Journal of Advances and Scholarly Researches in Allied Education

Vol. VI, Issue No. XII, October-2013, ISSN 2230-7540

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AN INTERNATIONALLY INDEXED PEER REVIEWED & REFEREED JOURNAL

www.ignited.in

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An Assessment of Traffic Characteristics and Trends of Delhi City with Increasing Urbanization

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Abstract – The revolution in the automobile industry and liberalised economy has led to tremendous increase in the vehicle ownership levels. This has resulted in changing traffic characteristics on road network. In this paper an attempt has been made to analyse the changing traffic composition trends, speed characteristics and travel patterns of Delhi.

Delhi is a fast growing city, which over the years has undergone landmark change in the characteristic of its transportation sector. Development and urbanization over the past decade has led to rapid increase in the population of Delhi, the metropolitan city of India. Consequently, there has been a tremendous increase in the number of vehicles, which are causing very high.

This Paper attempts to appreciate the problems & the critical issues in the traffic & transportation sector of the city. Further it attempts at proposing solutions to improve and manage the system in the coming years. oxides (NOX), sulfur dioxide (SO2), volatile organic compounds (VOCs), particulate levels of air pollution. Vehicular emissions are becoming most predominant source of air pollution in Delhi.

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INTRODUCTION

Similarly urbanization is direct in India. The urban population has developed from ten percent in 1901 to twenty eight percent in 2001. The skewed conveyance of the urban population amongst a couple of cities is a matter of concern to the organizers and managers of urban framework. About seventy percent of the urban population is found in Class-I cities (population of one hundred thousand and then some). Further 38 percent of the aggregate urban population is found in metropolitan cities (population of one million and that's just the beginning) numbering something like thirty-five. This overwhelming convergance of population in a couple of focuses has brought about the development of cities in density and area. With the expand in population and economic exercises the travel request has expanded numerous folds. The deficient open transport and the simple accessibility of financing offices for private vehicles have brought about expanded vehicle proprietorship levels and their use. Further, the progressions in urban structure and structure regarding fellow use, density of population and amassing of exercises have changed the travel design. As it were the traffic issues are expanding in the cities by and large and the circumstances is getting mind boggling particularly in center areas of the city.

Under the strong influence of urbanization, the urban population of India rapidly increased from 62 million in 1951 (20 per cent of total population) to a mammoth 326 million by 2001 (25.5 per cent of total population). At this rate it is expected that India will achieve 50 per cent urbanization by 2050, i.e., 50 per cent of the total population would be living in urban centers. This high rate of urbanization has also brought about a wide range of urban problems, especially in the field of transportation.

Delhi, the capital city of India is the third largest city in the country, with a total area of 1483 sq km and a burgeoning population of more than 14 million, Delhi has a total vehicular population of about 5 million, which is more than the combined vehicular population of Mumbai, Kolkatta & Chennai. The high vehicular population can be attributed to the fast rate of growth of the city's population & the comparative low rate of growth of its public transport (road & rail) system. The growth in personalized modes of transport & the comparative low rate of growth of public transport modes can be further emphasized by the fact that in 1999 for each bus in Delhi, there were 62 two-wheelers. 24 cars, 3 auto-rickshaws.

The amount of vehicles has become exponentially from 3.033 million in 1997-98 to 5.627 million in 2007-08 at a yearly compound growth rate of 6.42%. Decennial growth rate is generously higher if there should arise an occurrence of private vehicles (92.53%) as contrasted with commercial vehicles (13.41%). In the classification of private vehicles, cars & jeeps have enrolled a decennial growth rate of

126.14%, which is most elevated among all the classes of vehicles emulated by bikes (i.e. bike, cruiser & moped) with 79.62%. In the commercial classification of vehicles, Taxies, have enrolled most astounding decennial growth rate (82.35%) took after by Busses including light, medium and heavy Passengers vehicle (43.75%).

Auto rickshaws have enlisted a negative decennial growth rate of (-) 6.25%. The same pattern has been watched if information is contrasted with compound yearly rate of growth. It is normal that with extension of Metro and better bus transport the growth of private individual vehicles will be controlled.

