Transportation demand management: a case study of Ahmedabad city

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Abstract

The city is one of the most important centers of 4500 years of Indus valley civilization. This unique city was named after Sultan Ahemadshah who founded it in 1411 AD. The city was originally bounded with a fort having 12 gates. Ahmedabad was the capital of Gujarat State, presently defined as a metropolitan city and an important industrial trade center of Gujarat State.

Ahmedabad is the second largest textile city of India. Geographically, the city is divided into two parts beyond and above the non perennial river Sabarmati. The old city is defined as the eastern sector and beyond the river is defined as the western sector. The majority of industries are developed within the eastern side and the western sector is defined as the civic sector. Internal movement among the civic and industrial sectors is generating a very high intensity of traffic during the entire day and even late at night particularly within the central core of the city. With the provision of a modern infrastructure concept, the traffic management system can be improved with a permanent solution to integrate both the sectors.

1 Introduction

The urban sprawl of Ahmedabad includes a total area of 310 sq.km. Out of which 190 sq.km. area falls under Ahmedabad Municipal Corporation (AMC) and 120 sq.km. area is under Ahmedabad urban Development Authority (AUDA). The tentative population of Ahmedabad city is 4.8 million. The entire city developed in radial shape and surrounded by highways connecting to other cities and states.

Rajsthan State Highway Link, Capital Gandhinager Link, International Airport, various Industrial Estate, Diamond Industries, Baroda Express Highway,

Narol Transport Houses, Textile Industries are located in semi circular from in term of eastern outer core of the sector.

Highway links to Saurastra and Kandla Port, Modern Shopping malls, Social Clubs, Modern hotels, Halls, Conventional centers, Multiple theaters, Nationally reputed Educational institute, High Court, Newly developed residential localities etc. are defined as a outer core of western sector.

Central core bifurcated by river Sabarmati and main trunk road of Ahmedabad city known as ashram road. This road connected to all business activities, major markets, central railway station, bus station on eastern side and major educational institutions and civil area on western side. both above area are the central core of city.

Ashram road the trunk road are located parallel to the Sabarmati river. Starting from vasana toll post to and Sabarmati container depot having eight kms. length approximately. There are seven bridges including a railway bridge constructed across Sabarmati River to connect both the sectors.

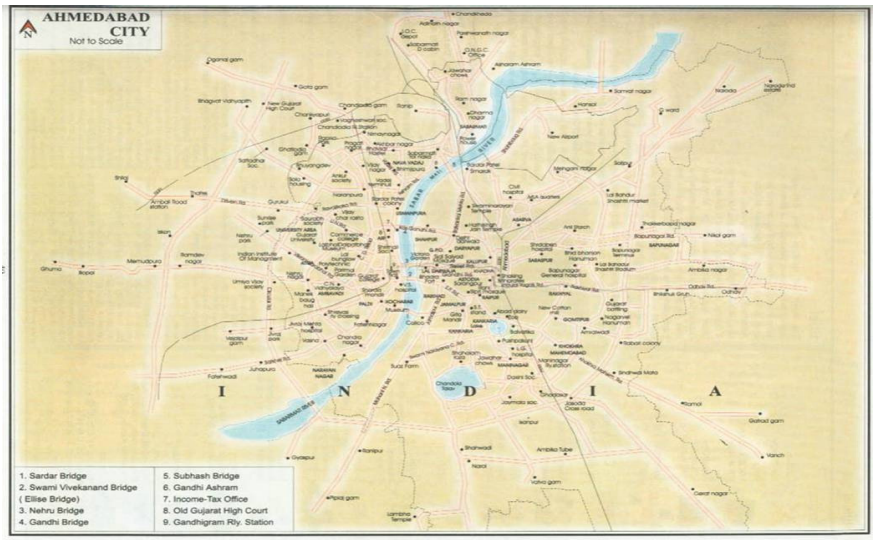


Figure 1: Road map of Ahmedabad city.

2 An overall traffic study of the city

Network of existing road

Ahmedabad zone. The total road length is around 1240 kms, wherein area under road accounts for approximately between 10-12 percent. The total length of major roads, of width 35 mts and above is around 60kms, whereas 30mt. wide road accounts for around 60km. It has been observed that major roads covering a road length of 120 kms carry most of the traffic.

