NMT PLANNING NEED AT SAHARA INTERSECTION OF SURAT

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***Abstract**: From the beginning of history, human sensitivity has revealed an urge for mobility leading to a measure of Society's progress. The history of this mobility or transport is the history of civilization. For any country to develop with right momentum, effective and efficient transport as basic infrastructure is a must. Urban areas are engines of economic growth for any nation and efficient transportation systems act as fuel. Surat (the diamond capital of India) of Gujarat state is one of the most important city in the state and the 8th populous city in the country as per Census of India, 2011 accommodating a population of 44.62 Lakh. Since last three decades, it has achieved drastic population increase with considerable immigration of workers feeding the needs of globally known textile, diamonds and real estate industries of Surat. The city, today is having a spread over 327 Sq Km having diverse land use at various locations. Apart from industrial clusters, there are commercial clusters across the city, one of which is the famous Textile Market area on the Ring Road connecting Surat railways station to other parts of city. The market area has a grade separated road already in operation. However, a very nearby intersection of Sahara is serving as a node to various links reaching to different residential pockets of work force of this market. Present study discusses an academic field survey (at 15 minutes interval) based observation of existing facilities for pedestrians and bicycle users on the intersection and the volume. It was observed that during morning peak hours (i.e. 9.30 to 11.30 am) average volume of pedestrian and bicycle users was reaching at 38,878 and 4,823 respectively while in the evening normal hours (i.e.4.30 to 6.30 pm) the same were observed as 17,362 and 1,382 respectively that leads to demand for focus and re-adjustment of the intersection geometry. Also, the paper discusses two alternatives that may be thought upon as options to serve the NMT users.*

***Keywords**: Bicycle, Intersection redevelopment, NMT users, pedestrian, Sahara intersection, Surat.*

1. INTRODUCTION

At global level, it was reported by the UN-Habitat that 47% of the total population was urban in year 2000 which was expected to reach up to 60% by the year 2030. Urbanization in India was mainly caused after independence, due to adoption of mixed system of economy by the country which gave rise to the development of private sector. Urbanization is taking place at a faster rate in India. The process of urbanization increases both in the number and size of towns and cities. Urbanization is the most significant phenomenon of the 20th century which has almost affected all aspects of the national life in India. Urbanization in India is in pace with 33% of total population of the country and as per UN-Habitat the same is expected to cross 40% by the year 2025.

Surat is famous for its food and now it is “the silk city” as well as “the diamond capital” of India. There are hundreds of cloth manufacturing and allied industries located in and surroundings of the city. The city is one of the oldest historical trade centers of India. The historical development of Surat dates back to 300 B.C. Surat city is located in well-developed South Gujarat region. The city occupies a pivotal position on the Ahmedabad – Mumbai corridor centrally located at a distance of

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260 km North of Bombay and 224 km South of Ahmedabad, as well as on the 225 km long industrial belt, having direct linkages with the industrial urban centers of Vadodara, Ankleshwar and Vapi.

Due to rapid industrialization, with the large establishments of KRIBHCO, L & T, ESSAR, NTPC, Reliance industries etc. and in addition to the normal development of the traditional textile industries, diamond industries and construction activities, Surat has become an important growth magnet for the migrants. Also relatively peaceful and harmonious social environment and moderate climate has converted the migrants into permanent settlers in the city. This resulted in higher decadal growth compared to any city in the state in last two decades. Following table shows the increase in population over last century with population density and sex ratio in context of spatial spread of the city.

Years	Area (in Sq Km)	Population in Lakhs	Density in ppHa	Sex ratio
1901	8.18	1,19,306	145.85	953
1911	8.18	1,14,868	140.42	926
1921	8.18	1,17,434	143.56	902
1931	8.18	98,936	120.94	868
1941	8.18	1,71,443	209.58	898
1951	8.18	2,23,182	272.83	916
1961	8.18	2,88,026	352.11	915
1971	33.85	4,71,656	139.33	887
1981	55.56	7,76,583	139.77	857
1991	111.16	14,98,817	134.83	839
2001	112.28	24,33,785	216.76	777
2011	327.34	44,62,002	188.00	758

Table 1 Demography of Surat

The table shows that with increase in the geographical area of the city and population, the sex ratio has decreased. This in particular indicate the considerable presence of males and the industrialization may be a governing reason to think upon.

