# An Assessment of Parking Demand and Facilities of Rajkot Regional Bus Stand

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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. The study area is Rajkot GSRTC Bus stand area which in turn generates high parking demand. The basis of study is parking demand along the Rajkot ST Bus stand. The license plate method will conducted for collecting the data of current conditions for improving services. The parking management strategies like short term, medium term and long term, the way that can be implemented are discussed. To solve the current parking problem and solutions which are used to recommend that will manage the parking facility of off-street parking. But based on the future parking demand in the study area long term parking management can also be suggested, such as provision of Multistory Parking.

**Keywords- Public Transport, Parking Facilities Parking Demand and Forecast, Parking Lot, Parking Solution**

## I. INTRODUCTION

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 vessels, waterways, and port facilities; for rail and road transportation, trains, trucks and stations; for air transportation, planes, airways and airports. Similarly, the elements of motor transportation are vehicle, the road, and a place to park at the end of trip. Increased urbanization gives rise to problem of congestion. As city growing, it will be important to plan and build new facilities for both public and private transportation. There is a strong relationship between parking facilities and traffic flow characteristics in the city. Unplanned urbanization and transport facilities cause parking problems. Inadequate parking facilities results in decrease of road capacity and many negative side effects such as air, and noise pollution. Beside these, it also causes economic consequences by losing time and fuel, loss of productivity, high energy consumption and increase in accidental death rates. Thus, all parking facilities as well as others should be designed and planned properly in order to provide a better life for the people and for the prosperity of the city. Due to rapid growth in population, increase in mobility of the traffic flow rate has begun. Although shopping centers have their own parking facilities, people tend to park on the street and go to underground parking only when no space is available on the street.

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 the 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. LITERATURE REVIEW

1) Cheng Tiexina, Tai Miaomiaoa, Ma Zeb (2012) studied "The Model of Parking Demand Forecast for the Urban CCD" the Tianjin Binjiang Road CCD is the largest commercial centre in Tianjin, China, Where entertainment, Dining, shopping, leisure are held for the integration of multiple consumption functions. With the increase of the number of automobiles, the city parking demand occurred a rapid growth, and the city automobile parking had become a very serious traffic problem for Central Commercial District in cities. The parking demand forecast is the key of public parking planning and provides the basic data for the size of the parking lot.

For the evaluation of parking the average turnover rate, parking place occupancy, service level, parking fees and growth rate of automobiles .Meanwhile, the capacity of road network is applied to rectify the short-term parking demand forecast. Through the site survey, the data of various types of land in the working days and the non-working days were obtained, including the parking generation rate, average lot turnover rate and average lot utilization rate On the basis of the Parking Generation Rate Model, the improved model was set up, considering more factors.

The consideration of the average turnover rate of parking spaces, the utilization of the lot, the service level of parking, parking fees and automobile growth rate, the improved model was setup on the basis of the parking generation rate model. the amount of parking demand should be in a rational quantity range under the road network capacity limitation to avoid the amount of parking demand forecast exceed the actual road network capacity. By the case study, the improved model was applied to the Tianjin Binjiang Road CCD, which illustrated it was applicable and practicable.

Junbin Xua, Zhiyong Zhanga , Jian Ronga(2012) studied "The Forecasting Model of Bicycle Parking Demand on Campus Teaching and Office District" In this paper to forecast the demand of the campus teaching and office district bicycle parking generation rate more accurate with the introduction of multi-model, which regarding affects are not carried on more considerations with the other parking demand influencing factor according to the actual investigation and study data.

2) The paper analyzes the three types of regional architecture characteristics of bicycle parking demand, and gives the parking demand -supply forecast model which based on the parking generation rate model. The model considers the trip distance, parking distance, the facility cycling rate and the use factor which are also integrated in the model, thus obtains the number of bicycle parking facility which should construct actually.

To study the distribution of the bicycle parking time has an important meaning, the different building types among the university teaching office area do not have the same peak parking periods. The school buildings which the peak time is at 9:30 am and 15:30 pm the office building of the campus teaching and office district which the peak time is at 9:45 am and15:00 pm. the paper proposes a calculation example to expound the practical application of this model.