There are 7 existing bridges across the river Sabarmati, of which 3 bridges are being widened. Within the AMC there are 9 existing rail bridges and underpasses, and 13 in AUDA area, totaling to 22. One of the biggest circular, (4 lane having 60 mts width) ring road surrounding Ahmedabad, approx covering length 60 kms is under progress by AUDA.

Details of the traffic flow in term of vehicles per day, traffic speed in city during pick hours and accidental stretches is shown in tables 1, 2 and 3 respectively

Table 1: Traffic flow data.

Average traffic on all major roads -individual

Year	Motor Cycle	Cars	Taxi Cabs	Auto	Rixa	Trucks	Others	Total
1994-95	437667	56098	4208	37673	37676	19033	9985	564664
1995-96	485288	64693	4210	37630	37630	19051	10045	620917
1996-97	531417	74336	5221	38820	38820	20651	12379	682824
1997-98	653703	95470	5600	42134	45325	22215	30510	894965
2001-02	943020	110425	6000	85310	66230	28510	47469	1286964
2002-03	985477	117967	6200	115040	73531	29300	55419	1382933

Table 2: Average traffic speed on road of the city.

Sr. No	Name of road	No of Vehicle/Hr.	Speed in km/hr
1	Ashram road	4236	16
2	Naroda Highway	2559	22
3	Laldarwaza – Airport	4430	13.5
4	Kalupur – Kuber Nagar	3224	18.5
5	Sarangpur – Rakhial	2307	17.5
6	Rajpur –Khokara	1769	25
7	AMC – Chandola lake	2766	25
8	AMC Narol rotary	2183	25
9	AMC- Satellite	3692	25
10	Mt. Carmel – Drive – In	2620	15
11	S.P Stadium Sola road	1855	25
12	S.P Jn. – Ghatlodia	2716	17
13	Prem darwaja -RTO	3119	14.3
14	Income Tax – NID	4629	16
15	Sardar bdg. – Kalupur	4000	12.7
16	Kalpur stn – I.T Junction	4000	12.5
17	Usmanpura – River bank	2375	25
18	Shahibaugh- Rakhial	4000	25
19	Shahipur – Knokhara	4000	25

Table 3: Accident prone stretches.

Sr. No.	Road Stretch	Length		% Accident
		(In Kms)	In (%age)	
1	Naroda –Narol	14.5	1.2	26.5
2	Paldi – Vasana	2.4	0.2	13.7
3	Astodia Darwaza – Ellisbridge	1.7	0.14	6.1
4	Sarangpur Darwaza – So-ni-pol	1.6	0.13	2.2
5	Parimal – Methakali	1.6	0.13	2.2
6	Vasna – Sarkhej	2.9	0.24	2.1
	Total	24.7	2.04	52.8

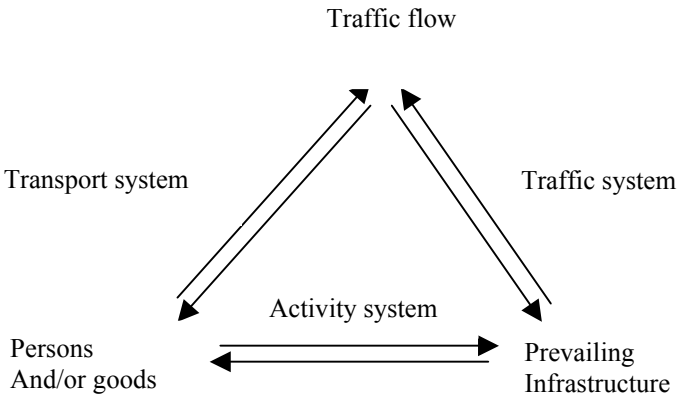
3 Study area profile

The study area which is the central area between ashram road to rakhial passing through Nehru bridge, relief road, Railway station and sarangpur, on which traffic is flowing with interruptions, and making atmosphere polluted the same road ends at CTM crossing which is the entry and exit for eastern outer core.

Due to the large amount of population moving across both the sectors whole day making major bottle necking position over the study area during pick hours of their working and activities.

