PARKING ANALYSIS IN URBAN AREA – A CASE STUDY OF ANAND RAILWAY STATION AREA

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Abstract: - *Each medium of transportation involves three necessary elements, without which it cannot operate effectively: the vehicle, the right-of-way, and the terminal. For water transportation, these essentials consist of the vessels, waterways, and port facilities; for railroad transportation, trains, tracks, and stations; for air transport, planes, airways and airports. Similarly, the elements of motor transportation are vehicle, the road, and a place to park at the end of the trip.*

Parking space availability is one of the most serious issues in most of the cities. The increase in heavy population in cities has resulted in increase in the travel demand. This demand for parking is increased in an alarming proportion in central business district (CBD) areas and other work centers of cities. Floods of automobiles flowing in and out in large numbers have created a stage that there are hardly any chance of entering the central area without delay in time and speed.

The study area is commercial hub of Anand city area which in turn generates high parking demand. The basis of study is parking demand along the station area of Anand. In absence of adequate parking facility, vehicles are parked along the kerb causing traffic congestion and hazards.

Keywords: - parking, space inventory, link, urban area, on street parking, carriageway, demand, supply

I.   INTRODUCTION

The automobile is doubtless one of the outstanding invention of the man .It has become an inalienable part of modern life and one can well imagine what life would be in present time without this wonderful invention. The numbers of motor vehicles increase at an alarming proportion. The vehicular traffic has become increased. The congestion on the streets began to hamper the safe and efficient movement of traffic. The numbers of accident were caused and serious problem of parking environment pollution began to be felt.

One of the problems created by road traffic is parking. Not only do vehicles require street space to move about but also they do require parking; space where occupants can loaded un loaded. Every car owner would wish to park the car as closely as possible to his destination so as to minimize his walking.

II.   OBJECTIVES OF STUDY

The objectives of study based on problems at location. The objectives are:

- ➢ To study existing parking facility of area.
- ➢ To check the parking facility to meet the .parking demand
- ➢ To study parking deficiency in study area.
- ➢ To suggest recommendations for better management for parking.

III.   SCOPE OF STUDY

The scope of study was limited to following

There is need to conduct survey on the availability of all vacant spaces both public and private, to explore the possibility of converting such places in to parking areas. The major objective involved preparation of Comprehensive Parking Management Plan along with suitable parking policy framework that could be easily implemented on station area and could be replicated on other Streets of the Anand City.

IV.   METHODOLOGY

The study will follows following steps.

1. The first step is to study and identification of study area location.
2. Various literature research paper, book, thesis report, related to study are referred.
3. Study area profile give existing situation of Anand city study area.
4. Conduct different parking survey.
5. Collected data has been analysed.
6. Conclusion and recommendation for batter parking management in study area.