2. CASE STUDY AREA

The textile industry is one of the oldest industries in the country and continues to be a significant contributor to value of industrial production, employment generation and to national income. An estimated 5 percent of GDP is contributed from the sector. It adds to about 30% of country's export earnings while adding about 7 to 8% of the gross import bill. The industry consist of manufacturing, trading, power looms units, processing units, texturizing units, cutting-packing-dispatching-ancillary units. Surat is well established with all there varieties of units in considerably good number.

Commercial activities at the Textile Market area located on the Ring road is predominated by the trading activity of different products of raw to finished cloths. Fig. 1 show the textile market area on the satellite image. Sahara intersection is a major crossing of four road arms, connecting Surat railway station, Udhna, NH8 and Bardoli and the city core areas. Within a distance of 100 Mt. the western railway line (having 8 Mt. embankment with three box underpass) passes in parallel to the ring road. Also, the intersection is having a grade separated elevated four lane road at 14 Mt. height from the intersection road level. The intersection is operated by the Surat Traffic Police through manned signal system. None of the arms have any footpath or parking spaces with few of intersection

geometrical elements in existence.

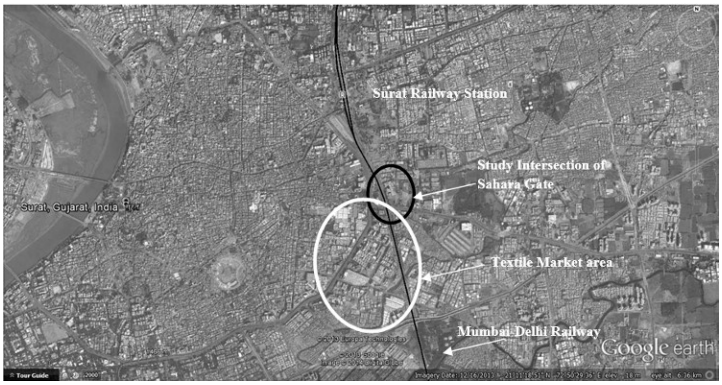

Fig. 1 Sahara intersection

Following Fig. 2 shows the land use in the area under study. A 150 Mt. length on roads of all sides was studied for the present use of buildings under various activities. The table below indicate the land-use structure of the area.

Land use	Area in Ha.	%
Residential	5.823	35.83%
Commercial	3.322	20.44%
Open space	2.235	13.75%
Transportation (road & rail)	4.625	28.46%
Reservation area	0.246	1.51%
Total	**16.251**	**100.00%**

Table 2 Land use structure at the Sahara Intersection

Here, it is important to note that in eastern part of the intersection, there is a residential colony in support to the huge commercial establishment just at around 500 Mt. in south to the intersection. In that way, the land use structure at the intersection observes no such highly significant user potential in itself however, the intersection is important from the connectivity point of view from different areas to the nearby textile trading market area (Udhna arm) of the ring road. It is also important to note the there is a grade separated road in the North-south direction connecting Udhna to Surat Railway station on the ring road.

Fig. 2 Land use at Sahara intersection

3. RESULTS AND DISCUSSIONS

A pedestrian and bicycles volume count survey was performed for three days at the intersection. The arms were named as shown in Fig. 3 showing direction of movement of pedestrian as well as bicycles.

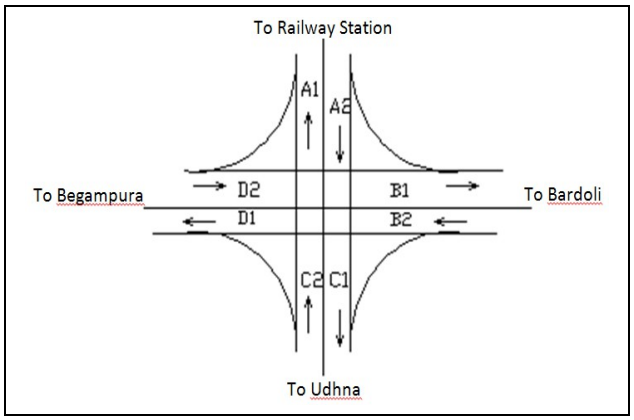

Figure 3 Intersection nomenclature for survey

Following results were obtained based on the survey carried out which shows that the intersection is being used very highly by the pedestrians and bicycle users where at present there is no specific provisions for any of the NMT users. Morning time for the survey was 9.30 am to 11.30 am (peak hours) while the evening survey time was 4.00 pm to 6.00 pm (off-peak hours). The survey was performed with an interval of 15 minutes. Such time slots were taken up to have a quick idea of NMT user volume at different time spans.