This model is based on the basis of the parking generation rate model, added the rate of bicycle parking turnover and utilization in the peak period, and considering the influence of the factors affecting the corresponding rate. To get the demand number of the bicycle parking facilities in the campus teaching and office district

The questionnaire survey and the actual research form, identified the bicycle parking demand within the length of peak time, parking duration, the rate of utilization and turnover in the campus teaching and office district.

3) Meet K. Hingrajia, Pratik D. Vagadia, Vidhi H. Khokhani (2015) studied "Parking Management Blueprints for Rajkot - Solution to Urban Transport Problem." Rajkot has many historical milestones and spaces to visit. The major portion of financial activity of the city is located in the ancient area of the town, viz.: Metoda, Soni Bazar, Gujari Bajar, Yagnik Road. Parking demand in Rajkot city, especially the old commercial area meets by roadside parking along all the major roads and there are no off-street parking facilities ever increasing parking demands. Thus these locations are prime for the traffic and parking spaces. Further the main market of the city fabrications on these location. To withstand the urban activity of Rajkot, there should be suitable parking facilities and proper management. For the evaluation of parking demand, parking supply and parking space of the related study area data were collected by conducting parking duration and accumulation survey, inventory of regulatory measures, inventory of parking spaces and user opinion survey. Parking data analysis shows that most vehicles are parked for very short durations during the peak hours because of trading areas. The area is also linked different important destinations of trading and commercial centers so traffic flow is obstructed because of existing on street parking facilities. Results in delay and waste of time occur for long trips.
4) Jaydipsinh P. Chudasama, Dr. L.B.Zala (2012) have stuided "Parking Evaluation: A Case Study of Amul Dairy Road Anand" Amul dairy road is entrance of Anand city. High volume of traffic consisting of both fast and slow moving vehicles is plying through the road. Major traffic generators like banks, restaurants, commercial centers, shopping complexes, residential flats, government offices, city bus stop, railway station etc are located along Amul dairy road. In the absence of adequate off-street parking facilities, vehicles are parked haphazardly along the curb causing traffic congestion and hazards. To mitigate this problem, suitable parking management plan has to be developed and implemented on a concerted and continuous basis taking into account the various aspects of transportation problems of the area.

Data is collected by both primary and secondary sources. Primary data are collected by performing surveys of study area and secondary data are one's that are collected from secondary sources without performing survey. Sources can be Census Department, Regional Transport Office, Police Department, Institutions etc. To understand the existing conditions of study area. The surveys have been carried out like Traffic volume count survey, Parking space inventory survey, Land use survey and Parking survey.

Parking data analysis shows that short-term parkers are 85.26%, medium-parkers 12.16% and long-term parkers being only 2.58%. Amul dairy road experiences problem of parking during peak hours only. The parking demand on study zone 3 & 4 was 543 parking spaces during peak- hours when data was collected.

## III. RESEARCH METHODOLOGY AND DATA COLLECTION

To examine the commuter's behavior and satisfaction with parking lot ant facilities, the data were collected from space inventory survey and a license plate method survey. It is a standard in research on parking behavior. Data were analyzed in using statistical method and using SPSS software for developed model.

A space inventory survey following information are given the no of lot, lot size, parking space, road geometry, no of vehicle parking space, and the second survey method license plate method to find the parking accumulation, parking load, parking duration of different vehicle, parking capacity, parking index and parking turn-over.

## IV. DATA COLLECTION

The analysis of license plate survey showed that the how much percentage of vehicle park in specific time interval. Also the give the parking accumulation cure, parking load, parking duration of different vehicle cure, parking index and parking turn-over information.

SPSS 20. a statistical analysis tool was used to carry out the statistical analysis. Two statistical methods have been used for the analysis of the survey.

