

A Survey on Environmental Impacts Due to Traffic Congestion in Peak Hours

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Abstract

Traffic congestions, air pollution, noise pollution & its resultant ill effects and frustration have become the order of the day. The necessitate for traffic evaluation and assessment is likely to improve for future development of Road Transport Network. Assessment of traffic is stipulation to planning of highways and flyovers. It also provides the basis for determining the number of traffic lanes to be provided for different road sections having regards to volume, composition and other parameters of traffic. Day by Day the increasing of population and numbers of vehicles also increases the load on traffic. Due to this increasing result into excess fuel consumption and which affect pollution. For manipulating the emanated fuel consumption and pollution load to the environment by HMV or LMV during rest at Traffic signal, appraisals were carried out at different traffic signal intersection in Nagpur city in the given research study, an investigations is carried out on the critical environmental impacts causes due to congestion of traffic.

Keywords: Traffic Congestion, Environmental effects, pollution, urban environment, impact, fuel loss, intersection, Noise

I. INTRODUCTION

Traffic is generally defined as the interchange of people, goods or vehicles between spatially separated points, and thus includes pedestrians and all types of vehicles mechanized, motorized or non-motorized. Today man and his transport vehicles occupy a large share of the urban space. Alternatively, for an existing road network traffic analysis provides a means of assessing the traffic conditions. Traffic analysis can therefore help further in the evaluation of investment needed for the future road constructions and improvements. Such traffic surveys are a valuable source of data for planning of highways, flyovers, roads etc. As such, these should be a regular feature in all the traffic departments. Nagpur, being a developing metro, has got a traffic density which is growing at a rapid pace. The perpetually increasing number of two wheelers, four wheelers along with public transport and pedestrians poses a serious a serious question mark for a smooth and congestion free movement of traffic. As we have seen effective management of traffic has been carried out at the heavily crowded areas like Sitabuldi, Wardha road, Hingna road, Sakkardhara, Mihan, Railway station etc. Flyovers of effective design of have been constructed keeping in view the density of the flow of the traffic and the roads undersurface it. They have provided flexible options to the commuters and thereby redistributed the traffic efficiently. Traffic surveys are an integral component of a comprehensive traffic and transportation study. Appreciation of existing traffic and travel characteristics is extremely important for the development of comprehensive traffic and transportation plan. There is the need to measure the total volume of vehicle i.e., Inflow and Outflow of vehicle at various intersection points at rest while signal turns to Red, so that the cumulative volume of the problem of it can be set up and steps can be taken to prevent vehicle idling. The purpose of the study is to assess the finding the volume of vehicles and to provide an estimation of Gaseous pollutant which affect environment due to congestion in peak hour presently in Nagpur city.

II. LITERATURE SURVEY

Traffic jam can be well-thought-out as one of the serious global problems for both developed and under developed countries. Traffic congested areas, especially in the urban areas traffic jams are an annoying and harmful problem to the residents and travelers. It is the consequence of discrepancy between transportation demand and supply. For the developing countries increases in urban population are creating pressure on the existing transportation system for which, traffic problem has already become a part of urban transportation system. In general, the development of transportation systems shaped the socio-economic benefit for any country. However, at the same time, this development is responsible for polluting the environment (Banerjee, 2009). Moreover, numerous industrial activities are causing irretrievable damage to the environment. Consequently, the quality of life of the city dwellers is also getting exasperation by disturbance of sleep, interruption of daily activities.

