

Concept of Parking Study and Management in the Jaipur City

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Abstract: Jaipur is one of the important cities of Rajasthan known for its religious and historical importance. It is a mid-sized city having population of about 42 lac in year 2022. Transportation is the key infrastructure of a country. As road transportation gives personal mobility to the person, the vehicle ownership rate has increased at a fast rate. This increase in the number of vehicles has given birth to the problem of parking. The availability of less space in urban areas has increased demand for parking space, especially in shopping centers, public places and office complexes. It also has an impact on transportation development. With the growing population of motor vehicles, the problem of parking has assumed serious proportions in the town. Shortage of parking spaces forces drivers to park their vehicles on the road which further creates lot of problems like congestion, jams, accidents and also reduces effective road width. The objective of this study is to identify the current parking supply and parking demand in Jaipur city. The study consists of parking usage survey using fixed period sampling method.

It is found that the utilization percentage of on-the-road parking space varies from 146 to 216 percent of all the eight sites considered in the study. The average utilization factor is 175%. At present the demand for parking exceeds the parking space available on the roads for all the eight parking sites. Separate parking lots, in addition to properly marked on-the-road parking bays, need to be provided on the available spaces close to the studied areas to address the problem of parking.

Data was collected from different sites along main corridors of Jaipur. The sites were selected in such a manner that they cover all locations of substantial parking along main routes of the city. The sites

selected for the study are **Ajmeri gate, Johari Bazar, Railway Station, Choti Chopad, Badi Chopad, Chand pole, Sindhi Camp, Collectorate Circle**

Key Words: motor vehicles, parking, parking demand, Jaipur city, parking space, problem of parking.

I. INTRODUCTION

Parking considered to be an important component in the planning of all cities. In recent years, both developed and developing countries are facing transport related problems which worsened with congestion, increasing time of journey and pollution. These problems are not only due to circulating vehicles but also related to parked vehicles consuming a large chunk of public space. Carefully designed and sensible parking measures can optimize the efficiency of road space, enabling citizens to carry out all economic activity with improved mobility. Adequate availability of parking space in a city also encourages commercial activities and satisfy the demands of residents and visitors. In the other hand, private vehicles are parked for most of the hours in a day either at residential parking sites at activity destination. In land-use planning of an urban area, parking constitutes a high share and an important motivator for urban planners to think about parking policies for reducing vehicle ownership and use. A parking regulation can be introduced to an urban area to address current transport problems and to support and compliment cost-intensive sizeable public transport systems for improving the cost-effectiveness. Hence parking policy can be developed as a component of spatial planning at the local and regional levels and transport planning procedures to behaves as though, cohesion between

their execution planning for land-use and transportation planning. Parking is one of the major problems that are created by the increase in the vehicle traffic. Transportation is the key infrastructure of a country. As road transportation gives personal mobility to the person, the vehicle ownership rate has increased at a fast rate. This increase in the number of vehicles has given birth to the problem of parking. The availability of less space in urban areas has increased the demand for parking space, especially in shopping centers, public places and office complexes. It also has an impact on transportation development. There is a significant and tremendous increase in the demand of parking spaces due to increase of road traffic during the last one decade in small cities as well. This has led to congestion of on-street spaces in the office and shopping area neighborhoods during peak hours. The parking demand also leads to socio-economic and environmental losses.

Study area: Jaipur

Parking problem in Jaipur can be studied by dividing it into two parts, the area within the older city popularly known as the walled city and the area outside it. Parking is an important issue inside the walled city and an emerging one outside it. This study aims at studying the existing parking problems and their causes, and management in the walled city. Being the major hub of commercial activities in the city, a tourist centre and a densely populated region, the land utilisation inside the walled city has reached its zenith and no further scope of space creation (increasing the supply) is left to deal with the rising demand for parking in this area. The thesis therefore explores the question—Can an efficient price mechanism and better management practices improve the conditions of current parking needs in the city. Keeping in mind the limited period of my dissertation and the huge area of the Walled City I sampled down my study to eight main sites nearby walled city. These are very vibrant areas of the Walled city and are frequently visited by both locals and tourists alike. This gave me the opportunity to study the parking management in perspective of future response as well.

Objective of the study

a. To study the existing parking facilities in

identified areas along main corridors of the city.

- b. To carry out study to determine the present parking demand of the identified areas.
- c. To assess the present parking supply of the areas.
- d. To identify the scale of current parking related problems of the areas.
- e. To recommend remedial measures to address the problem of parking in the areas.