*Table 1: parking survey form for license plate method*

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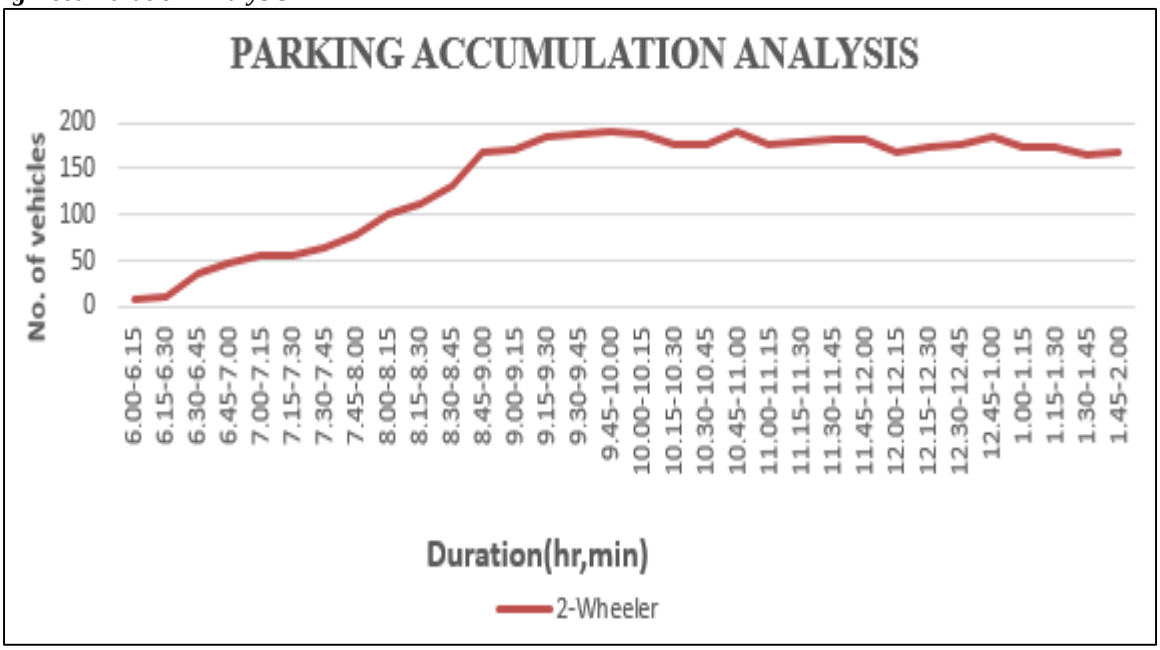
|---|---|---|---|---|---|---|---|---|
| *Parking Survey Form* | | | | | | | | |
| *Date of Survey* | | | *Time* | | | | | |
| *Location of parking* | | | *Type of Vehicle* | | | | | |
| *Time Interval* | | | | | | | | |
| | *0-15* | | *15 -30* | | *30-45* | | *45-60* | |
| *1* | *4598* | | | | *4598* | | | |
| *2* | *3467* | *3467* | | | | | | |
| *3* | *2357* | | *2357* | | | | | |
| *4* | *6790* | | | | *6790* | | | |
| *5* | *264* | | | | | | *264* | |
| *6* | *7691* | | *7691* | | | | | |
| *7* | *2749* | *2749* | | | | | | |
| *8* | *0646* | | | | | | *0646* | |

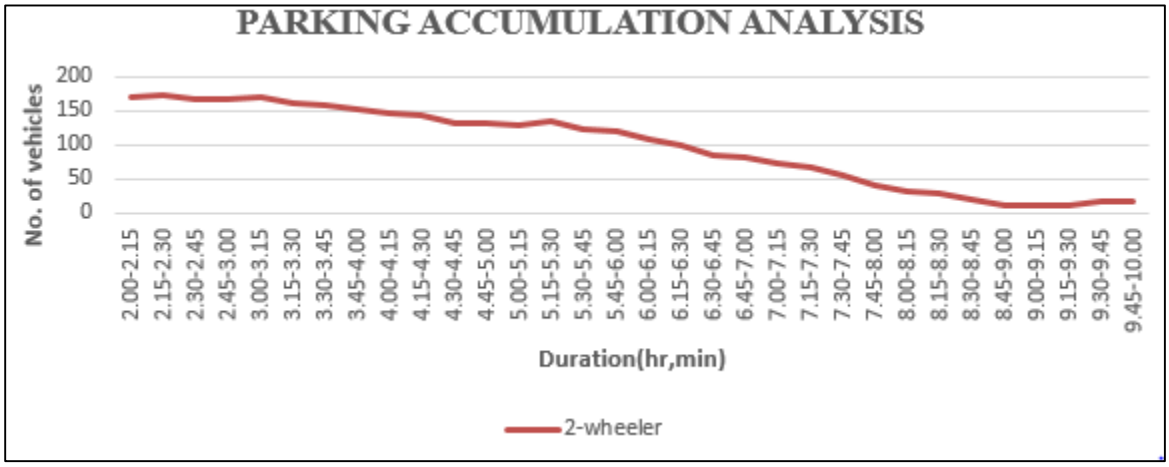
A detailed analysis is carried out in order to see how the parking accumulation, parking volume, parking load, duration, turnover considered as independent affects the adequacy of the performance of city parking systems. The adequacy of performance of the parking system in city depend on parking space. The output of these analysis methods is then interpreted in order to parking the quality of the variability of the user's perceived satisfaction with respect to the public parking system.

