

Traffic & Pedestrian Studies of Selected Routes in Nagpur City

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Abstract

Traffic flow is one of the major issues that most of the metropolitan cities are facing in spite of measures being taken to ease and reduce it. Traffic congestion in the recent past years, has emerged as one of the main challenge for engineers, planners and policy makers in urban areas. Also it is a challenge to provide efficient road width, footpath width, and signal time for the increasing demand with the limited resources available. In this research traffic flow and pedestrian facilities of selected routes in Nagpur city has been studied. This research investigates those sections of the Nagpur city which are considered among the busiest roads.

Key words

Traffic Flow, Pedestrian Facilities, Traffic Signal, Footpath, Traffic Congestion.

Introduction

Nagpur, being a developing metro, has got a traffic density which is growing at a rapid pace. The increasing number of two wheelers, four wheelers along with the public transport and pedestrians poses a severe issue for the smooth and congestion-free movement of the traffic. It is seen that no effective traffic management has been carried out at the heavily crowded areas like Variety square, Law College Square, Shankar Nagar Square, Ravi Nagar Square, Lokmat Square, etc. Effective designs of flyovers have been constructed keeping in view the density of the flow of the traffic and the roads underneath it.

One of the major reasons is the complexity involved in modelling pedestrian behaviour. Complexity arises from multiple parameters which affect the pedestrian crossing behaviour and are very difficult to identify. At signalized intersections, pedestrian travel is extremely high with lesser amount of safety measures provided to them. At gross level one will analyze the fundamental flow parameters like speed, density of pedestrian motion and at microscopic level one may track the paths followed by individual pedestrians while moving respectively. From this it is clear that the pedestrian may create their own paths in their journey trip.

Coming to the pedestrian crosswalks there were several cross walks like zebra crossing are designed for a road, provide gainful work to assist the pedestrians to move from one side to the opposite aspect of road, and which plays a significant role in the mobility and safety mode of signalized intersections. In some other places like where the busy traffic takes place, pedestrian choose the mid blocks to cross the road. But there's no safety as compared to signalized intersections. Even several pedestrian crosswalks area required in these midblock sections when pedestrian has to walk too much distance to either ends of divider to cross the road.

A number of traffic and transportation surveys were conducted as a part of the study in order to assess the passenger and goods movement pattern, travel characteristics, [1][2][3][4][5][6][7][8] pedestrian and parking characteristics and the available infrastructure facilities within the study area. The data collection activities included classified traffic volume counts, PCU, speed, footpath analysis, parking surveys, pedestrian surveys.

Objective of Work

- To study the traffic flow.
- parking facilities
- Pedestrian facilities available.

Review of Literature

Sachin Dass et al (2006) have reported that with an increase in the motor vehicular traffic and the corresponding increase in the corresponding increase in the congestion and increase in the road accidents. [12] The importance for improvement of the pedestrian facilities has assumed great significance.

Wen Dong and Alex Pentland (2008) have reported their results on the high resolution tracking data for hundreds to thousands of urban vehicles, [14] as well as the availability of digitized map data, provide urban planners unprecedented opportunities for better understanding urban motor vehicle transportation and for better exploiting the knowledge thereof.

Rajat Rastogi, et al, (2011), studied the Pedestrian Speeds at Midblock Crossings. Speed while crossing a road depends on various characteristics related to pedestrians, traffic, and physical features of the road. [10] A few of these characteristics are age, gender, pedestrian movement singly or in a group, traffic volume, size of the urban area, and width of the road.

Marisamynathan, Vedagiri Perumal (2014), [9] have analysed the crossing behaviour of pedestrians like crossing speed, compliance with signal, and pedestrian-vehicular interaction under mixed traffic conditions.

Rajko Horvat, Goran Kos, Marko Ševrović (2015), [11] studied the design elements of road infrastructure such as, Road type and number of traffic lanes, cross-sectional profile. A Scientifically model has been developed to explore the traffic flows to the exact of traffic flows in urban areas.

Tejas Rawal, V. Devadas (2015), have studied on the world wide recurring problem in road traffic congestion which was acutely faced by almost all major cities.[13]

Study Area

The study area is limited to three routes of Nagpur.