A. Impact of Air Pollution

The urban transportation activities affect the environment mainly in term of air pollution. In this study the motor vehicle emissions, mainly SO_x , NO_x and CO emissions during peak hour the average peak period emission rates of SO_2 , NO_2 and CO are 0.26, 0.79 and 13.44 ton per hour. At a rest position, engine speed gets increases. Engine speed severely affects the environment also. For increasing the engine speed from 600 to 1050 rpm, the emission rates of SO_2 , NO_2 and CO 2.5, 2 & 5 times (in grams/ hour) while idling 64,000 miles in peak hour in engine wears have been esteemed by Khairnr Mayank (May 2015)

B. Air Pollution From Urban Road Traffic

Air pollutants are airborne substances that occur in concentrations high enough to cause adverse effects on health, the environment and/or outdoor structures (amenity, property, cultural). Air pollutants can affect health in different ways and in varying degrees of severity ranging from minor irritation through serious illness to premature death. Air pollutant emissions come from both natural (e.g. Biogenic emissions) and anthropogenic (caused or produced by human being) sources. Although emissions from natural sources can be substantial and are indeed the main source in non-urban areas, this study specifically investigates (anthropogenic) road traffic emissions in urban areas. The emission of air pollutants has led to several air quality issues such as photochemical smog, acid rain, visibility degradation and irritation. Road transport emanates air pollutants from the incineration of liquid or gaseous fossil fuels (i.e., petrol or diesel). Although thousands of gaseous pollutants from the means of transportation traveling on the road patch can be ascertained, most of them can be classified in the subsequent major groups according to their origins and formation processes. (Z. Bin et.al, 2009)

C. Noise Cost

The speed of vehicle, type of vehicle, the kind of tyres and the vehicle's state of maintenance are the main reasons for noise cost. There are two approaches for the estimation of noise costs: bottom-up approach, top-down approach.

The bottom-up approach is generally called the 'Impact Pathway Approach', the starting point of which is the micro level, i.e. the traffic flow on a particular route. There are two scenarios to be scrutinized. The first one is called reference scenario which reflects the present scenario with traffic volume, speed allocation, vehicle technologies and so on. Another one is called as marginal scenario which is based on the reference scenario but includes one additional vehicle.

The top-down approach is using the Willingness to Pay or the Willingness to Accept (compensation) for more silence and the health effects and multiplies these unit values with the national data on noise exposure for different noise classes. This approach produces an average value. (Z. Bin et.al, 2009)

D. How Should Congestion Be Measured?

The use of free-flow speeds should not be used as a direct benchmark to measure congestion policy outcomes as such an approach obliquely suggests that successful policies deliver free-flow speeds a too high-priced goal for peak hour traffic. Free-flow speeds might be used as a standard of technical system performance but a better alternative might be to use median speeds or to use some other benchmark or set of benchmark values such as percentage of maximum legal speed or different speed bands. Congestion is typically categorized as either recurrent or non-recurrent:

Recurrent congestion is generally the consequence of factors that act regularly or periodically on the transportation system, such as daily commuting or weekend trips. However, even recurrent congestion can display a large degree of randomness, especially in its duration and severity. (School or colleges areas) Non-recurrent congestion is the effect of unexpected, unplanned or large events (e.g. highway works, crashes, special events and so on) that affect parts of the transportation system more or less arbitrarily and, as such, cannot be easily projected. The share of non-recurrent congestion varies from road network to road network and is linked to the presence and effectiveness of incident response strategies, roadwork scheduling and prevailing atmospheric conditions (snow, rain, fog, etc.).(A. Kostikj, et.al, 2012)

E. Environmental Effects:

Pollution: One of the most destructive effects of traffic congestion is its impact on the environment. Despite the growing number of hybrid (mix type) vehicles on the road, cars stopped in traffic still produce a large volume of harmful carbon emissions while signal is red. Besides aiding to global warming, these emissions can cause more short-term & localized problems, such as smog & increased respirational problems in a community due to deficient air quality.