S.No.	Category	No. of Vehicles		% Share in 2007-08	Decennial growth rate % [1997-98 to 2007-08]	Annual Compound Growth Rate %
		1997-98	2007-08			
A.	**Private Vehicles**					
i.	Four Wheelers [Cars, Jeeps Wagon]	765,000	1,730,000	30.74%	126.14%	8.73%
ii.	Two Wheelers [Scooter, Motorcycle]	1,992,000	3,578,000	63.59%	79.62%	6.03%
	Sub Total	**2757000**	**5308000**	**94.33%**	**92.53%**	**6.84%**
B.	**Commercial Vehicles**					
iii.	Auto Rickshaw	80,000	75,000	1.33%	(-)6.25%	(-)1.15%
iv.	Taxis	17,000	31,000	0.55%	82.35%	6.24%
v.	Buses	32,000	46,000	0.82%	43.75%	4.33%
vi.	Goods Vehicle+ Tractors	147,000	161,000	2.86%	9.52%	0.02%
	Sub Total	**276,000**	**313,000**	**5.56%**	**13.41%**	**0.81%**
	Total	**3,033,000**	**5,627,000**	**100%**	**85.41%**	**6.42%**

Table 1 : Growth of Motor Vehicles in Delhi up to 2007-08

In Delhi, the amount of vehicles for every 1000 persons has developed from 247 in 1997-98 to 332 in 2007-08, giving a 34.41% decennial growth rate. Throughout the same period, four wheelers in Delhi have expanded from 765000 to 1.73 million giving a decennial growth rate of 126%. Delhi had 102 four wheelers for every 1000 population in 2007-08 (Decennial growth of 64% throughout 1997-98 to 2007-08) of which 85 were private cars. By and large, auto entrance in India, nonetheless, keeps on remainning low at 8 cars for every 1000 population. Auto density in Delhi is more than 10 times of national normal.

Delhi is overwhelmingly subject to way transport, with the railways (roundabout Rail) indulging just about 1% of the neighborhood traffic. Till 2003, busses constituted about 1% of the aggregate number of vehicles, yet indulged 60% of the aggregate traffic burden, while customized vehicles represented 93.73% of the aggregate vehicles however pandered to just 30% of the aggregate traffic burden. Such a tremendous offer of private vehicles in Delhi, while serving a generally constrained reason regarding the transportation modal part, clearly makes huge weight on way space, stopping, and contamination specifically and through clogging.

Delhi has a ring rail system which is horribly underutilized. On the other hand, with initiation of Metro in Delhi, open transport in Delhi has seen distinguishable change. With each of the three passageways of stage I of MRTS and a few lines of stage II getting operational, something like one million traveler excursions are constantly covered by Metro. Table-2 surrenders transport interest conjecture to the year 2025 in urban areas of NCT- Delhi.

S. No	Item	2005	2011	2025
1	Intra city trips (million)	16.04	21.54	26.06
2	Modal split – Public transport (%)	82.00	82.00	82.00
3	Mass transport trips (million)	13.15	17.66	21.37
4	MRTS (Mass rapid transport systaem) (million)	4.32	5.80	7.1
5	Surface Rail (million)	1.42	1.90	2.30
6	Bus (million)	7.41	9.96	11.97
7	Peak hour factor (%)	10.00	10.00	10.00
8	Peak direction factor (%)	60.00	60.00	60.00

Table 2 : Transport Demand Forecast in Urban Areas of NCT- Delhi.

This high vehicular population & the consequent high traffic volume on the city roads, has put the transportation system in the city under heavy stress, with the situation getting worse day by day. Thus it is imperative to assess the transportation problems of the city & incorporate possible solutions, as envisaged in the various plans and programmes of Delhi Urban Area to mitigate these problems in the coming years.