1. From Law college square to Shankar Nagar
2. From Lokmat square to Variety square
3. From Ravi nagar square to Ram Nagar square

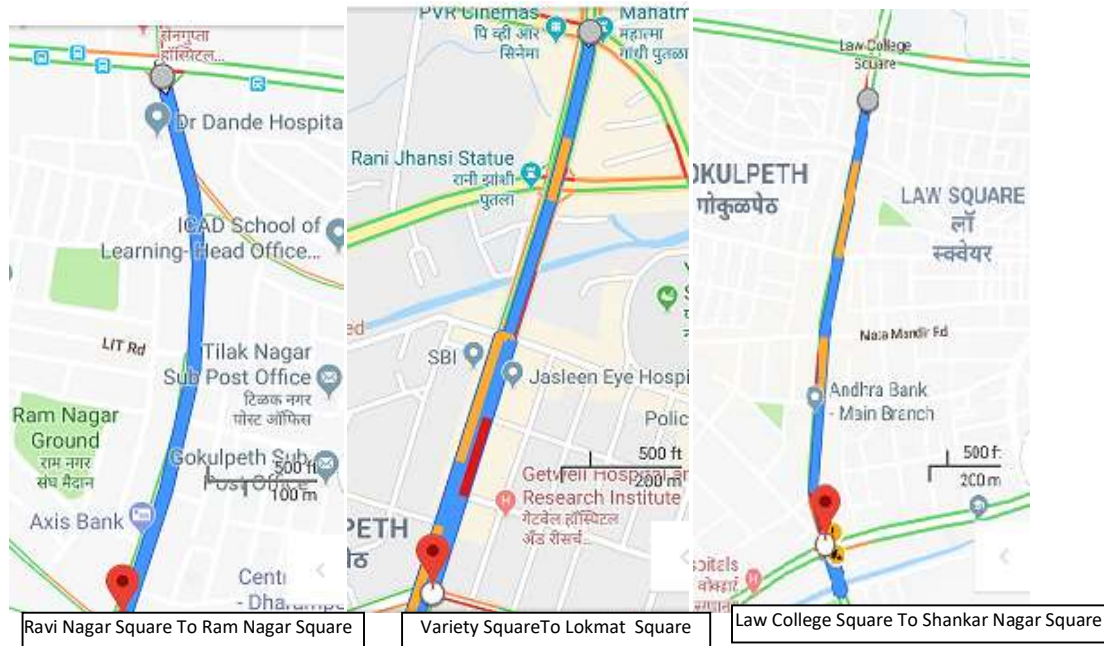


Figure 1: Google Map of Three Routes

Methodology

Traffic surveys and pedestrian studies were conducted. Pedestrian facilities were studied and all the data were analysed using Microsoft Excel.

Results and Discussion

Traffic volume data has been collected in all the routes of study area presented in the Figure 2, Figure 3, Table 1 and Table 2. Peak hour traffic volume is collected in the morning from 10 a.m. to 12 noon and in the evening from 4 p.m. to 6 p.m. Similarly Non peak hour traffic volume is collected from 1 p.m. to 4 p.m. Similarly total pedestrians using or not using footpath was also collected during the same peak and non-peak hours. Total footpath area and obstruction in footpath area was also studied, the data of the same is shown in Figure 4, Figure 5, Table 3 and Table 4. The obstruction area of footpath varies from 10% to 60%. Due to which the pedestrians are forced to use road which is meant for vehicles. This directly affects the speed of vehicles. The average speeds of two and four wheelers have fallen respectively to 25 KMPH and 22 KMPH. Also it observed that pedestrians not using footpath is almost ranges from 80% to 90%. This may be due to encroachment of footpath by roadside vendors and obstructions in footpath.

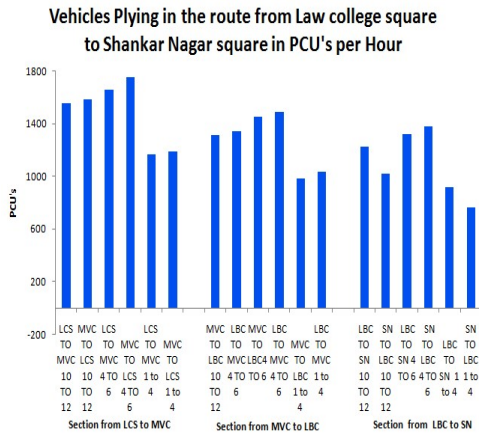


Figure 2: Sample Graph showing total Vehicles Plying (PCU's)