V.   STUDY AREA LOCATION

Anand is known as the Milk Capital of India. It became famous for Amul dairy and its milk revolution. This city hosts the Head Office of Gujarat Cooperative Milk Marketing Federation Ltd (AMUL), National Dairy Development Board of India, well known Business school-IRMA and Anand Agricultural University. Also other famous educational hubs of the city are Vallabh Vidhyanagar and Karamsad, an educational suburb of Anand which is home to close to 10,000 students from all over india.
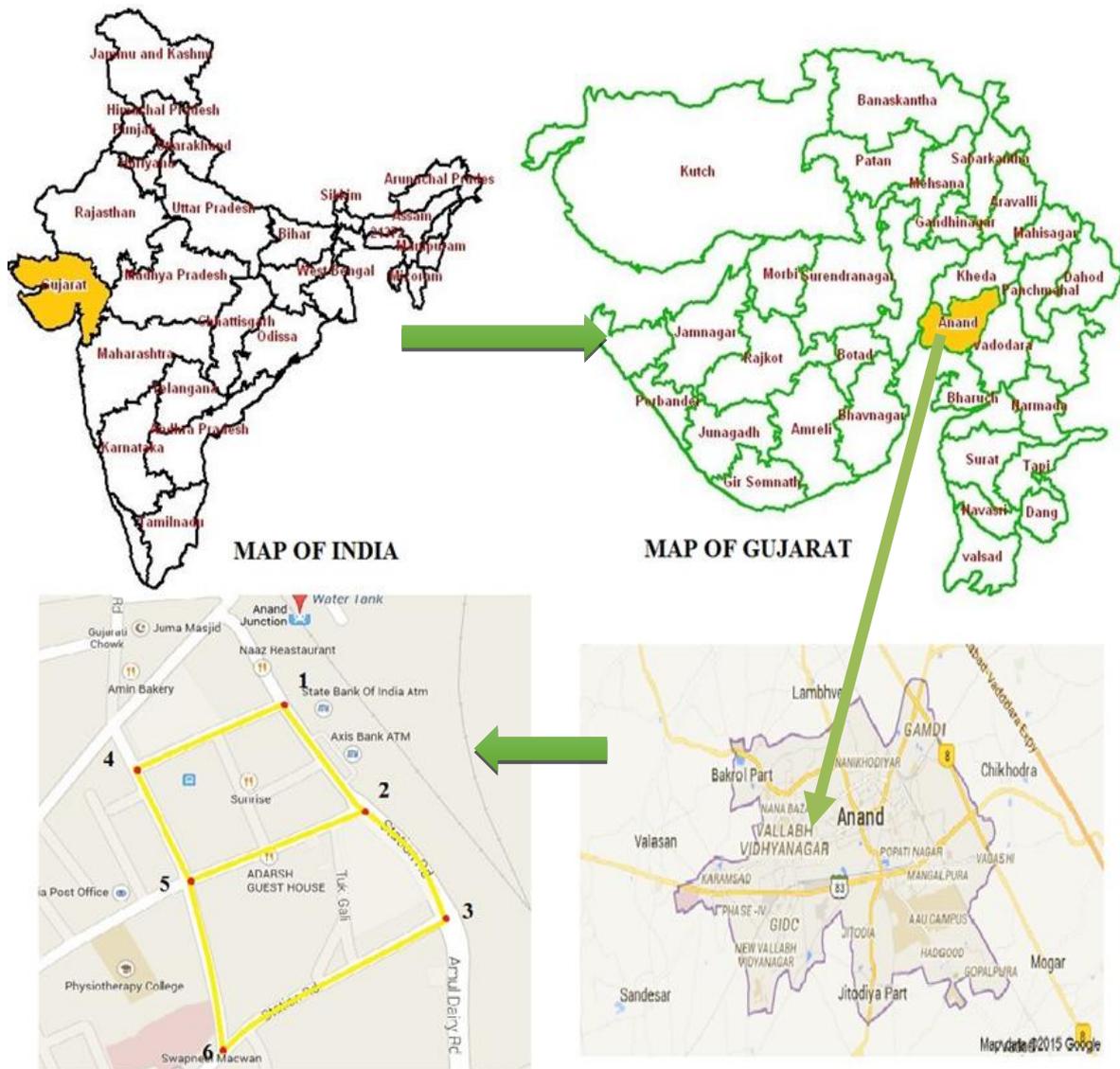

Figure 1 study area profile

VI. DATA COLLECTION

1) Space Inventory Survey.

Space inventory survey is provided in table below. This links under study have minimum length of 94m to maximum of 198m. Two links are two lane and remaining are single lane. Carriage way widths vary from 6m to 12m with and without footpath.

Table 1: Space inventory

LINK	CARRIAGEWAY WIDTH		FOOTPATH		TOTAL LENGTH	TYPE OF ROAD
	Right	Left	Right	left		
Link-1(1-2)	8.4m	8.4m	2m	2m	133m	Tow lane
Link-2(2-3)	6.8m	6m	-	-	147m	Two lane
Link-3(1-4)	12m		-		172m	Single lane
Link-4(2-5)	9m		-		198m	Single lane
Link-5(3-6)	7.8m		-		138m	Single lane
	11.4m		-		94m	Single lane
Link-6(6-5)	7.8m		2.4m	-	117m	Single lane
Link-7(5-4)	7.9m		3m	1.3m	160m	Single lane

2) Parking survey

For parking survey was conducted using licence plate method survey on each link. In this case of survey, every parking was monitored at a continuous interval of 15 minutes and the license plate number was noted down. The survey was conducted from morning 8 am to evening 8 pm.

