

# On-Street Parking Management and Model for Khargone City

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## ABSTRACT

Khargone city (8, 030 sq.km) is small area of Madhya Pradesh state with population of 18, 73, 046 lakhs. One of the problems created by road traffic in urban area is parking. It has impact on transport development. Vehicle required sufficient street space to move and to park. Where occupant can be loaded and unloaded. Traffic congestion and parking is synonymous to each other because failure to meet parking that result to traffic congestion. With growing population of motor vehicle the problem of parking has assumed serious proportion. The availability of less space in urban area has increased demand for parking space specially in central business area. A systematic study of parking demand and characteristics are possible for controlling parking is of help to a traffic engineer and town planner.

Four major centre in khargone city with insufficient parking space namely **Jhanda Chouk to Post office Chouraha, Post Office Chouraha to Sabjimandi, Old Radha Vallabh Market to Post Office Chouraha and Main Bus Station to Gour Petrol Pump**. Extensive survey are being at these four places to determine the demand and supply of parking. To find the mean parking time of the vehicle, graph will be also plotted between cumulative parked vehicle and their parking duration. parking demand model will also developed by regression analysis. To obtain higher value of  $R^2$ , linear and non-linear model will also be used.

**Keywords :** Traffic Management, Parking Arrangement, On Street Parking Facility, Parking Demand Model.

## I. INTRODUCTION

Population of all cities in India is increasing day by day cause of this all cities face various parking problem. Parking is a essential component of the transport system. It play an important role in traffic management. Now a day parking problem is related to space, so we minimize the space to reduce the parking problem. Every vehicle user would wish to park his vehicle as closely as possible from his destination in order to minimize walking. It is roughly estimated that out of 365\*24 hours in a year, car runs on an average only 400 hours, while for remaining 8, 360 hours it remains parked. Therefore it is very essential that these should be a proper parking arrangement.

Parking studies are essential to minimize road congestion and accidents. Improper parking arrangements become obstacle to effective traffic management. Parking studies are essential to know parking demand and for development plan and terminal facilities. These studies help in improving

regulations existing parking facilities . proper parking system also increases the efficiency of roads.

Parking are of two types one is on- street parking and other is off- street parking . On- street parking means parking a vehicle on the street along street curb. Many time we can park our vehicle on the street, but sometime there are restriction . Some time we allowed to park our vehicle only one side of street and sometime we are not allowed to park vehicle at anywhere on the street. Off- street parking means parking our vehicle anywhere but on the street. Generally these type of parking like garages and lots . Off street parking can be divided in to two parts are as indoors outdoors. Private lots and garages are also included in off street parking.

## II. METHODS AND MATERIAL

### 1. Various Causes of Parking Problem

- ✓ Availability of fewer parking spaces.

- ✓ Too many cars for roadway due to inadequate mass transit option or other reasons.
- ✓ Fundamentally parking is a problem of space.
- ✓ Demand of space for park is growing with the infrastructural growth of our city.
- ✓ Obstacles in the road causing blockage and merge.

## 2. Objectives of the Proposed Study

- ✓ To determine the parking demand and supply characteristics at selected area.
- ✓ To estimate mean parking time.
- ✓ To develop and validate the parking demand model.
- ✓ To assess the parking characteristics including parking duration and accumulation.
- ✓ Analyze the main street traffic flow condition.
- ✓ With the help of Proper survey at selected areas to provide good on-street parking system.

## 3. Literature Review

**K.V.Aabhamol, S. Rekha, and R. Satikumar, May 2009**, they developed Parking demand model by using SPSS software for Trivadrur city. They concluded that –1) The mean time duration of two wheelers at east – fort was 15 minutes and palyalam and pattom was 8 minutes and 6 minutes respectively. 2) Two wheelers were found to possess less . parking duration than cars3) Departure of parked vehicle follows the poisson distribution. 4) As compare to offices, commercial centers need six times more parking space with the same area. 5) They established relationship between linear and non- linear parking demand model and reached the conclusion that linear parking demand model possess higher coefficient of determination than non –linear model.

**John Golias, GeorgeYannis & Michel Harvatis, January 2002**, deals with the determinants of choice between on- and off-street parking. In this text, a questionnaire-based survey was used and it concluded

that It concluded that the cost of parking have the most important impact on the choice of parking alternatives. In ordered to predict the choice of parking and behavior advanced model was developed.

**Prof. De La Salle, 2013**, The on-street parking facilities in Ermita-Malate area needs improvement since most of the on-street parkers stay for a very long period and they park in areas where parking is not allowed. The laws and ordinances are not implemented properly, thus, the motorists tend to ignore these. And Recommendations are (1) the area of Ermita-Malate should impose better parking rules and regulations and these should be strictly implemented. (2) More parking facilities should also be constructed so that the demand will be met by the supply of parking spaces. (3) Off-street parking facilities are increase since some areas are residential areas so off-street parking facilities should be increased instead.