## V. DATA ANALYSIS

### *A. Parking Accumulation Analysis*

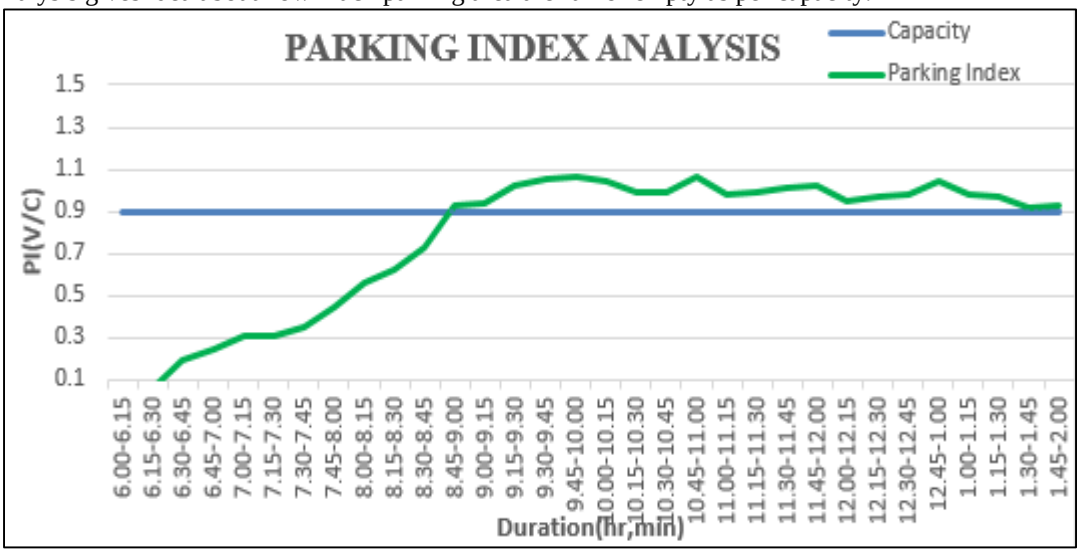


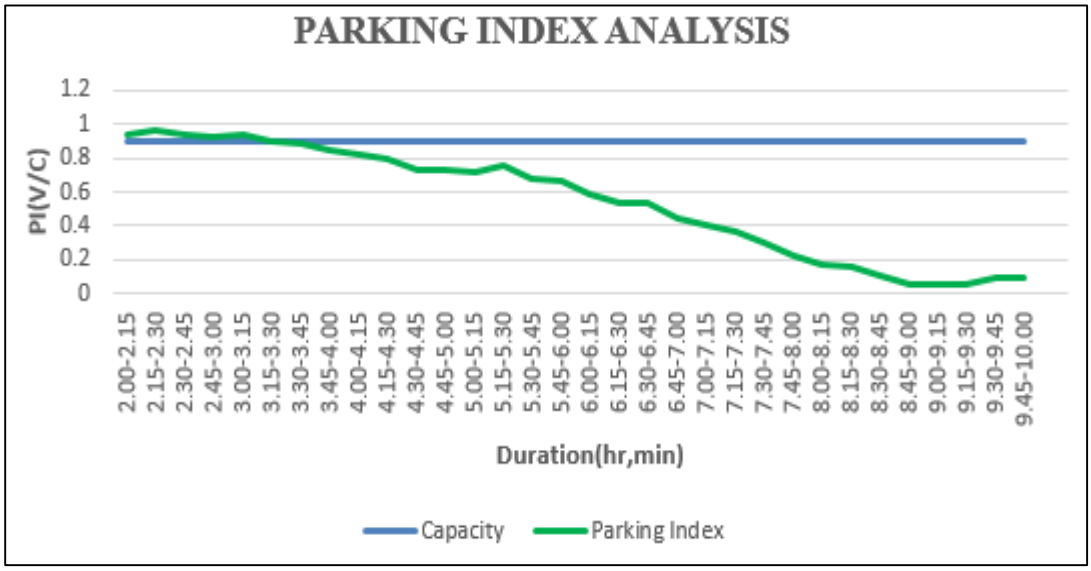

The Parking accumulation analysis show variation of parking of vehicle at different interval of time.
2 shows variation of vehicles parked at parking lot. From figure, it is found that maximum accumulation as 190 vehicles morning 9.45 am to 10.00 am.




***B. Parking Index Analysis***

Parking index analysis will give idea about how much deficient or efficient parking lot for a particular time. For parking index, volume by capacity ratio is found out if this ratio is more than 1 it means vehicles parked for particular time is more than capacity of parking lot (Deficiency). Deficiency of parking lot is not good condition for parking. If parking index is less than 1 it means vehicles parked for particular time is less than capacity of parking lot (Efficiency). Efficiency of parking lot is good condition for parking. The analysis gives idea about how much parking area are full or empty as per capacity.



### *C. Parking Turn over in Terms of Capacity of Each Parking Lots*

Parking turn-over is the rate at which parking space is used. Lower value of turnover means the parking bay utilized by less vehicles and higher turnover means the parking bay utilized by more vehicles for 16 hours of time duration

| *Sr. No.* | *Parking lots* | *Volume of vehicles* | *Capacity of parking lots* | *Turn over (vehicle/bay/16 hours)* |
|---|---|---|---|---|
| *1* | *2W at back side parking lot* | *473* | *179* | *2.73* |

### *D. Parking Duration*

Parking duration analysis was carried out to find the length of time spent in a parking space by the vehicle. After doing License plate Survey of all parking lots it is found that number of vehicles parked for which different time duration on working day and nonworking day. License plate Survey of all parking lots it is found that number of vehicles parked for which different time duration on working day.