In the Pollution there is also an Noise Pollution Impact on Environment in which the assessment of traffic noise pollution is not that much easy part of work and it get varies with types and physical conditions of vehicles, speed and road geometry Estimation of traffic noise is more difficult for considering the diversion in traffic conditions including mixed vehicle types, congestion, road conditions in Indian metro cities where the population is much more. (Vijay et.al, 2015)

F. Fuel Consumption & Pollution

The stopping & starting of vehicle in traffic bottleneck conditions burns fuel at a higher rate than the smooth rate of travel on the open highway. This increase in fuel consumption costs commuter's additional money for fuel & it also contributes to the amount of emissions released by the vehicles. These emissions create air pollution & are related to global warming.

1) Fuel Losses

Establishment of an integrated microscopic traffic-emission simulation platform for manipulating the hazardous vehicle emissions, as per to the studies which can capture the instantaneous vehicles modal activities and quantify the relationship between motor vehicles exhaust emissions and vehicles operating modes (Chen Kun et.al, 2007). Their study illustrated that vehicles emissions are sturdily dependent on vehicles operating modes or the vehicle operating studies, especially during acceleration while running and also in rest position at a signal. More advance, different instantaneous speeds and accelerations result in different traffic emissions. The impacts of different traffic control strategies on traffic emissions are analyzed and testified that vehicle emission is highly dependent on local driving cycle, hence local road, traffic, vehicle and their delay and driving pattern affect the vehicle emission ominously. (Ravindra Kumar et.al, 2011).

By applying the engineering/management measures at they selected 12 intersections points, to estimate the savings in delays and on the basis of the savings accrued at low, medium and high volume intersections the savings at the total signalized intersections was estimated, assuming similar kind of remedial measures. Their study reported a total of 67.78 per cent of savings in fuel wastage and 71.12 per cent savings in the economic loss due to fuel loss is expected to be accrued. The Annual fuel loses and monetary losses at signalized intersections in Delhi. It is evident from the data which collected that 13,58,69,632.0 Kilograms of CNG, 4,73,57,100.2 Litters of Diesel, 14, 784, 05, 94.7 Litters of Petrol worth Rs. 9945 Million is being wasted at the signalized intersections of Delhi during rest position of vehicles at signals.(Parida et.al,2008)

G. Suitable Mitigation Measures

1) Optimization of Signal Time

The improvement of Traffic signal timing is the most well-known congestion management practice in the World. The improvements of the Signal timing can include simple changes in timing plans or complex computer-controlled signal synchronization along an entire region. As a result of effective signal timing improvement if the congestion is reduced then safety is increased and the amount of emissions released to the air is also reduced (S. L. Hallmark, et.al,2004). Another study suggests that acceleration produces the highest emission rate whereas idling produces a lower rate of emission. Therefore, efforts aimed only at reducing stop time may not always be successful in achieving overall reductions in air pollution emissions. Study also suggests that signal timing get improves in traffic flow by which leads to reduction in vehicle emissions and adequate improvements in Level of Service (LOS) (Lei Yu, et.al, 2006)

2) Public Transportation System

The use of public transport creates a better and safer environment in the metropolitan cities by reducing traffic congestion, pollution and provides more efficiently, less costly and negligible energy solution to the Urban Transport problems also take less travel time. The processes such as arrangement of separate bus lanes/bus ways on major arterials, provision of bus priority signals, support of battery operated buses, introduction of premium bus services, enhancement of private participation to bring capacity enlargement and price difference etc. are to be taken to strengthen the road based public transport and avoid to use the individual vehicle and more on more awareness should be given to use the public transport. The impacts of different traffic control strategies on traffic emissions studied by (CHEN Kun et.al, 2007). They studied that setting bus lane can improve the traffic operation of the roads in the study network, and by which reduction of the emissions of CO, HC, and NO_x of buses respectively by 2.58 %, 5.02 %, and 2.67 %. However, setting bus exclusive lane increases the CO emissions of cars.

III. CONCLUSION

Traffic congestion is a critical issue in Congested cities. In this paper, make a small effort to put together some ideas and strategies which relates to the environments impacts. From the analysis work, it was found that sustainability concept can minimize congestion and excess emission of gaseous pollutant problem to some extent only.

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