Scope of this work

The Scope of the current work is to understand the effect of parking policy on public transportation patronage. The present work examined the effect of parking policy on the reduction of private vehicle use, requirement of parking supply and increasing public transport patronage.

II. REVIEW OF LITERATURE

General

Various Researcher used different methods to resolve parking problems in city.

A Shah and et.al (2021)[1] has studied literature review on parking system the main reason for parking systems is there is a lack of parking spaces in metropolitan cities. In this study, the various types of parking systems are discussed, in which some are automated whereas others are manual. The advantages and limitations of the different types of parking systems were also discussed. The selection of the parking system depends on the cost of the system, the maintenance cost, and the area available for implementing the system.

V Chaitanya and et.al (2021)[2] has studied the sole purpose of this work was to take the conventional parking system to another level by adding automated parking and security for vehicles. By automation, whole manual process of noting the vehicle numbers and showing the free parking slot was replaced by a system which captures images and extracts vehicle number from that image and sends it to the database. Based on the database, a free parking slot that is allotted to the specific user is displayed on the screen at the turnstile gate. they

also included security for registered users by sending a notification to the respective user.

Anusha and et.al (2019)[3] has studied on smart parking system. The problems which would arise while working with smart parking system as well as the solutions has been described which gives a good platform for all the users. With the implementation of smart parking system, it assures the ease of life for individuals who struggle in daily routines of their day-to-day life. The system that we propose provides real time information regarding availability of parking slots in a parking area. Users can book a parking slot for them by the use of our mobile application. So, the users can save their time from searching for parking slots.

S Porru and et.al (2019)[4] has studied smart mobility and public transport: opportunities and challenges in rural and urban are as to understand how IoT technologies can be leveraged to improve transportation in rural areas, this study tries to understand whether only urban areas are suitable for the successful application of IoT technologies, or whether smart mobility systems can be deployed successfully for smart land too. For this purpose, they tried to answer RQ1 and RQ2 by leveraging the results stemming from the analysis of 10 different projects related to smart mobility.

A Pomaji and et.al (2019)[5] has studied smart parking management system Smart is used to book parking slots without any great effort by the user using an android device. The user can check the status of parking area and book the parking slot in advance. This will result in overcoming many problems which are being created due to the bad management of the traffic. Mobile computing has proven as the best area of work for researchers in the areas of database and data management so this application is applied in Android Mobile OS. This application is utilized by can be applied nook and corner due to its easy usage and effectiveness.

Summary

The preceding studies are pointing towards a long-term use of a considerable amount of on-street parking. This means that significant parking spaces remain blocked for a very long time or in other words remain reserved. Shared parking or multiple

usage of the same parking space is a better and efficient parking technique. Therefore, pricing of on-street parking should be higher than that of the off-street parking spaces. What is important here is that instead of making off-street parking cheaper than the onstreet parking, the latter should be kept demand responsive and regularly revised as done in other Cities.

III. METHODOLOGY

The present study aims at determining parking demand and supply for the mid-size city Jaipur having population around 42 lacs (as per 2022). It also recommends the measures to resolve the problem of parking in Jaipur city. The Jaipur city in Rajasthan is selected for the study due to ease of data collection.

The methodology of parking study can be divided into four stages. These are:

Definition of Study Area

The first stage consists of identifying the study area, location, adjacent streets and parking inventory for identifying the parking spaces serving the main corridors of Jaipur city including the existing parking problems.

Data Collection

There are two types of data collection methodology for study of parking survey. These are:

1. Fixed period sampling for parking demand
2. Parking Supply for parking space availability

Fixed Period Sampling

The method of fixed period sampling has been followed for collection of the parking data. In this method, all the parked vehicles at the selected site are counted at the beginning of the survey and then after a fixed time interval of 60 minutes for a duration of about 9 to 11 hours during peak hours of parking at the site. The parked vehicle data so collected is converted into PCUs (Passenger Car Unit) by multiplying with corresponding PCU factor. The maximum PCUs per hour is taken as the parking demand of the site. The following paragraphs represent the parking demand in respect of all the eight sites selected for the study.

Parking Supply Sampling

Parking supply is calculated by counting the number of vehicles like car, three-wheelers and two-wheelers which were able to fit in parking area available on the road at various study sites during peak hours of parking. The vehicle data so collected is converted into PCUs (Passenger Car Unit) by multiplying with corresponding PCU factor which is described in IRC: 106-1990 and parking supply in terms of passenger car spaces is found out.

Analysis of Data

The third stage is the data analysis to determine percentage utilization of existing parking in the study area and through these parking characteristics (existing parking) the study can identify the current parking inadequacies to develop proposals to improve parking supply.

