

Analysis for Maximum Utilization of Parking Area

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Abstract— One of the problems created by road traffic is parking. Not only do vehicles require street space to move about, but also do they require space to park where the occupants can be loaded and unloaded. This results in a great demand for parking space in the CBD and other areas where the activities are concentrated. The numbers of vehicles are going on increasing at an alarming rate. The commercialization of the area is also happening at a fast rate. The investment on parking facilities have not kept in pace with these growing traffic leading to congestion and deteriorating the Traffic flow condition.

In Toranvali Mataji one of the busiest market in Mehsana city. It is the main connecting link between the central business district and the main residential areas in Mehsana city. This study was mainly aimed to find the present parking scenario in the area which included parking demand, parking supply, and analysis for maximum utilization of available parking area and to suggest suitable solution for present and future to mitigate the parking problems in the Mehsana area.

I. INTRODUCTION

One of the problems created by road traffic is parking. Not only do vehicles require street space to move about, but also do they require space to park where the occupants can be loaded and unloaded. The period over which a vehicle is parked is very great compared with the time it is in motion. The size of average parking space is 14 m². It is roughly estimated that out of 8760 hours in a year, the vehicle runs on an average for only 400 hours, leaving 8360 hours when it is parked. Every vehicle owner would wish to park the vehicle as closely as possible to his destination so as to minimize his walking. This results in a great demand for parking space in the CBD and other areas where the activities are concentrated. With the growing population of motor vehicles, the problem of parking has assumed serious proportions.

II. METHODOLOGY

Parking studies usually are prerequisite to developing new or expanded parking programs. The studies should be designed to:

- 1) Inventory of existing parking space available and measure current levels of space usage (accumulation and space turn over).
- 2) Identify salient parking characteristics (duration, purpose, trip destination and walking distances to destination).

- 3) Quantify demands.
- 4) Forecast parking demand.
- 5) Determination of Car equivalent Parking area (CEPA) Factors considering characteristics of different vehicles available in market.
- 6) Suggestion for parking inventory improvement considering maximum Utilization Criteria.

III. DATA COLLECTION AND ANALYSIS

A. Details of Parking Survey:

- Location: At Toranvali Mataji
- Area: 45271.51 square meter
- Survey Method adopted:
 1. Parking Space Inventory.
 2. Parking Usage Survey by Patrol
 3. Questionnaire Type Parking Usage Survey
- Length: 865 Meter
- Date: 18th March 2013, Monday
- Time: 8:00 am To 8:00 pm
- Number of stretch: 5
- Number of time slots: 24(30minute duration)
- Number of observer: 15
- Type of vehicle surveyed: 3 (Four wheeler, 3Wheeler, 2Wheeler)



Figure.1: Study Area

Time	Type Of Vehicle			Total Required Area	Utilization Area Of Parking in %
	Two Wheeler	Three Wheeler	Four Wheeler		
	0.2 CEPA	0.5 CEPA	1.0 CEPA		
8.00 TO 8.30	147	20	14	734	0.18
8.30 TO 9.00	211	34	20	1089	0.26
9.00 TO 9.30	407	40	38	1916	0.47
9.30 TO 10.00	545	49	84	2990	0.73
10.00 TO 10.30	644	51	92	3386	0.82
10.30 TO 11.00	702	68	105	3841	0.93
11.00 TO 11.30	791	58	112	4114	1.00
11.30 TO 12.00	779	79	104	4115	1.00
12.00 TO 12.30	389	30	32	1716	0.42
12.30 TO 13.00	331	21	37	1563	0.38
13.00 TO 13.30	587	45	78	2996	0.73
13.30 TO 14.00	595	60	83	3190	0.78
14.00 TO 14.30	534	55	75	2877	0.70
14.30 TO 15.00	603	88	84	3418	0.83
15.00 TO 15.30	556	57	84	3075	0.75
15.30 TO 16.00	574	50	92	3187	0.77
16.00 TO 16.30	644	42	93	3338	0.81
16.30 TO 17.00	639	55	84	3290	0.80
17.00 TO 17.30	664	35	95	3372	0.82
17.30 TO 18.00	660	47	84	3293	0.80
18.00 TO 18.30	722	51	100	3711	0.90
18.30 TO 19.00	659	45	79	3207	0.78
19.00 TO 19.30	648	46	95	3404	0.83
19.30 TO 20.00	625	48	61	2887	0.70

Table. 1 Parked Vehicle Detail at 30 Minute Duration And Parking Area Calculation

B. Forecasting Of Future Demand of Parking:

For prediction of future parking demand regression analysis is the best method. The formula expressing the compound rate of growth of traffic is:

$$P_n = P_0 (1+r)^n$$

P_n = Parking demand in the nth year

P₀ = Parking demand in the base year

n= no of years

r=annual rate of growth of parking demand, expressed in decimals (assume 10.5%)

Parking Demand is given in table 2 for year 2013, 2018, 2023 & 2028.