VII. ANALYSIS OF PARKING SURVEY DATA

1) Car Equivalent Parking Area (CEPA) Calculation

The CEPA is car equivalent parking area require by vehicle parked including required clearance. This has been worked

out by obtaining actual area needed for parking of cars and vehicles. The CEPA is computed using following relation.

$$CEPA = \frac{area\ of\ parking\ vehicle}{area\ of\ parking\ an\ average\ car}$$

The CEPA for various vehicles observed on links are given in Table 2.

Table 2:- CEPA selected for selected vehicles

Sr.No	Vehicles	Area for parking	CEPA	Selected CEPA
1	Car	13.8	1	1
2	2-wheeler	3.13	0.24	0.2
3	3-wheeler	6.56	0.49	0.5
4	cycle	2.24	0.17	0.2
5	LCV	13.8	1	1

2) Parking Demand Analysis In Terms of CEPA

Parking demand and capacity on sides of link-1 to link-4 are given in figure 2 and the same for link5, link-6 and link-7 are presented in figure 3. During peak hours parking demand exceeds the capacity.

Figure 2 demand and capacity on link-1 to link-4
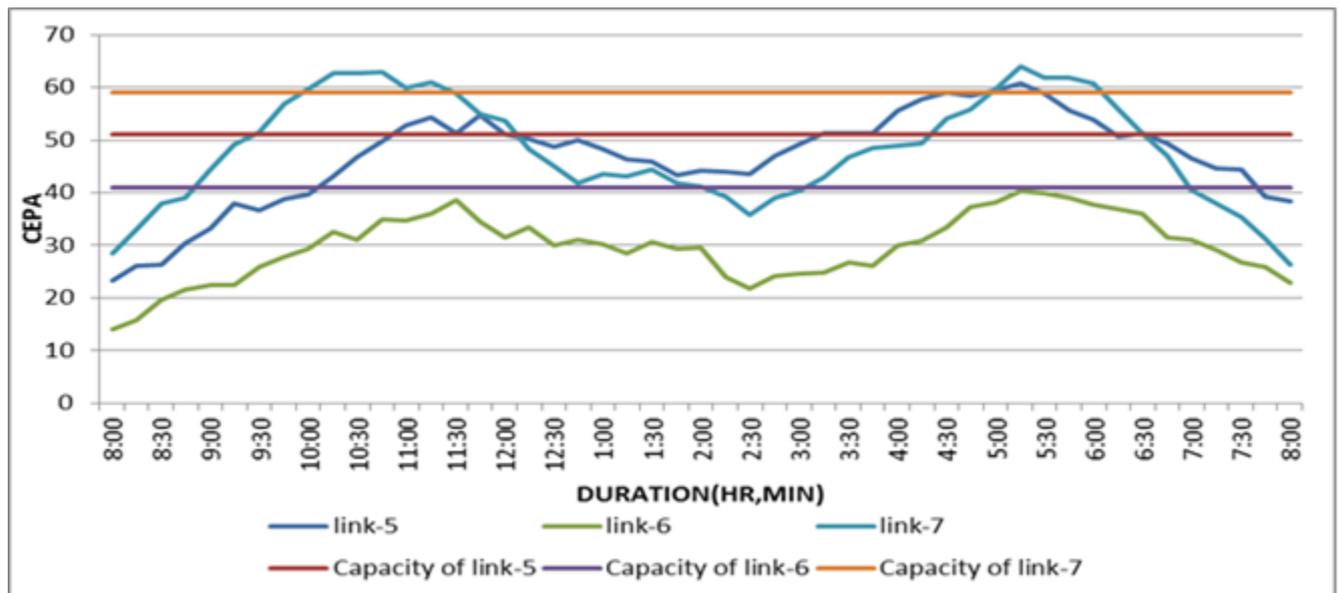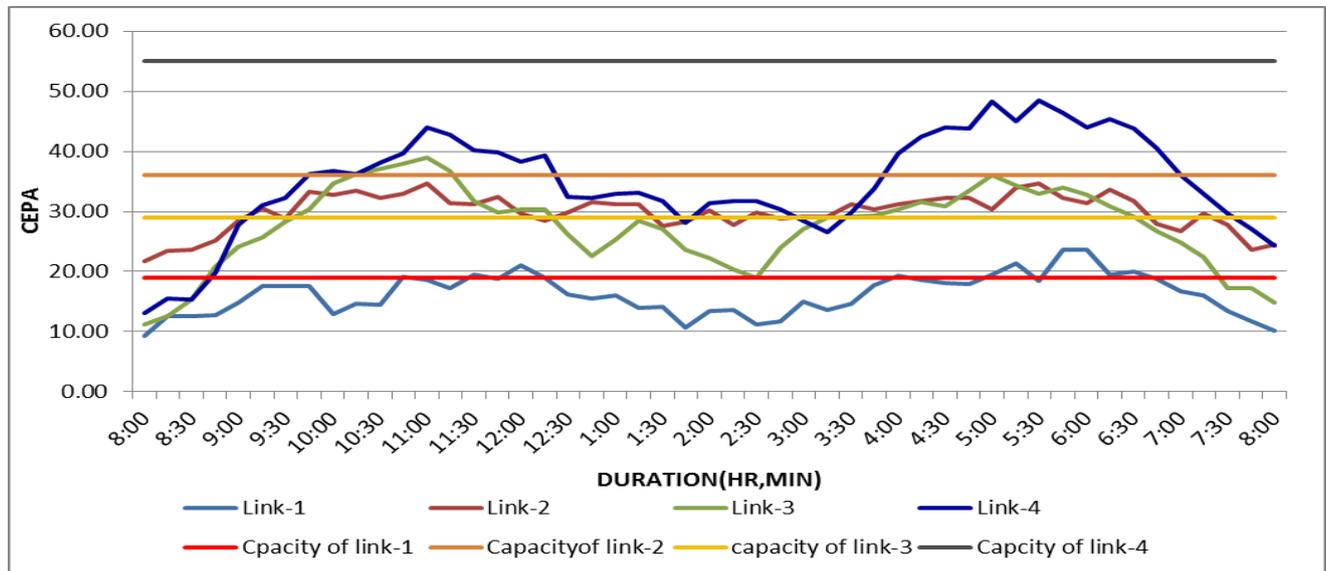
Figure 3 demand and capacity on link-5, link-6 and link-7