Recommendation

The data analysis and the inferences helped in providing certain suggestions and recommending certain measures to control the problem of parking in the

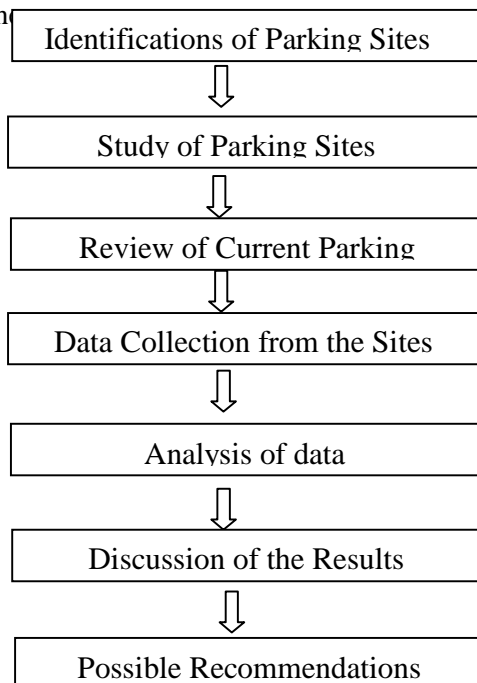


Fig. 3.1 Flowchart of the study

IV. EFFECTS OF PARKING

Parking has some ill-effects like congestion, accidents, pollution, obstruction to fire-fighting operations etc.

Congestion

Parking takes considerable street space leading to the lowering of the road capacity. Hence, speed will be reduced, journey time and delay will also subsequently increase. The operational cost of the vehicle increases, leading to greater economic loss to the community.

Accidents

Careless maneuvering of parking and un-parking leads to accidents which are referred to as parking accidents. Common type of parking accidents occurs while driving out a car from the parking area, careless opening of the doors of parked cars, and while bringing in the vehicle to the parking lot for parking.

Environmental Pollution

They also cause pollution to the environment because stopping and starting of vehicles while parking and un-parking results in noise and fumes. They also affect the aesthetic beauty of the buildings because cars parked in every available space create a feeling that building rises from a plinth of car.

Obstruction to Fire Fighting Operations

Parked vehicles may obstruct the movement of firefighting vehicles. Sometimes they block access to hydrants and access to buildings.

V. RESULTS

Data collection sample at one of the survey sites- Ajmeri Gate (Area Nearby Indian bank)

Vehicle parking data collected from Ajmeri gate is mentioned in table 5.1. It is observed that the maximum parking demand is 47.7 PCUs (Passenger car unit) per hour during the time between 12:00 pm to 1:00 pm. Where PCUs for 2 Wheelers is 0.5, PCUs for Car is 1.0 and PCUs for 3 Wheelers is 1.2. The results obtained are

graphically represented in Figure 5.1 which shows the variation of parking demand per hour with time.

Table 5.1 Parking Demand for Ajmeri Gate (Average of April 2023-Week-1)

Time	Two Wheelers	Three Wheelers	Cars	PCUs
10:00 Am-11:00 Am	22	11	13	37.2
11:00 Am-12:00 Pm	20	18	14	45.6
12:00 Pm-01:00 Pm	27	16	15	47.7
01:00 Pm-02:00 Pm	28	15	12	44
02:00 Pm-03:00 Pm	25	14	11	40.3
03:00 Pm-04:00 Pm	24	9	16	38.8
04:00 Pm-05:00 Pm	21	12	17	41.9
05:00 Pm-06:00 Pm	23	17	12	43.9
06:00 Pm-07:00 Pm	16	8	11	28.6
07:00 Pm-08:00 Pm	19	10	9	30.5

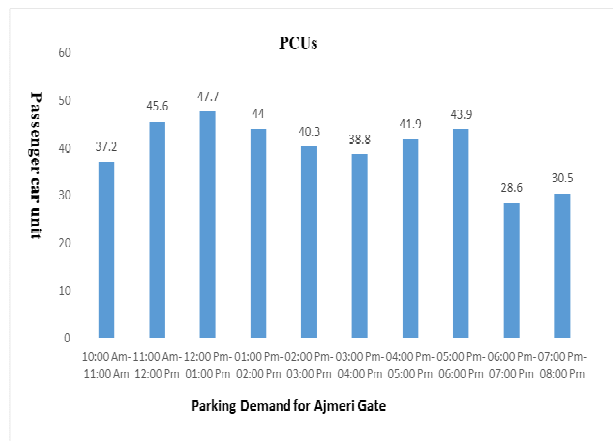


Fig. 5.1 Variation of PCU per hour with time for Ajmeri Gate

RESULTS

Data collected from all the locations are summarized and utilization of existing parking area is derived by dividing parking demand by parking supply. **Chand Pole** has the maximum percentage utilization of the existing parking space and **Railway Station** has the minimum. The relationship between maximum parking demand and supply is represented in tabular and graphical format in Table 5.2 and Figure 5.2