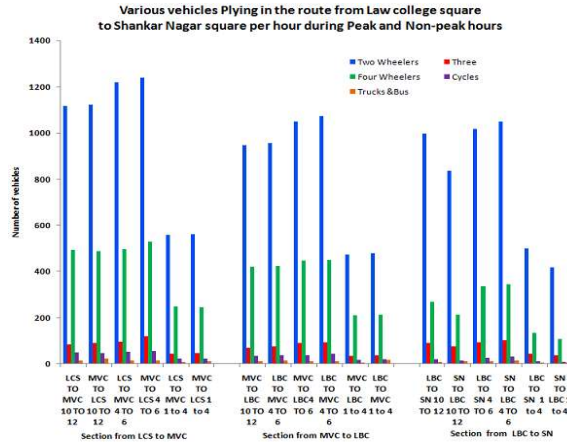


Figure 3: Sample Graph showing Vehicles Plying

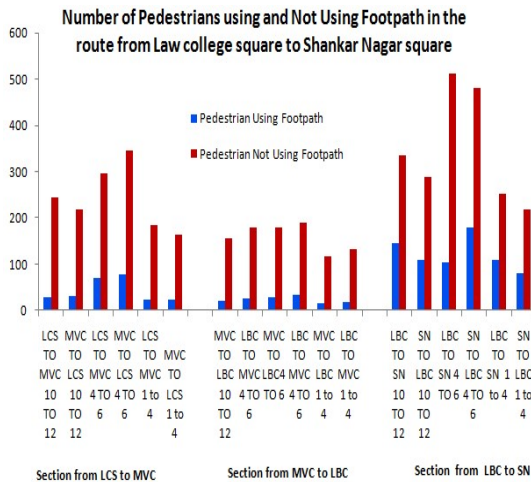


Figure 4: Sample Graph showing Utilization of Footpath by Pedestrians

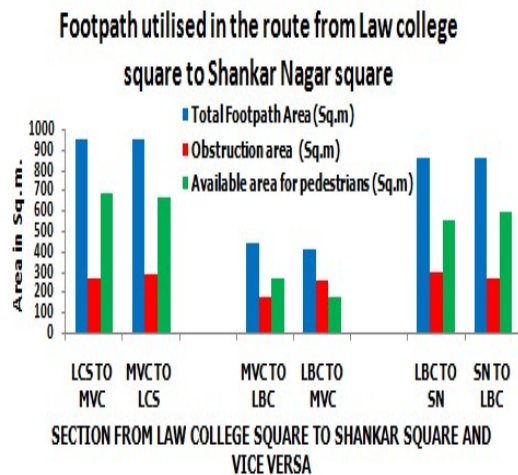


Figure 5: Sample Graph showing Availability and Obstruction Area of Footpath

Route from Lokmat square to Variety square	Two Wheelers	Three wheelers	Four Wheelers	Cycles	Trucks & Buses	Total Volume (in vehicles)	Total Volume (in PCU's)
LS TO PS 10 TO 12	3276	748	1148	126	110	5408	2697
PS TO LS 10 TO 12	3420	940	1023	145	198	5726	2981
LS TO PS 4 TO 6	3854	764	1040	98	102	5858	2861
PS TO LS 4 TO 6	3792	846	1326	114	116	6194	3081
LS TO PS 1 to 4	2456	561	861	94	82	4054	2022
PS TO LS 1 to 4	2565	705	767	108	148	4293	2235
PS TO JRS 10 TO	3490	823	951	107	117	5488	2757
JRS TO PS 10 TO	3156	795	923	101	103	5078	2574
PS TO JRS 4 TO 6	3875	789	1079	89	92	5924	2901
JRS TO PS 4 TO 6	3945	812	1145	95	97	6094	2990
PS TO JRS 1 to 4	2617	617	713	80	87	4114	2067
JRS TO PS 1 to 4	2367	596	692	75	77	3807	1929
JRS TO VS 10 TO	3820	1620	946	156	293	6835	3879
VS TO JRS 10 TO	3712	1570	897	167	274	6620	3745

JRS TO VS 4 TO 6	3492	1562	1380	128	310	6872	3928
VS TO JRS 4 TO 6	3516	1617	1423	132	306	6994	4010
JRS TO VS 1 to 4	2865	1215	709	117	219	5125	2908
VS TO JRS 1 to 4	2784	1177	672	125	205	4963	2808

Table 1: Traffic Volume in the Route from Lokmat Square to Variety Square

Route from Ravi Nagar square to Ram Nagar square	Two Wheelers	Three wheelers	Four Wheelers	Cycles	Trucks & Buses	Total Volume (in vehicles)	Total Volume (in PCU's)
RS TO LITR 10 TO	1489	229	728	32	42	2520	1204
LITR TO RS 10 TO	1372	214	718	28	36	2368	1133
RS TO LITR 10 TO	1836	258	840	36	48	3018	1427
LITR TO RS 4 TO	1921	261	872	39	54	3147	1485
RS TO LITR 10 TO	1377	193	630	27	36	2263	1069
LITR TO RS 1 to 4	1442	214	520	22	38	2236	1061
LITR TO RNS 10	1612	248	847	36	49	2792	1337
RNS TO LITR 10	1479	297	812	36	51	2675	1321
LITR TO RNS 4	1975	315	978	42	54	3364	1612
RNS TO LITR 4	2079	342	907	41	63	3432	1653
LITR TO RNS 1 to	1487	214	689	31	39	2460	1165
RNS TO LITR 1 to 4	1587	247	589	27	48	2498	1195