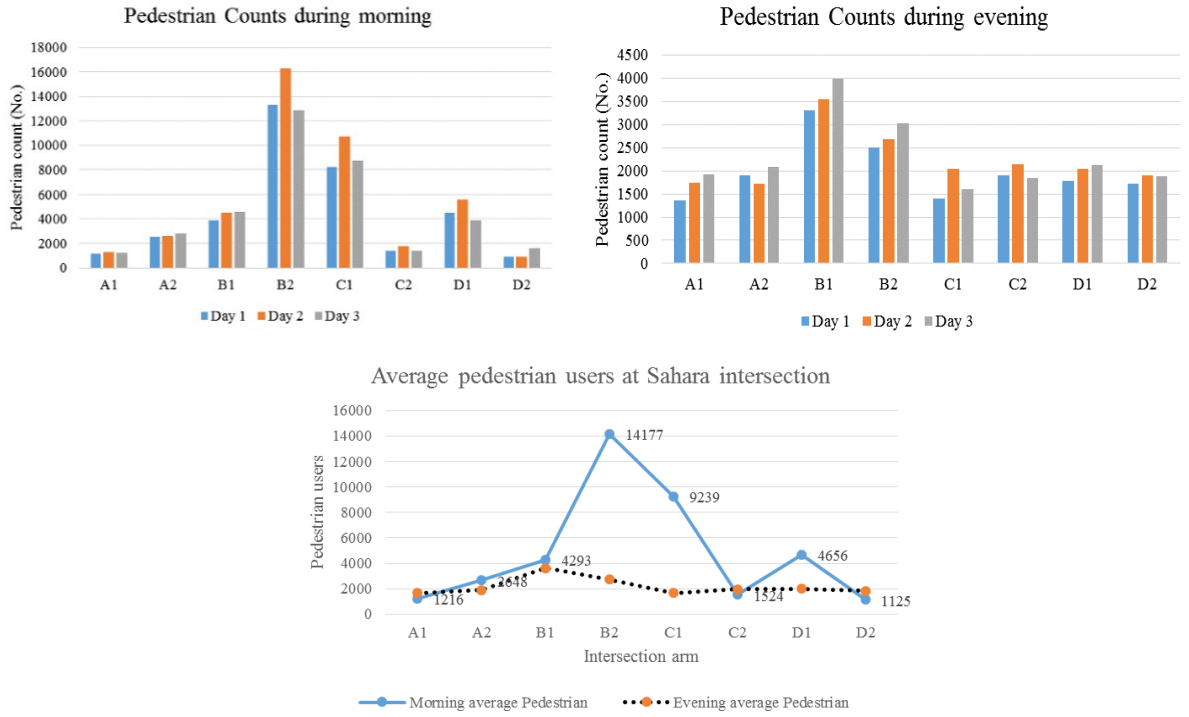

Fig. 4 Pedestrian users at Sahara intersection

Above graph in Fig. 4 show the average values of survey performed for pedestrian count. The users from direction B2 i.e. from Bardoli arm to the intersection is considerably high catering users from residential pockets to the work places (the major movement direction being C1-Textile Market area). The evening hours are very much with reduced volumes as the users from textile market are relived from jobs a little late by around 9 pm. However, total users are 38,878 in morning and 17,362 in evening on average of survey days for a total duration of two hours.