Year	Available Parking Area (Sq. mt)	Parking Demand (Sq. mt)	Area Suggested As per Max. Utilization	Additional Parking Area As Per Max. Utilization (Sq. mt)
2013	3038	4071.90	2946.61	Adequate
2018	3038	6708.24	4854.38	1816.38
2023	3038	11051.47	8009.73	4971.73
2028	3038	18206.7	13216.05	10178.05

Table 2 Parking Demand in Year 2013, 2018, 2023, 2028

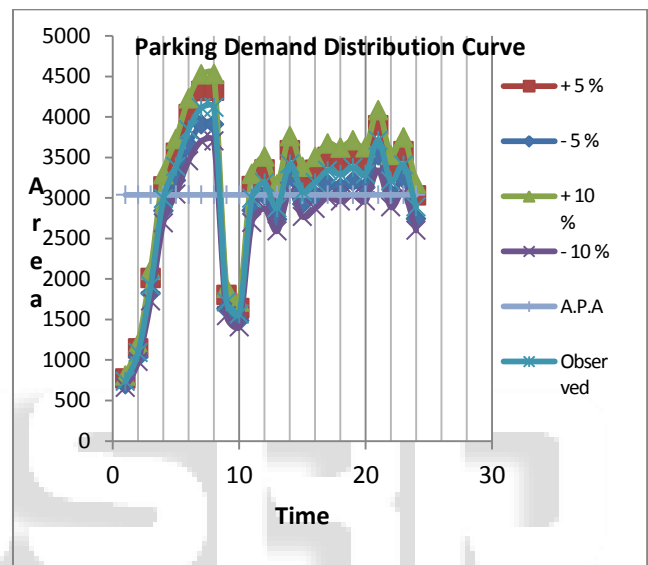


Figure. 2 Parking Demand Distribution Curve

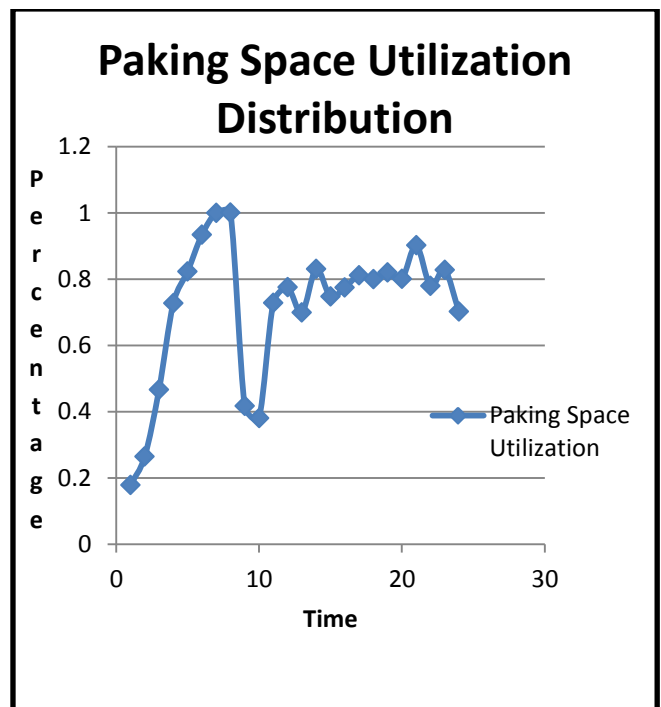


Figure. 3 Paking Space Utilization Curve

IV. CONCLUSIONS

With the phenomenal increase in personalized motor vehicles, one of the major problems confronted by the motorists is the acute shortage of parking space. The demand for parking has increased in alarming proportion in Central Business District (CBD) areas and other work/activity centers of the cities.

- 1) Here parking area for base year parking demand is adequate but need of parking facility for future is increasing at alarming rate.
- 2) Considering the demand for future a multilevel automated parking system is advisable, for which economic analysis needs to be done.
- 3) Parking space Utilization is an unproductive use of space, so it has to be carefully provided; hence the parking space requirement was worked out on basis of maximum utilization of parking space criteria with sensitivity analysis to consider the influence of uncertainty in parking demand rate.

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