3.1 Utilities position of area

- Connectivity for commercial activities within old city area.
- Social and educational activities.
- Occupancy of ground area by walking.
- Hard carts, loading vehicles, auto-rickshaw and two wheelers traffic occupancy
- Outsides traffic occupancy by railways and state transports.
- Occupancy of footpath area by small retailers and hawkers.
- Interlinking street system within old city area
- Over-utilization of roads is much higher than the saturation point of the road.
- High pedestrian volume on all the roads reveals the importance of pedestrian.
- Low speeds, high traffic volume, and low level of service make the journey costlier.
- Imbalance in demand and supply of parking leads to parking spill over to the carriageways of different roads, resulting in reduced road capacities.
- High vehicular emission and energy losses by different transport modes in the central area make it environmentally and economically inefficient.



Basic connectivity model of the traffic

Figure 2: Transportation sustainability.

Table 4: Characteristics of traffic in study area.

Mode	Traffic flow in % age	Trips (Min)
Walk	22.15	85% twice a day
Bicycle	15.16	90% twice a day
Two wheelers	23.27	90 % twice a day
Buses/four wheelers	14.35	65% twice a day
Auto rixa	12.18	70% twice a day
Others	11.89	55 % twice a day

3.2 Pollution characteristic

In the month of Dec 2004 -average (winter season)

Area of city	Particulate pollution	Gas pollution	
Ahmedabad	SPM (mg/ m^3)	SO_2 (mg/m^3)	NO_2 (mg/m^3)
	408	4	39

National Ambient Air Quality Standard for residential area

SPM	Suspended particulate matter	200 mg/m^3
SO_2	Sulpher-di-oxide	80 mg/m^3
NO_2	Nitrogen-di-oxide	80 mg/m^3

4 Transportation demand management

Transportation demand management (TDM) is a system to generate easy traffic flow with safety and by virtue of which different area can be communicated smoothly with less time without congestion.

The TDM system can reduce the air pollution and the traffic can flow in uniform manner. These impacts include environmental as well as economics impacts.

4.1 Measures of objectives

(a) Air pollution
(b) land consumption
(c) Differential accessibility
(d) Transportation economy
(e) Noise impacts
(f) Transportation facility
(g) Total travel time
(h) congestion
(h) Travel cost
(i) Travelers facility and satisfaction
(j) Accident Rate
(k) Medical or other emergency

4.2 General out look of traffic and activities to the study area.

Western Sector
A: City area Central core
B: Domestic Educational, Corporate area
C: Residential area

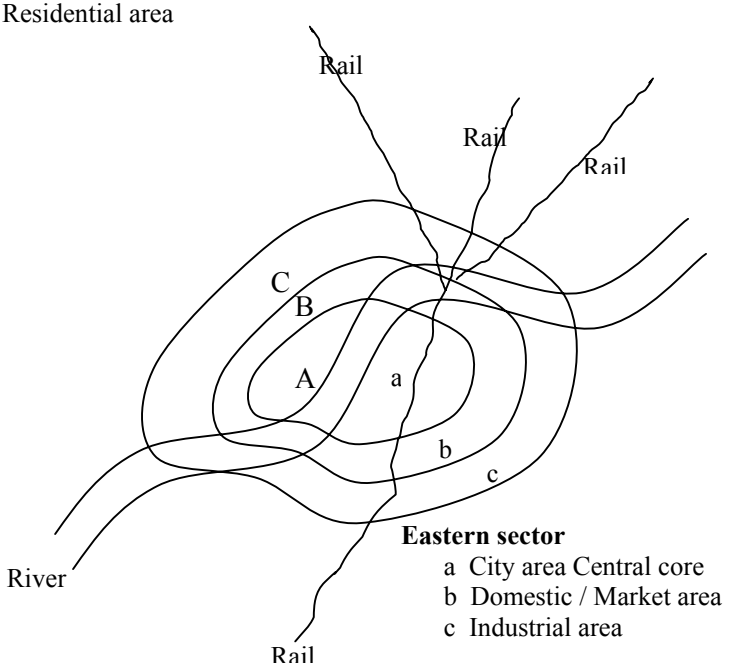


Figure 3: General outlook of city.