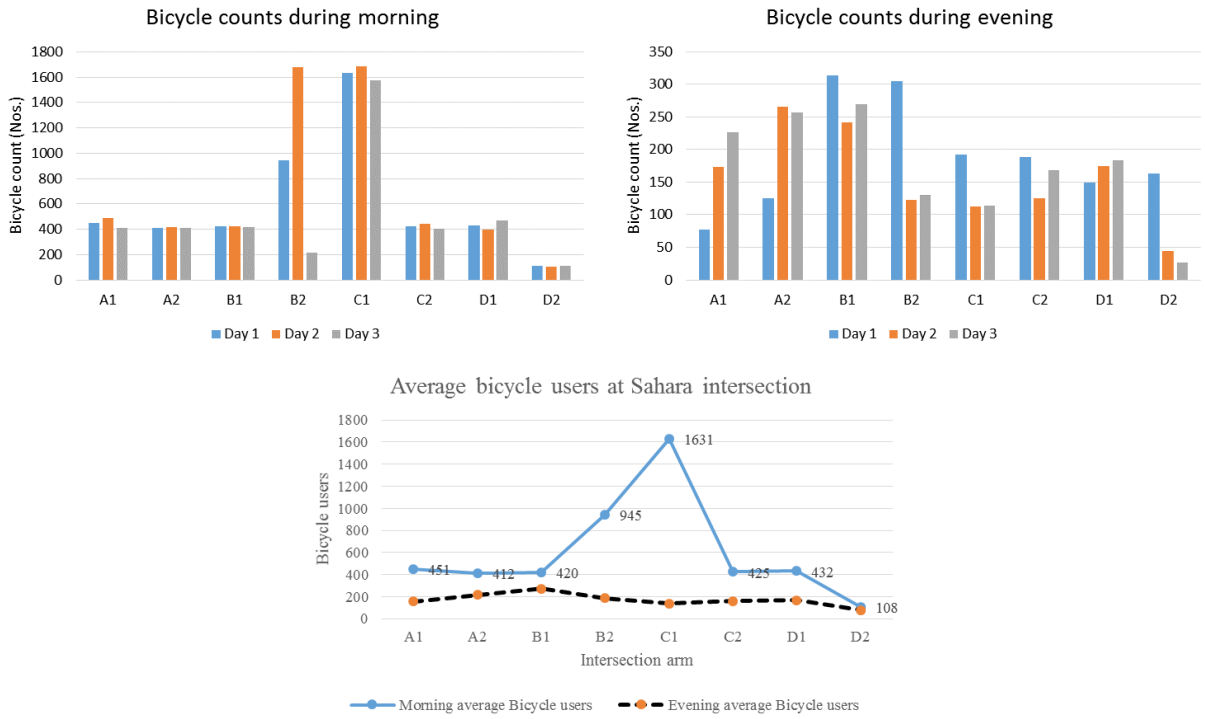

Figure 5 Bicycle users at Sahara intersection

Graph in Fig. 5 shows the volumetric directional movement of bicycle users at the intersection under study. Major volume bearing direction is C1 (towards Udhna) where major contributor is direction B2 (from Bardoli arm) which shows almost similar trend of workers from residential pockets moving to work places. Total volume using the intersection was observed as 4,823 and 1,382 bicycles in the morning and evening study hours respectively. It is observed that the bicycles have major movement towards market area from all other directions whereas pedestrians are crossing the railway line from Bardoli arm and spreading in all the directions with major movement towards the market area.

Towards the suggestive remedy to the observations, with existing constraints such as grade-separated fly over road (height restrictions) and the railway line embankment, possibility of constructing a skywalk is less for connecting all the directions, however the same is possible for directions C1 to B2 only with combination of underground walkway tunnels for smaller lengths connecting other arms (estimated at INR 37.13 million on pro-rata bases). Also, an underground walkway tunnel may also be proposed and the same can be provided connecting all the arms (estimated at INR 34.26 million on pro-rata bases). However, a detailed survey as well as an elaborative feasibility study may be carried out to evaluate best suitable alternative.

4. CONCLUSION

With increase in urbanization, importance of pedestrian and bicycle users is also increasing. From the survey at Sahara Intersection of ring road, it was found that almost 1% of population in Surat city is using the intersection through NMT mode without any dedicated facility that may be one of the main reason of congestion in peak duration (two hours) wherein this share is certainly higher for the entire of the day. Skywalks and underpass in combination was found to be most suitable out of different possible alternative arrangements to reduce pedestrian pressure on the intersection. However, a thorough underground tunnel is the most suitable alternative, not only on the cost part but the construction and user suitability aspects also.

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