VEHICLE POPULATION

The urban population in Delhi is predominantly dependent on road transport. Delhi has the largest number of vehicles compared to any other Indian city. The vehicle population growth in Delhi has sharply increased by an average annual rate of 7.40% for private vehicles and 9.15% for commercial vehicles (GNCTD, 2010). The number of vehicles per kilometer of road in Delhi has gone up from 128 to 191 between 2003 and 2009 (Goyal et al., 2013). Population data of different types of vehicle (e.g., Bus, LCV, HCV, Taxi Car, etc.) for Delhi has been derived from the Statistical Abstract of Delhi (2012). Annual average vehicle–kilometer travelled were assumed to be 10 000 for passenger cars; 36 000 for taxis and auto–rickshaws; 50 000 for buses and 30 000 for HCV and LCV (Guttikunda and Calori, 2013) and 27 000 for 2Ws (Sahu et al., 2011). Auto–rickshaws (or 3W) and buses have been assumed to use only CNG, as fuel post 2005. The population data of CNG vehicles has been taken from Ravindra et al. (2006) and the number of diesel vehicles is obtained from previous studies (Goyal, 2007). Diesel is mostly used in public passenger and cargo vehicles.

2Ws, light motor vehicles (passenger), cars and jeeps use gasoline. However, most of the buses and omni–buses and 5% of total cars and jeeps use compressed natural gas (Das and Parikh, 2004). Amongst the total 2W, 72% are motorbikes, and remaining 28% are scooters. Since 4S–2W emits less pollution compared to that of 2S–2W, thus a ratio of 72:28 has been considered for 4S–2W and 2S–2W. The age–wise

distribution of vehicular population of Delhi has been taken from CPCB (2010b).

CASE STUDY OF DELHI

Study Area –

The area of Delhi is partitioned into three parts (i) inward, (ii) center and (iii) external areas as demonstrated in Figure 1. As could be seen from the figure the internal area is the center area of Delhi comprising of Connaught Place, New Delhi Railway Station, walled city and encompassing areas. The center area incorporates for the most part the NDMC area and is limited by the Ring Road. The external area is the area outside the Ring Road and inside the limit of Delhi as indicated in Figure 1. The information acquired

through traffic reviews in Delhi were examined focused around the above areas.

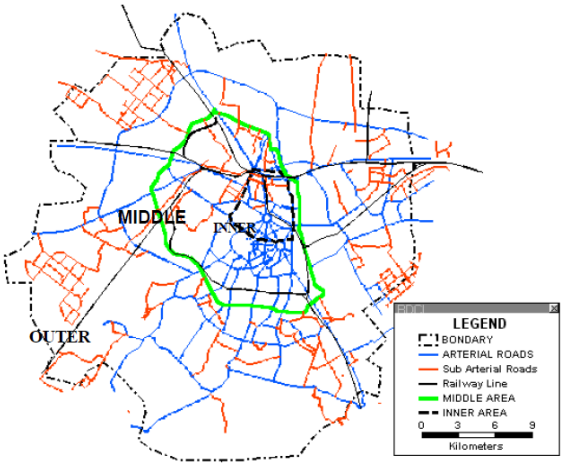

Figure 1. Major Road Network Of Delhi And Delineation Of Areas

Traffic Volume -

Grouped traffic volume exclude overviews were conveyed at a few (50 mid-pieces) areas. Proper proformae were used to record the amount of vehicles moving over the check point during a given time. From these traffic counts, volume of traffic in distinctive hours of the day has been listed at all the number focuses and the information has been broke down to comprehend the arrangement of traffic. Keeping in mind the end goal to comprehend the change in traffic characteristics and additionally to record for the recently created areas/land use the traffic review areas were chosen judiciously.

The typical hourly variation of traffic volume on selected road sections in each of the areas is shown in Figure 2. It can be observed from the figure that in all the areas goods traffic is generally low during daytime and the same is predominant during night hours (22:00 to 04:00). This is due to time/entry restrictions that are in vogue as part of the traffic management measures.

