

NMT: An Issue for Sustainable Development

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Abstract

Pedestrians, bicyclists and non-motorized rickshaw are the most critical elements in mixed traffic. Several researchers are agreed that the congestion at the major urban roads is due to overlook attitude for NMT. So it's important to create a safe pedestrians, bicycle and public transport friendly urban roads without increasing the right of way of existing arterial roads in most of the cities. Sahara Darwaja is main entrance of Surat city of Gujarat state and connecting major employment center with the residential center. During peak hour about 6000 Pedestrians are crossing this area. These high density Pedestrian flows create chaotic movements and results into congestion, delay, pollution and unsafe movements. This paper focusing the issues related to NMT and improvement of traffic condition to have sustainable transportation planning. At the concluding remarks authors are focusing the less expensive and less disruptive planning proposals for the surrounding land uses.

Keyword- Sustainable Development, Non-Motorized Transportation

I. INTRODUCTION

In developing world, cities are searching sustainable solution for mobility. This search becomes complicated due to rapid rise of urbanization as result of motorization, migration and population rise. With the rapid rise in the urbanization the travel demands also grown faster than the population growth increasing movements between the city centre (or work place) and suburb (or nearby residential area) by variety of modes such as walking, cycling, two wheeler, car, Para transit, public transport, etc. The migrated population are settling nearby the city centre or work place due to less affordability and in absence of public transport facility or insufficient public transport facility they are choosing walking as mode of travel to reach at work place from residence and vice versa. This result into the high density pedestrian flow during peak hours along with other modes of travel resulting into congestion, delay, poor operating conditions for other vehicles with high rate of pollution.

Like many other cities, Surat is also attracting large numbers of migrated population along with floating population in search of work. The study area of Bombay Market to Sahara Darwaja corridor is surrounded with residential areas like Suryanagar Society, Parvat patia, Puna gam, Raju nagar, Jiavant nagar, Trikam nagar, Mahendra Park and Market place at Ring road being flooded with high density pedestrian flow during peak hour. It was estimated that 50% of the flow during peak hour is composed of pedestrian flow. This high density pedestrian flow with limited infrastructure facilities resulting into the congestion, accidents, pollution and delay to other modes of travel. This corridor becomes critical and creating unsafe movement for Pedestrian and other Non-Motorized mode merging with high magnitude travel trip of goods and passenger vehicles during peak hours. Detail study of classified Traffic Volume, Inventory Study, Accident Study, and Pollution Measurement was carried out to understand the critical issues of the study area from NMT point of view. Based on study various proposals has been given for better traffic management creating safe and pollution free movement for pedestrian and bicyclist.

II. STUDY AREA

Surat is a city located on the western part of India in the state of Gujarat. It is one of the most dynamic cities of India with one of the fastest growing city due to migration from various parts of Gujarat and other states of India. Population of city is about 28 lacs spread over 326 sq.km on the bank of river Tapi.

The study area of Bombay Market to Sahara Darwaja corridor is situated in south-east zone of Surat city. The study area is having mix development of residential as well as commercial. Figure 1 show the aerial view of the study area as available from Google to present realistic view of the study area. The study area is situated on Surat-Bardoli corridor. Textile markets are situated near residential area so this road carries high volume pedestrian traffic as well as non-motorized modes of vehicles. Apart from this the road connecting N.H. 8 which is the major entry and exit point for Surat city leading to higher vehicular population in the area.



Fig. 1: Aerial View of Study Area

(Source: Google Earth)

The major road Bombay market to Sahara darwaja is two lane divided highway having width of 18 m from Sahara darwaja to Bombay market and 17.5 m from Bombay market to Sahara darwaja. At 500 m from Sahara darwaja there is a railway underpass having three open segments of width 8.5 m, 9.5 m and 8.5 m respectively. The area is surrounded by SMIMMER hospital, travelers' offices, shopping complex & slum area.

III. TRAFFIC SURVEYS AND OBSERVATIONS

A. Traffic Volume Survey

Manual method was opted to carryout traffic volume survey for a one week near railway over bridge at Sahara Darwaja. Survey was carried out for hourly basis classified volume. Traffic survey was carried out from 6:00 AM to 6:00 PM. Table 1 shows the Classified Traffic Volume at Sahara Darwaja and whereas Figure 2 reflects Classified Hourly Traffic Flow.