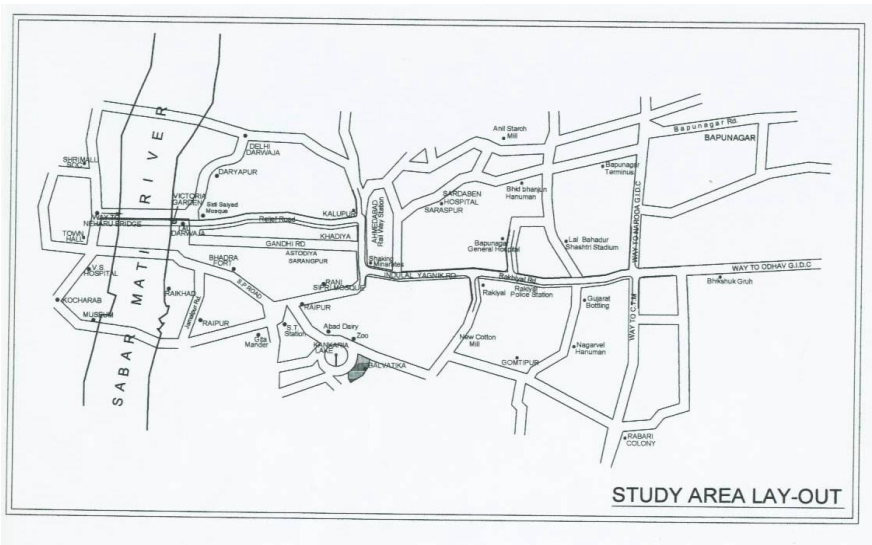


Figure 4: Chart showing the existing position of the area of conclusion.

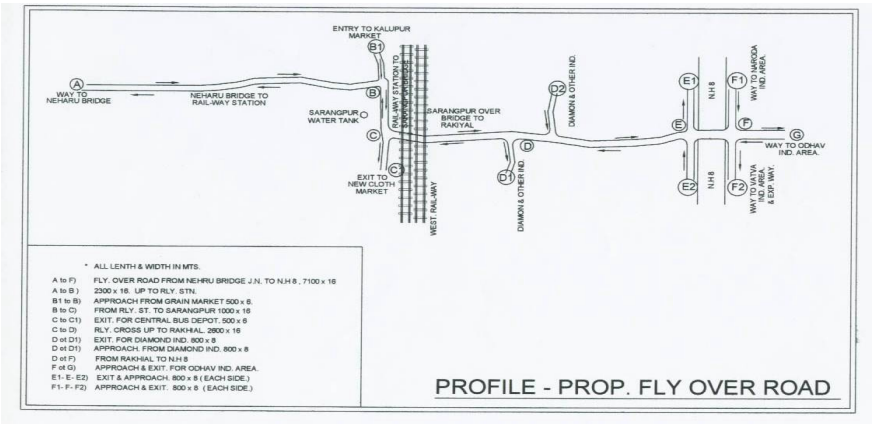


Figure 5: Profile showing the proposed fly over road.

5 Conclusion

It is verified and scrutinized that the old city road has already been widen up-to their maximum possible limit, hence it is not possible to widen for any further width.

The traffic who wants to travel from one sector to another sector has to cross the city without any reason, which creates and bare the interruption to the traffic who intends travel for city only.

After in depth study and analysis it was concluded to provide a fly over road at the effective study area location, From Nehru bridge junction to the NH 8 JN having approx length 8 kms (Figs: 4 and 5, A to G marked in the map), across connecting to eastern and western sector exactly parallel on to the existing road where only exists and entrees are provided at important junctions.

6 Economical aspects

The land at the both side of the study area is highly commercialized and small traders, shops, hotels factory buildings etc also located at both side. The maximum numbers of road crossings also interrupts the existing traffic. The land cost is much higher then the other area hence the easiest way is to construct a fly over road in all manners.

The cost of infrastructures can be determined by various way and sources.

6.1 Effective measures to collect and generate the revenue

The evaluation involves and alternatives related to size, area, and the system to collect and generate the revenue.

6.1.1 Self finance

a) Execution and development by BOT base (Built Operate and Transfer)

6.1.2 Government sources

a) Contribution from local Municipal Corporation
b) Contribution from Urban Development Authority
c) State Government Developments Sources (Dept Of Roads)

6.1.3 Public support

a) Imposition of development taxes
b) Development Bond by Local Corporation
c) Auction of the structures for advertisement /media rights by hoardings and kiosks on electric poles, pillars ,gantry over junctions etc.
d) Collection by toll taxes.

References

[1] Data sources :(part) CEPT Ahmedabad
[2] Book referred: C. Jotin Khisty B. Kent lall Transportation Engineering, An Introduction third edition