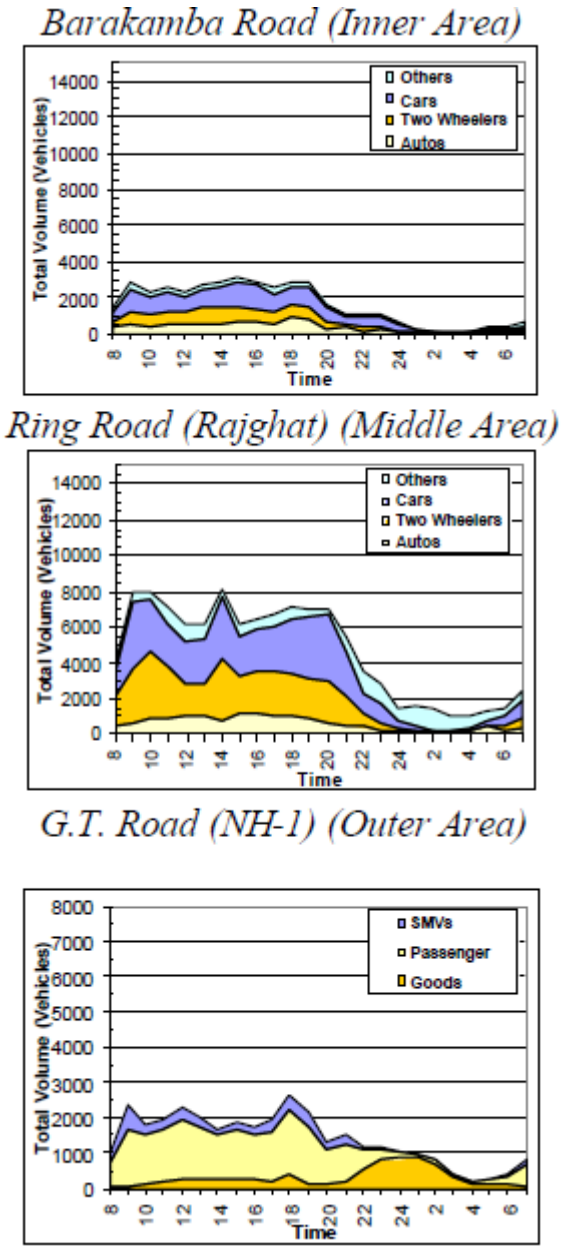

Figure 2. Traffic Flows on Selected Roads in Delhi.

Traffic Load on Road Network -

The classified traffic counts conducted at 42 mid-block, 10 outer cordon stations and 14 intersections provided extensive data on traffic flows on the road network of Delhi. Employing this data, the traffic flows have been arrived at on the adjoining links in the neighborhood of the count points. Thus the traffic flows along with composition have been worked out

for each of the links of the road network identified for the purpose of this study. To validate the figures of traffic arrived at on neighboring links sample traffic counts were made to confirm the same. The estimated traffic load along each of the links is translated into pictorial form using digitized map of Delhi and GIS Software, TRANSCAD and the same is presented in Figure 3.

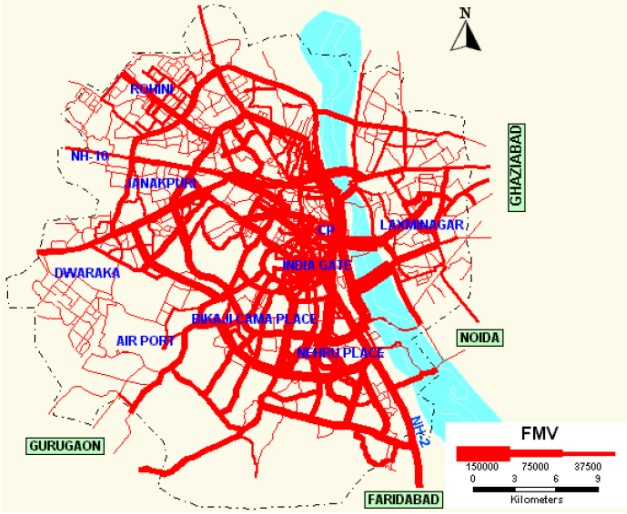

Figure 3 : Traffic Flow Pattern in Delhi

From the figure it can be seen that the radials and ring roads carry major portion of traffic movements in Delhi. Using the link traffic loads and composition of traffic by vehicle type, vehicle - kilometers traveled on each of the links have been estimated and in turn the total vehicle kilometers traveled by each category of vehicles on the road network of Delhi have been estimated.