Table 1: Classified Traffic Volume at Sahara Darwaja

Time	PEDESTRIAN	CYCLE	2W	3W	4W	HMV	OTHERS	TOTAL (Vph)
6.00 - 7.00	261	128	414	807	53	77	8	1748
7.00 - 8.00	380	330	786	1509	119	130	22	3276
8.00 - 9.00	696	738	1022	1980	164	126	71	4797
9.00 - 10.00	3138	719	2411	2362	173	94	80	8977
10.00 - 11.00	6692	1315	3596	1769	302	134	31	13839
11.00 - 12.00	3124	689	4733	1236	371	121	21	10295
12.00 - 13.00	747	154	3059	1191	340	139	29	5659
13.00 - 14.00	552	184	2413	1246	408	232	17	5052
14.00 - 15.00	347	149	2084	1169	363	130	14	4256
15.00 - 16.00	287	124	2044	1082	294	81	16	3928
16.00 - 17.00	338	129	2265	1225	299	83	11	4350
17.00 - 18.00	470	140	2482	1495	261	55	14	4917
18.00 - 19.00	719	360	2481	1577	415	52	19	5623
19.00 - 20.00	764	303	2532	1660	420	70	15	5764
20.00 - 21.00	534	184	2284	1645	338	51	17	5053
21.00 - 22.00	318	88	2003	1386	228	40	6	4069
22.00 - 23.00	44	36	855	1166	124	25	6	2257
23.00 - 24.00	42	50	624	1111	87	23	1	1937
0.00 - 1.00	30	25	495	718	37	12	1	1319
1.00 - 2.00	9	4	124	254	54	2	1	449
2.00 - 3.00	10	6	91	146	28	9	0	289
3.00 - 4.00	34	24	65	221	13	18	0	375
4.00 - 5.00	94	76	190	350	61	10	2	782
5.00 - 6.00	151	147	319	462	110	33	13	1235
Total	19780	6103	39372	27768	5062	1747	415	100246

Table 1: shows morning peak hour traffic of 13,839 vehicles observed during 10 am to 11 am whereas evening peak hour traffic of 5764 vehicles are observed during 7 pm to 8 pm.

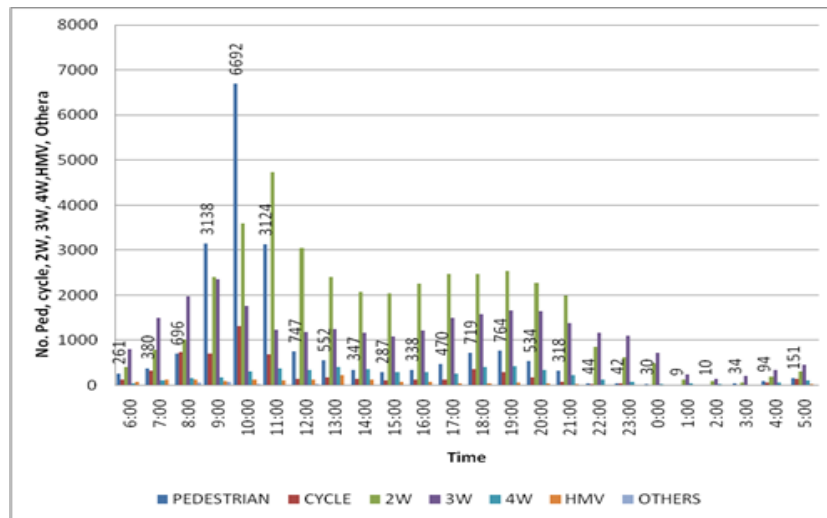


Fig. 2: Classified Hourly Traffic Flow at Sahara Darwaja

Figure 2 clearly indicate that during peak hour, flow of pedestrian is high as 6692 persons / hour compare to the other modes of traffic. This will be the critical point which is to be focus for better traffic management.

