can be considerably enhanced with the use of a GIS. One reason must be the large amount of effort required to set up the required GIS databases, which includes the collection of data to input to the models and obtaining the relevant geographic coverages by which to analyse the results. In addition, the end user has to acquire proficiency in operating the air pollution modelling software and then be able to transfer and manipulate the output in a GIS. Regrettably for the development of GIS, in the UK these data are relatively expensive,particularly for private individuals and organisations. In the case of local authorities, however, the data costs may be less to the end user as agreements exist at the organisation-level with suppliers, which spread the cost over a number of different departments. On the other hand, the reward for the effort and expense may be considerable. Once sufficient data are held in the GIS, traffic impacts may be modelled to cover a variety of differing circumstances.
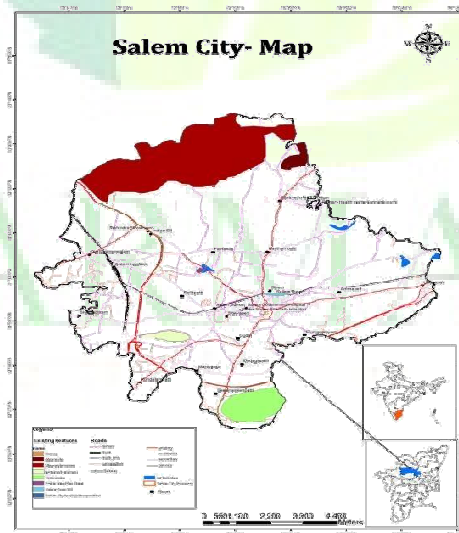
Fig 4: High traffic roads
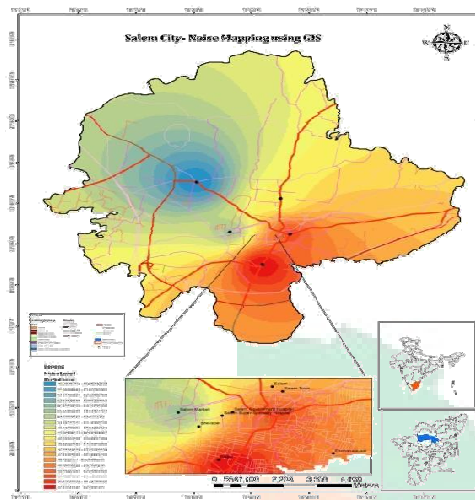
Fig 5: Polluted Area due to traffic

CONCLUSION

This paper looks at the possibilities for real time control of noise and air pollution. It is concluded that the environmental noise and air pollution problem caused by the traffic vehicles is the main cause of urban noise levels. The inhabitants living in these areas are bound to suffer from health problems and lowlife quality. From the technical point of view, it is necessary to take several measures in order to reduce the noise levels. In order to do so, measures should be considered as follows:Reduction of speed limits, mainly near residential areas, schools and hospitals. Incentives may be given to the vehicle manufactures to develop new systems in order to reduce sound power emissions. Removal of encroachments and banning the use of air horns within the city limits. Among all things that can be done to relieve the environmental noise and Air pollution problem in the city of Salem, the most effective one is to promote awareness of the population about the risks of daily exposure to high noise levels and air pollution level.

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