TRAFFIC STUDIES

Three types of primary surveys (Ahmad S.A. 1999) are conducted with an objective to assess the traffic characteristics are turning movement survey, origin-destination survey and speed & delay survey.

Traffic Flow Characteristics -

Figure 4 shows the variation of traffic flow at different hours of the day at the western approach of the bridge i.e. Ring Road-Nizamuddin Bridge junction. It can be seen in the figure that the distinct peak traffic is observed between 9:30 hr - 10:30 hr and 17:45hr - 18:45 hr in the morning and evening peak hours respectively. The peak hour traffic is 12,129 PCU and 12,801 PCU in the morning and evening respectively. Figure 5 shows the hourly variation of traffic flow at the Sarai Kale Khan junction. It can be seen in the figure that the distinct peak traffic is observed between 9:30 hr-10: 30 hr and 17:45 hr-18: 45 hr in the morning and evening peak hours respectively. The peak hour traffic is 8,156 PCU and 8,334 PCU in the morning and evening respectively. Figure 6 shows the hourly variation of traffic in a day at Bhairon junction. The peak hours are same as Sarai Kale Khan and Nizamuddin junction. The traffic in peak hour is 11,971 PCU and 11,149 PCU in the morning and evening respectively. Figure 7 shows the variation of traffic flow at different hours of the day at the eastern approach of the bridge i.e. Noida More junction. The peak hour lies between 9:45 hr- 10: 45 hr and 18:00 hr-19:00 hr in the morning and evening peak hours respectively. The peak hour traffic flow is 10,309 PCU and 10,602 PCU in the morning and evening respectively.