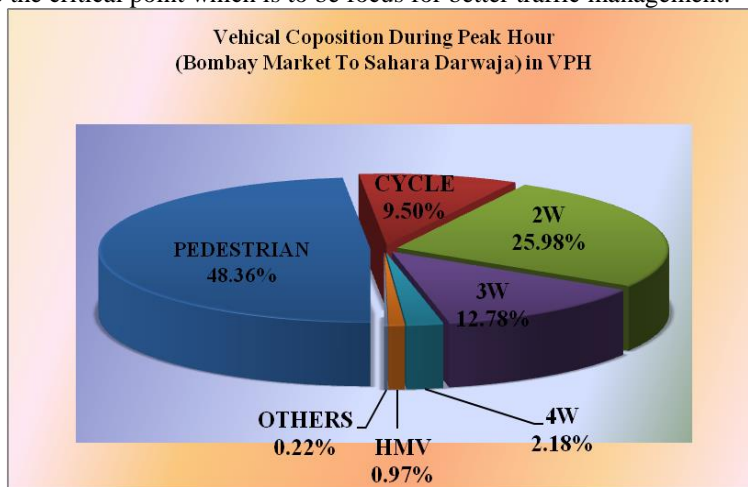


Fig. 3: Vehicle Composition during Peak Hour at Sahara Darwaja

Figure 3 clearly indicates that pedestrian flow is as high as 48.36 % of total traffic flow where as it is estimated that half the traffic i.e. 58.08 % is composed of NMT in absences of public transport system the three wheeler and two wheeler was found to be 12.78 % and 25.98 % respectively.

B. Accident Data

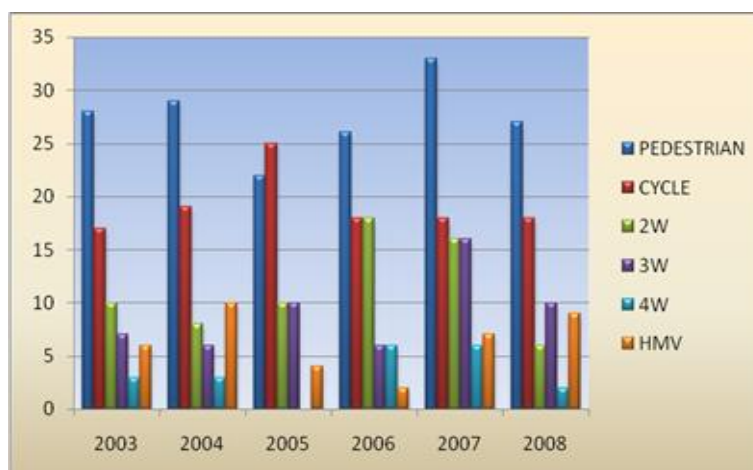


Fig. 4: Accident Analysis for Study Area

The data for the accident was collected from the three different police stations and analysis of the same is produce in Figure 4. It was observed that the pedestrians are more affected then the other vehicles. Pedestrians are more affected as high as 33 accident in 2007 where as low as 22 accident in 2005. So it's required to think a separate path for NMT transport.

C. Pollution Data

To measure level of pollution High Volume Sampler is used. Emission of various pollutants as SO_x, NO_x, SPM were recorded and are presented in Table 2. The data were collected for three days for peak hour duration 10:00 AM to 11:00 AM.

Day	SO _x (µg/m ³)	NO _x (µg/m ³)	SPM (µg/m ³)
1	106	61	614
2	104	62	616
3	108	58	618
limit Specified by CPCB	80	60	360

Table 2: Emission of Various Pollutants at Sahara Darwaja

The observed emission of SO_x, NO_x and SPM is very high compare to acceptable values stipulated by Central Pollution Control Board. This high level of pollution will create the unsafe environment for the road users.

IV. TRAFFIC ISSUES

A. Lack of Traffic Management by Traffic Police

Figure 5 shows the photograph of vehicle movement during peak hour. It shows that at junction of Sahara darwaja, when vehicle traffic move from Sahara darwaja to Udhna darwaja during red face of signal, at the same time pedestrians also walk from Bombay market across that road. Here zebra crossing is covered by vehicles, and pedestrian has to force fully move away from zebra crossing. This indicates the ineffective management of traffic which results into pedestrian vehicle control even after provision of zebra crossing and traffic police.



Fig. 5: Lack of Traffic Management in Study Area

B. High Density Pedestrian Flow during Peak Hour

Figure 6 shows the high density pedestrian flow at study area during peak hour. Sahara darwaja junction is surrounded by markets and during peak hour Sahara darwaja junction is full with the pedestrian traffic occupying the same length and width of road as occupied by motorized vehicles. This heterogeneity will lead to less pedestrian safety, poor walking and environmental condition for pedestrian traffic. This will cause the road accident affecting



Fig. 6: High density pedestrian flow at study area

C. Inadequate Infrastructure Facility

Due to lack of the pedestrian footpath, zebra crossing, pedestrian signal, pedestrian separate path, cycle track rest place for the pedestrian etc the pedestrian movement become unsafe and which lead to pedestrian vehicular conjunction and lead to mix traffic conjunction. Figure 7 shows the unsafe road crossing by pedestrian at junction.