The demand capacity comparison for checking adequacy is given below.

Table-3 Demand and capacity on all links

Link	Area in sq.mt	Capacity in CEPA	Parking demand in CEPA	Remarks
Link-1	261	19	24	inadequate
Link-2	475	36	50	inadequate
Link-3	375	29	36	inadequate
Link-4	730	55	49	adequate
Link-5	670	51	61	inadequate
Link-6	730	41	40	adequate
Link-7	787.5	59	62	inadequate

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3) Parking duration analysis

Table-4 Parking duration analysis

No of time seen	Average duration in hour	link-1								link-2								link-3							
		2w	%	3w	%	4w	%	LCV	%	2w	%	3w	%	4w	%	LCV	%	2w	%	3w	%	4w	%	LCV	%
1	0:15	51	17	217	86	5	8	6	25	108	14	903	83	18	17	8	40	58	16	157	87	15	11	9	8
2	0:30	94	31	30	12	12	20	13	54	222	28	144	13	36	34	9	45	101	28	22	12	30	21	17	15
3 to 4	0:45 - 1	90	30	4	2	26	43	5	21	349	44	40	4	47	44	3	15	144	40	2	1	55	39	44	40
5 to 8	1:45 - 2	54	18	0	0	16	27	0	0	105	13	0	0	6	6	0	0	50	14	0	0	18	13	34	31
9 to 12	2:15 -4	6	2	0	0	1	2	0	0	11	1	0	0	0	0	0	0	4	1	0	0	18	13	5	5
13 to 20	4:15 - 5	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	4	3	1	1
20 to 35	5:15 - 8:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1
above 35	above 8:45	5	2	0	0	0	0	0	0	13	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		301	100	251	100	60	100	24	100	809	100	1087	100	107	100	20	100	359	100	181	100	140	100	111	100
No of time seen	Average duration in hour	link-4								link-5								link-6							
		2w	%	3w	%	4w	%	LCV	%	2w	%	3w	%	4w	%	LCV	%	2w	%	3w	%	4w	%	LCV	%
1	0:15	136	12	515	75	12	16	10	28	201	10	167	87	14	9	17	41	115	11	150	75	22	22	7	20
2	0:30	280	25	138	20	37	48	21	58	398	19	16	8	31	20	17	41	194	18	47	24	47	47	19	54
3 to 4	0:45 - 1	506	45	30	4	26	34	5	14	851	41	8	4	77	51	7	17	497	47	3	2	30	30	9	26
5 to 8	1:45 - 2	187	17	0	0	2	3	0	0	534	26	0	0	28	18	0	0	232	22	0	0	1	1	0	0
9 to 12	2:15 -4	19	2	0	0	0	0	0	0	35	2	0	0	2	1	0	0	10	1	0	0	0	0	0	0
13 to 20	4:15 - 5	3	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
20 to 35	5:15- 8:45	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
above 35	above 8:45	11	1	0	0	0	0	0	0	22	1	0	0	0	0	0	0	11	1	0	0	0	0	0	0
total		1143	100	683	99	77	101	36	100	2053	100	191	99	152	99	41	100	1062	100	200	101	100	100	35	100