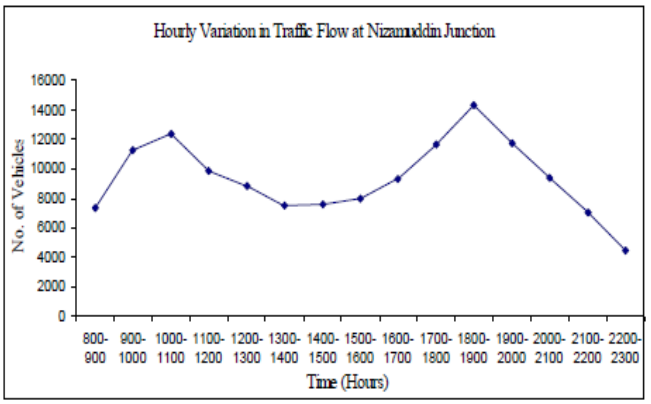

Figure 4. Hourly variation of traffic at Nizamuddin junction

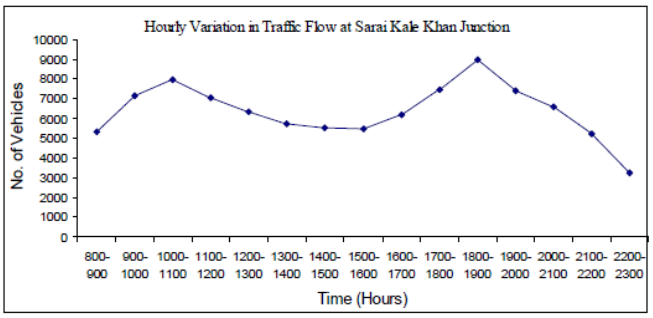

Figure 5. Hourly variation of traffic at Sarai Kale Khan junc-tion

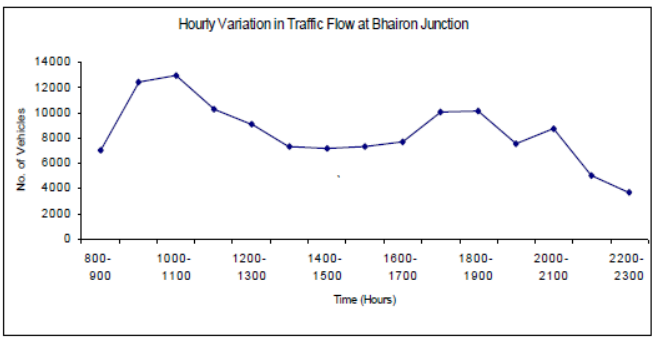

Figure 6. Hourly variation of traffic at Bhairon junction

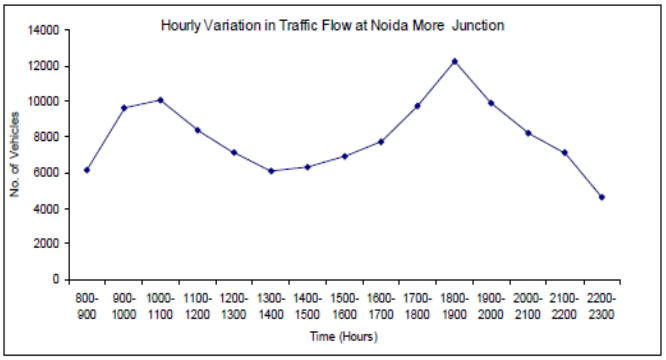

Figure 7. Hourly variation of traffic at Noida Mode junction.

Traffic Projection -

The traffic projection for future years of peak hours have been determined upto horizon year 2005 by taking growth rate of 5% per annum (LASA 1999). The projected peak hour traffic at Niamuddin junction for the year 2005 is 18,815 PCU and 19,859 PCU in the morning and evening respectively. At Sarai Kale Khan junction, projected peak hour traf-fic is 12,653 PCU and 12,930 PCU in the morning and evening peak hours respectively. Projected traf-fic in peak hour for Bhairon junction is 18,570 PCU and 17,295 PCU in the morning and evening peak hours respectively. The projected peak hour traffic at eastern approach of the bridge i.e. Noida More junc-tion is 15,999 PCU and 16,447 PCU in the morning and evening peak hours respectively.

TRANSPORT SYSTEMS IN DELHI

Delhi, the capital of India has a good network of rail & road and it also has a good system of airports. Consequently the city of Delhi is well connected, not only with all the major cities of the country but also that of the world.

Air -

Delhi has two airports, Palam (for domestic flights) & Indira Gandhi International airport (primarily for international flights).

Road -

Owing to improper development of rail based modes in Delhi, the city is heavily dependent on road based modes of transportation (93 per cent of the total trips performed in the city are made using road based transport systems).

BENEFITS

It is necessary to estimate future benefits to be accrued under different traffic alternative scenarios. An attempt has been made to estimate the future benefits with respect to saving in pollution cost and saving in vehicle operating cost .

HIGH CAPACITY BUS SYSTEMS OF DELHI

With rapid urbanization, the pressure on transportation systems has increased in most cities in India. The inadequate transport system of cities, accompanied by lack of comprehensive urban transport management strategies is promoting the use of private individual transport. Significant environmental, safety and health implications are associated with high traffic density and inefficiently designed urban transport systems. Most cities continue to face the problems of environment pollution, slower vehicular speeds, and traffic congestion accompanied by unacceptable accident rates. As a result, urban India encounters acute transport crisis and deteriorating air environment.

This situation calls for innovative, cost effective, safe and reliable transport strategies. Modern High Capacity Bus Systems (HCBS) integrated with information and communication technologies provide such an option for decongesting and improving urban transport situations. In most cities, buses are still the most widely used mode of conveyance and will continue to remain so. Therefore, it is crucial that

urban planners start looking at innovative ways by which the efficiency of the bus transport can be improved to cater o the growing urban population. Preferential right of way for buses along with priority for pedestrians and cyclists, intelligent transport systems, cleaner fuels and vehicle technologies could be the way forward for meeting the transport needs of our cities in the future.