Fig. 7: Unsafe Road Crossing at Sahara darwaja

D. Road Side Venders & Service Provider

Footpath is provided for the pedestrian for the safe movement of people but due to overlook attitude if the local body footpath is occupied by venders & service provider which will forcing the pedestrian to move on the road lead to accident and unsafe movement to other vehicle also. Figure 8 & 9 shows the footpath occupied by venders forcing the pedestrian to move on roads.



Fig. 8: Road Side Venders



Fig. 9: Improper use of footpath

V. PROPOSAL FOR NMT

Pedestrian facilities should be planned in an integrated manner so as to ensure a continuous pedestrian flow. It should be useful therefore to look at pedestrian needs for an area as a whole and prepare an overall strategic plan.

The basic aim should be to reduce pedestrian conflicts with vehicular traffic to the minimum. Efforts should be made to create such conditions that pedestrians are not forced to walk in unsafe circumstances, and that the motorists respect the position of pedestrians.

Analysis of collected data shows that during peak hour the flow of pedestrian is 48.36 % of the total traffic, whereas NMT comprises 58.08 % of the total traffic. This high density of pedestrian flow is critical where heavy vehicular traffic moving on the busiest corridor of Surat. Looking to the critical facts about NMT it is proposed to have High Density Pedestrian Corridor (HDPC). Figure 10 shows the plan with HDPC in the study area. Figure 11 & 12 shows the typical cross section for proposed HDPC.



Fig. 10: High Density Pedestrian Corridor (HPDC) at Sahara Darwaja

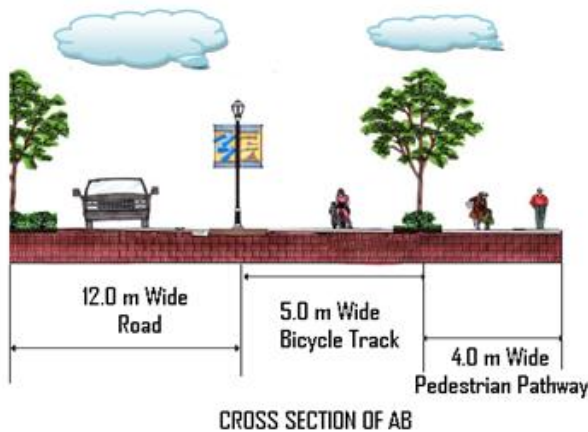


Fig. 11: Cross Section at AB

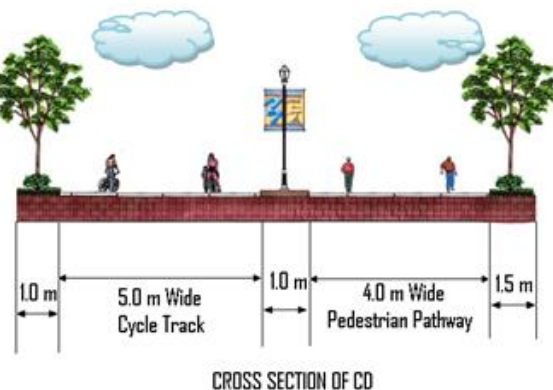


Fig. 12: Cross Section at CD

To reduce the conflict between pedestrian and vehicles a segregated lane is proposed to have the effective, safe movement of high density pedestrian. This High Density Pedestrian Corridor will start from Bombay market and it will pass through the last segment of underpass and it will have diversion behind SMC shopping centre and it will end at Anubhav market. This path carries the high density pedestrian up to the Anubhav market which is at the mid of all textile market area. Also there are two approaches are diverted to reach J.J. market and Jash market from behind shopping centre and transport godown respectively.

As per IRC-103-1988 width of 4.0 m is recommended for the traffic of 4000 persons/hour in both directions. Also to provide the facility for bicyclist bicycle lane along with the High Density Pedestrian Corridor is provided of 4.6 m. 1 m and 1.5 m separate lane is provided for the shops for road side vendors, rest place, sulabh sauchalaya and recreational spot is provided.

VI. CONCLUSION

Quality of life as well as safety of people is affected by transport system. The problem such as traffic congestion, rising air pollution and accidents are faced by commuters in the dense residential – commercial area. The study of existing NMT modes and the overall traffic scenario for Sahara Darwaja – Bombay Market corridor shows that there are problems of NMT & pedestrian flow, its safety & other facility in the study area. This type of problem can solve by compact and strong urban transport system. The main objective of this problem can be solved and establish significantly for a people by improving the efficiency and effectiveness of the city's transport system. The High Density Pedestrian Corridor can be one of the most suitable solutions to improve the existing condition by providing separate pedestrian lane with efficient crossing designs.

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