Table 5.2 The Ratio of Maximum Demand to Parking Supply

S.No	Parking area	Maximum Parking Demand (PCU per hour)	Maximum Parking Supply (Passenger Car Space)	Percentage Utilization of Existing Parking Spaces
1	Ajmeri Gate	47.7	27.8	171.58
2	Johari Bazar	46.8	26	180
3	Railway Station	41.2	28.2	146.1
4	Choti Chopad	47.3	26.6	177.82
5	Badi Chopad	48.8	29	168.28
6	Chand Pole	52.9	24.5	215.92
7	Sindhi Camp	47.2	27.4	172.26
8	Collectorate Circle	42.8	25.2	169.84

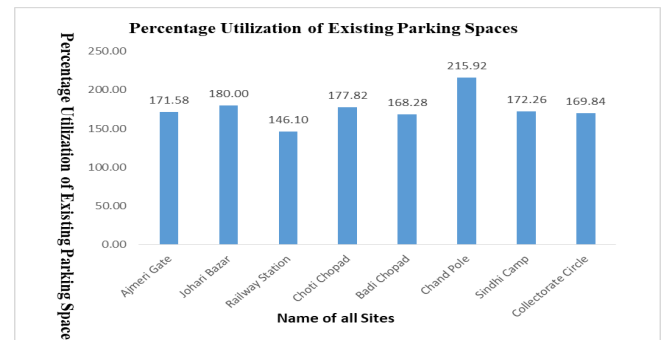


Fig. 5.2 Maximum Parking Demand To Parking Supply

VI. CONCLUSION

The research work can be concluded in following points as follows:

Parking takes considerable street space leading to the lowering of the road capacity. This results in reduction of speed and increase in journey time and delay. The operational cost of the vehicles increases leading to great economic loss to the community. It is required to remove haphazard road parking for an efficient transportation system. The present study conducted on eight selected sites of Jaipur indicates that the mid-sized cities are also affected by parking problems these days. The main conclusions drawn from the study are.

- The parking facilities, both on-street as well as off-street, are not properly provided at all the selected sites for the study.
- All of the selected sites for the study is not provided with properly marked on-street parking except some yellow color parking line towards the edge of carriageway.
- All the Eight parking areas are fully packed to their on-the road parking capacity and are in fact overloaded.
- The utilization percentage of on-the-road parking varies from 146 to 216 percent of all the eight areas considered in the study.
- Chandpole has the maximum percentage utilization of the existing on-the-road parking space whereas Railway Station has the minimum percentage utilization of the existing parking space.
- The average utilization factor of the existing on-the-road parking space of all the selected sites is 175% indicating that demand of parking space is nearly double the existing parking space available for on-the-road parking.

VII. RECOMMENDATIONS

Based upon results of the study, the following recommendations are made:

- Properly marked on-street parking be provided at all the selected sites for the study. The providing

of on-street parking may be prioritized as per utilization factor of the selected sites in the study.

- In addition to on-street parking, separate parking lots need to be provided on the available spaces close to the studied areas to address the problem of parking.
- The future parking demand should be taken care of while providing the parking lots.
- Paid basement parking lots need to be well designed, especially their entry and exit points, for comfort and convenience of parking. Measures like proper lighting inside the basement and proper signage be provided to enhance feeling of safety among the users.
- To encourage the use of paid parking, the charging criterion for parking may be made on hourly basis.

VIII. FUTURE SCOPE OF WORK

The present study on parking demand of Jaipur city has been conducted to collect and analyze parking data of selected sites on main corridors of Jaipur city. The scope for future study includes:

- The study may be conducted on other roads of the city as well.
- Detailed study is also required for integration of parking demand of whole of the city.
- The scope of the study can be enlarged by-
 1. Including more number of roads, more locations and more number of cities.
 2. Conducting origin and destination study of parkers to identify suitable locations of parking.
 3. Conducting a study on parking prices in the city.
 4. By including more type of vehicles and public transport.
 5. By conducting a study on mode of transport available in the area.
 6. By knowing the purpose of visit of the drivers.

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Annexure A-1:- Parking of vehicles near Sites