HCBS is a term used for bus transportation systems that use available space on arterial roads of cities with dedicated bus ways.

Basically, HCBS can be defined as a fully integrated, bus-based “rapid” transit system typically utilizing highly flexible service and advanced technologies to improve customer convenience and reduce delays. It combines most of the qualities of light rail transit with the flexibility and lower operating, maintenance, and capital cost of buses. The following features typically characterize a HCBS system:

o Exclusive travel ways

o Modern stations

o Modern buses

o Rapid service

o Automated fare collection

o ITS technologies

o Lower costs

It is not necessary that all of the above systems be available at the same time.

CONCLUSION

In view of the prevailing traffic and transportation situation in Delhi's urban area, it is imperative to develop possible sustainable traffic scenario for the horizon year 2021. If the increasing traffic and transportation problems are not taken into consideration in the right perspective, there is going to be a tremendous impact on the society in terms of continued traffic congestion on the roads, excessive air pollution and traffic noise by road based vehicles and increased number of road accidents. After having had a critical appreciation of traffic and transportation characteristics in Delhi's urban area, the study is conclusive with the following: -

1. Major arterial roads in general and Ring Road in particular, should be fully access controlled either though area traffic control or with the help of grade separated facilities.

2. The policy adapted by Delhi government for switching over from gasoline to CNG based vehicles has been a welcome move. As a result the pollution level in Delhi is supposed to have declined considerably. What is required to be done at this stage, to refine the raw CNG into an acceptable proposition, so that CNG operated vehicles does not cause any harm to the society.

3. An attempt should be made to integrate metro system with the city buses, by introducing an integrated fare schemes so as to promote the public transport system.

4. Various transport related proposals as envisaged so far need to tested on grounds by developing detailed land use transport models with a view to assessing their future impact on environment.

5. As Traffic and Transport Planning exercise is a continuous process, a detailed comprehensive transportation study at regional level focusing Delhi Urban Area as nodal activity zone is required to be conducted not only to meet the growing challenges in future, but also to ensure better quality of life with the development of environment friendly sustainable transport system.

REFERENCES

- Rahman, "Application of Remote Sensing and GIS Techniques for Urban Environmental Mamangement and Sustainable Development of Delhi, India," Applied Re- mote Sensing for Urban Planning, Governance and Sus- tainability, Springer-Verlag Publishers, New York, 2007, pp. 165-197.

- Bose, Rajat; Prof (Dr.) Sarkar, P.K. & Dr. Maitri, V., "Cycle Rickshaws – A Sustainable Mode of Transport, Case Study – Walled City, Delhi;" Indian Highways, October, 2004.

- CRRI (2002). Urban Road Traffic and Air Pollution, Draft Report, Ministry of Petroleum and Natural Gas, Govt. of India.

- CRRI (1991). Development of Traffic and Transport Flow Data base for Road System in Delhi Urban Area. Report Submitted to Delhi Administration, Central Road Research Institute, New Delhi.

- Delhi Development Authority, "The Master Plan for Delhi—1962, 2001 & 2021,"

- Goyal, P., Mishra, D., Kumar, A., 2013. Vehicular emission inventory of criteria pollutants in Delhi. Springer Plus 216, 1–11.

- Katarzyna, Tota (1999). The role of non-motorized transport in sustainable urban transport systems: A preliminary analysis of costs and benefits of non-motorized and bus priority measures on Vikas Marg. Delhi , prepared for TERI, Delhi.

- Nagpure, A.S., Sharma, K., Gurjar, B.R., 2013. Traffic induced emission estimates and trends (2000–2005) in megacity Delhi. Urban Climate 4, 61–73.

- Popescu, C.G., 2011. Relationship between heavy traffic and heavy metals from particulate matters. Romanian Reports in Physics 63, 471–482.

- RITES Ltd.; "Revised Master Plan for Delhi MRTS, Final Report;" May 2002.

- Tiwari, G, Mohan, D and Fazio, J (1998). Conflict analysis in mixed traffic conditions. Accd. Anal. Prev. 30(2), 207–215.