Table 2: Traffic Volume in the Route from Ravi Nagar Square to Ram Nagar Square

Route From Lokmat Square To Variety Square	Pedestrian Using Footpath	Pedestrian Not Using Footpath	Route From Ravi Nagar Square To Ram Nagar Square	Pedestrian Using Footpath	Pedestrian Not Using Footpath
LS TO PS 10 TO 12	20	1110	RS TO LITR 10	12	248
PS TO LS 10 TO 12	23	1117	LITR TO RS 10	15	236
LS TO PS 4 TO 6	28	916	RS TO LITR 4 TO	24	239
PS TO LS 4 TO 6	27	804	LITR TO RS 4 TO	23	243
LS TO PS 1 to 4	15	832	RS TO LITR 1 to 4	10	170
PS TO LS 1 to 4	17	838	LITR TO RS 1 to 4	12	178
PS TO JRS 10 TO 12	28	897	LITR TO RNS 10	18	287
JRS TO PS 10 TO 12	19	742	RNS TO LITR 10	21	264
PS TO JRS 4 TO 6	31	819	LITR TO RNS 4	25	289
JRS TO PS 4 TO 6	39	925	RNS TO LITR 4	27	281
PS TO JRS 1 to 4	21	672	LITR TO RNS 1	16	199
JRS TO PS 1 to 4	14	556	RNS TO LITR 1 to	19	197
JRS TO VS 10 TO 12	1200	2198			
VS TO JRS 10 TO	1324	2028			
JRS TO VS 4 TO 6	1500	2134			
VS TO JRS 4 TO 6	1489	2256			
JRS TO VS 1 to 4	900	1648			
VS TO JRS 1 to 4	993	1521			

Table 3: Pedestrian Using or Not Using Footpath in the two routes

Route From Lokmat Square To Variety Square	Total Footpath Area (Sq.m)	Obstruction area (Sq.m)	Available area for pedestrians (Sq.m)	Route From Ravi Nagar Square To Ramnagar Square	Total Footpath Area (Sq.m)	Obstruction area (Sq.m)	Available area for pedestrians (Sq.m)
LS TO PS	790.24	341	449.24	RS TO LITR	693	338	355
PS TO LS	788.44	441.86	346.58	LITR TO RS	745.5	323.4	422.1
PS TO JRS	493.06	88.34	404.72	LITR TO RNS	670	120	550
JRS TO PS	507.32	252.87	254.45	RNS TO LITR	790.24	341	449.24
JRS TO VS	535.35	200.82	334.53				
VS TO JRS	507.22	266.7	240.52				

Table 4: Total Footpath Area Obstruction due to Encroachments and Other Factors in the Two Routes

Conclusion

- It has been observed that out of the three road routes, maximum traffic is from Variety Square to Jhansi Rani Square. This is because it is considered as the most crowded area in Nagpur city.
- Since this region is a Central Business Area (CBA), here traffic count is higher as compared to the remaining two stretches.
- The pedestrian count is maximum on Variety Square to Jhansi Rani Square stretch. Due to encroachments, the complete footpath stretch is not available to the pedestrians. There are also various obstructions on the foot path which made pedestrians to step up and step down of footpath.
- On all the three routes it has observed that the footpath tiles were broken on many places, and at some points, the length of broken footpath is greater than 20 meters.
- Trees, electric poles, telephone DP boxes, shopkeepers' encroachments, removal of paver tiles/blocks and various openings were present in between the footpath which becomes the obstructions while walking through it.
- It has been observed that percentage area availability of footpath for the pedestrians is very less. So pedestrians have been forced to use road in place of footpath.
- On all the three routes, it was observed that vehicles were parked in no parking zone and also in haphazard ways. Also the pedestrians were using road due to encroachment of footpaths and obstructions on the footpaths. These are the reasons which resulted in decreased average speed of the vehicles plying on the road.
- Routine maintenance of the footpath with strict removal of encroachment will lead to smooth movement of the pedestrians.
- Pedestrians are encouraged to use footpaths and they are strictly warned not to use the road, which will result in full availability of width of road for vehicles and smooth traffic flow of vehicles.
- Strict and structural parking area will enhance the speed of vehicles.

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