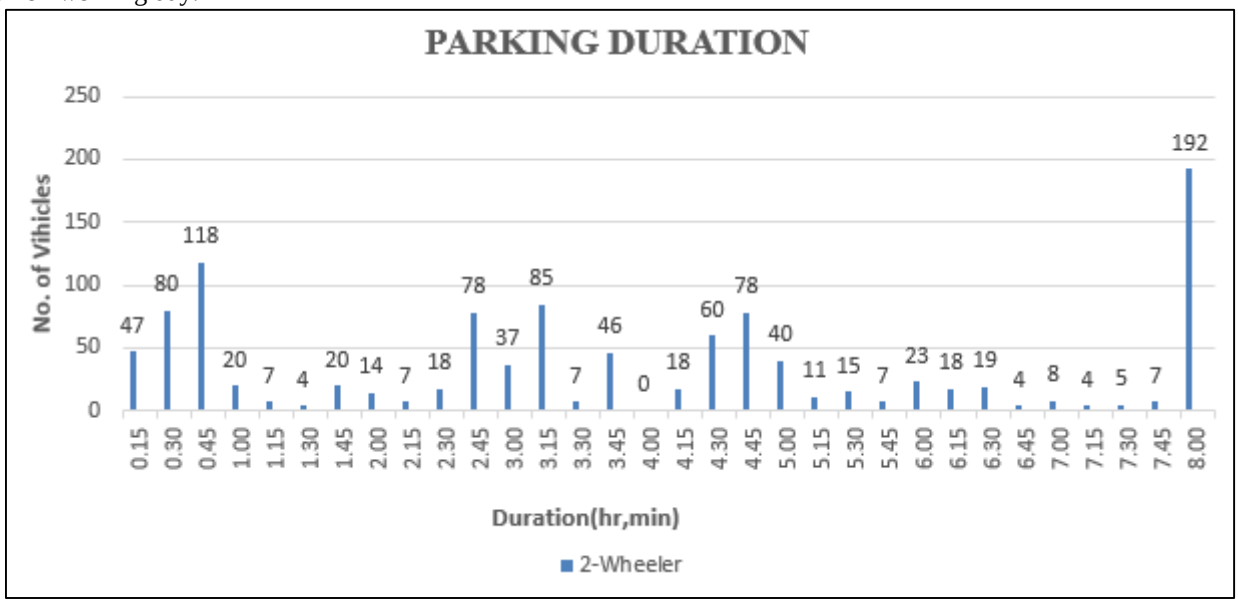



Fig. 4.5: Number of Vehicles Parked for particular duration at Back parking

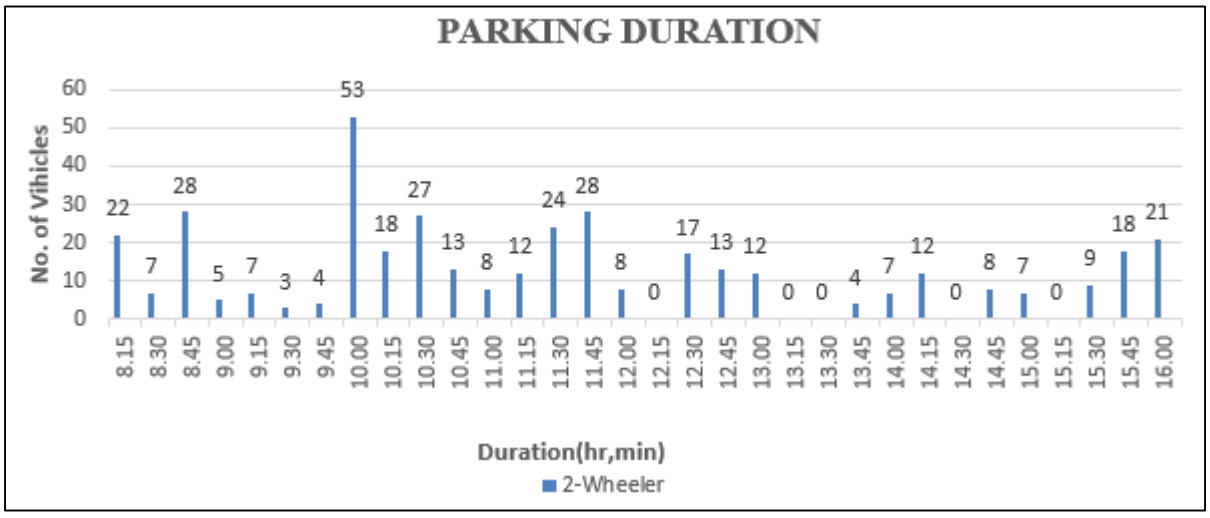



Fig. 4.6: Number of Vehicles Parked for particular duration at Back parking

Figure 4.5and Figure 4.6 shows number of vehicles parked for a particular time duration at parking lot-2. From figure 4.5, it is observed that maximum vehicles parked for long time at back side parking.

## VI. CONCLUSION

This study was conducted to evaluate parking assessment and demand with parking space and lot. To parking the vehicle demand have been important to service providers and bus operators. Forecasting parking facilities by conventional methods requires massive data and long time. So there is a need of such kind of model in general or data specific based on parking on demand depends.

Present study is a part of a research study to development of a model for sustainable growth of parking vehicle system in bus stand. Parking is not a small problem. If it is not solved tactfully now, then it will become a huge problem in the near future. The new parking space is required underground, multistory parking or new parking lot for more vehicle parked.

Several actions should be taken at local level in order to address the above problem and to highlight the necessity for sustainable salutation. This study will also help in explaining the important parameters that need to be considered in developing public parking facilities.

The Multi-storey parking recommended for provide the easy accessibility and mobility. By providing multistory parking of G+3 and Basement 1&2, we can satisfy the demand of Two-Wheelers parking up-to year 2019 and also satisfy the demand of Four-Wheelers parking up-to year 2021.

## REFERENCES

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