Table 5 Parking duration analysis (contd.)

No of time seen	Average duration in hour	link-7							
		2w	%	3w	%	4w	%	LCV	%
1	0:15	153	13	132	84	13	6	12	27
2	0:30	265	23	23	15	23	10	20	45
3 to 4	0:45 - 1	514	45	2	1	66	29	12	27
5 to 8	1:45 - 2	179	16	0	0	97	43	0	0
9 to 12	2:15 -4	10	1	0	0	24	11	0	0
13 to 20	4:15 - 5	0	2	0	0	2	1	0	0
20 to 35	5:15 -8:45	1	0	0	0	0	0	0	0
above 35	above 8:45	12	1	0	0	0	0	0	0
Total		1134	100	157	100	225	100	44	100

Parking duration analysis was carried out to find the length of time spent in a parking space by the vehicle. From the analysis, it was observed that, short duration (0 to 1 hour) parking is high (83%). The vehicles parked for half an hour were more compared to other duration.

4) Parking Turn Over In Terms of CEPA
Parking turn-over is the rate at which parking space is used. Here link-2 parking space has highest utilization.

Table 6 Parking Turn Over In Terms of CEPA

Link No	Volume in terms of CEPA	No of space available	Turn over
Link-1	271	19	14
Link-2	830	36	23
Link-3	413	29	14
Link-4	680	55	12
Link-5	699	51	14
Link-6	447	41	11
Link-7	574	59	10

5) PARKING LOAD

Parking load gives the area under the accumulation curve. It can also be obtained by simply multiplying the number of vehicles occupying the parking area at each time interval with the time interval. It is expressed as vehicle hours. Table 7 show parking loads under study.

Table 7 parking load of all links

Link No	Categories of vehicle			
	2W(veh,hrs)	3W(veh,hrs)	4W(veh,hrs)	LCV(veh,hrs)
Link-1	409	71	55	12
Link-2	1060	336	73	8
Link-3	280	53	103	136
Link-4	1119	227	47	17
Link-5	1728	56	129	18
Link-6	1066	83	62	24
Link-7	1011	41	293	24

VIII. CONCLUSIONS

It is observed that no separate sites for parking of vehicles are available in Anand Municipality area except a small space near station area. The vehicles are therefore, found to be parked on street, Considering the inadequate widths of the existing busy streets and the ever increasing vehicular/pedestrian traffic there on, such road side parking is not at all desirable, which is bound to invite serious accidents and traffic jams. Further, the on street parking considerably reduces the effective width of the roads and creates many traffic problems these problems are more serious at busy road junctions.

IX. SUGGESTIONS FOR IMPROVEMENT

➢ Though on street parking is an extravagant use of the precious space, it cannot be entirely prohibited. Angle parking seems to be better than parallel parking which is usually involves a backing motion. Delay of traffic is minimized with angle parking.
➢ Parking places are designed at desirable location alone, and no parking is permitted elsewhere, the measure will be successful only if the streets are probably signed and the carriageway marking are adequate.
➢ Also the proper enforcement by police can help in management of parking in this area.

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