**Virginia P. Sisiopiku, Ph.,** On-street parking decreases road capacity, increase cash potential and obstruct traffic. On street parking must be a design consideration to ensure user convenience and economic wellbeing of abutting property when off-street parking is not available or feasible.

**Young Woo Lee, 2014**, According to unstandardized coefficients of the developed model, 15.609 vehicles were parked on streets every 1000m<sup>2</sup> of gross floor area of detached houses, and 8.780 vehicles were parked on streets every 1000m<sup>2</sup> of gross floor area of neighborhood-convenience facilities.

**“Tentative Recommendation on the provision of parking space for urban areas” New Delhi,** Growing urbanization, increased demand of space for parking of vehicles in the city areas, whether for short and long-term parking. The parking demand is likely to increase still further at a higher rate in future.

Desirable parking space standards for different land use -

| S.No. | Land use                                                        | Parking space standard                             |
|-------|-----------------------------------------------------------------|----------------------------------------------------|
| 1.    | Residential                                                     |                                                    |
| I     | Detached, semi-detached row houses:<br>plot area upto 100 sq.m. | No private or community parking space is required. |
|       | Plot area from 101 to 200 sq.m.                                 | Only community parking space is required           |

|     |                                      |                                                                                                                                                                                              |
|-----|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | Plot area from 201 to 300sq. m.      | Only community parking space is required                                                                                                                                                     |
|     | Plot area from 301 to 500sq.m.       | Minimum one –third of the open area should be earmarked for parking.                                                                                                                         |
|     | Plot area from 501 to 1000 sq.m.     | Minimum one- fourth of the open area should be earmarked for parking                                                                                                                         |
|     | Plot area 1001sq.m. and above        | Minimum one-sixth of the open area should be earmarked for parking.                                                                                                                          |
| ii  | Flats                                | One space for every two flats of 50to 99sq.m.or more of floor area.                                                                                                                          |
| iii | Special, costly developed area       | One space for every two flats of 50to 100sq.m.of floor area. One and a half spaces for every flat of 100to 150sq. m. of floor area two spaces for every flat of above 150sq.m.of floor area. |
| iv  | Multi-storeyed group housing schemes | One space for every four dwelling except in cities like Calcutta and Bombay where demand may be more.                                                                                        |
| 2.  | Offices                              | One space for every 70sq.m.of floor area                                                                                                                                                     |
| 3.  | Industrial premises                  | One space for upto 200sq.m. of initial floor area. Additional spaces at the rate of one for every subsequent 200sq.m. of fraction thereof.                                                   |
| 4.  | Shops and market                     | One space for every 80sq.m.of floor area.                                                                                                                                                    |
| 5.  | Restaurants                          | One space for every 10 seats.                                                                                                                                                                |
| 6.  | Theaters and cinemas                 | One space for every 20 seats.                                                                                                                                                                |
| 7.  | Hotels and motels                    |                                                                                                                                                                                              |
| I   | Five and four star hotels            | One space for every 4 guest rooms.                                                                                                                                                           |
| ii  | Three star hotels                    | One space for every 8 guest rooms.                                                                                                                                                           |
| iii | Two star hotels                      | One space for every 10 guest rooms.                                                                                                                                                          |
| iv  | Motels                               | One space for each guest room                                                                                                                                                                |
| 8.  | Hospitals                            | One space for every 10 beds.                                                                                                                                                                 |

**Koffi Ayadu Edwin, 2014**, On- street parking is result of insufficient off-street parking facilities), which is reduce the road width, thus leading to obstruction of traffic flow. This type of parking space is not located on road side, in which any member of public can park their vehicles.

By using SPSS, he asses the menace on –street parking and congestion in Ilokoja, and found that parking problem and traffic congestion are ostensible in the area due to it land use pattern and inadequate parking facility. He studied with regard to area Abuja (the federal capital territory ), Lagos and eastern part of country which is imbedded with a lot of commercial activities and has generated lot of vehicular and pedestrian traffic . Hence demand for parking spaces and other facilities are high .

**Arjun C A and Dr. M. S. Nagakumar, August 2014**, On–street parking plays an important role in the efficiency of the overall transportation system. In this research paper license plate method are used. Various terms are used to analyze the parking data and traffic are as Traffic volume of commercial roads, parking volume (commercial & residential), parking turnover (commercial & residential), and parking duration at study area.

**Vanivilas road**, There are 72 lots in the stretch, from which 25% is for four wheeler and remaining for two wheelers. Study found that the parking was mainly utilized by people for hotels and restaurants particularly during evening hours . about 99% demand for parking found during evening hours. According to survey found that all vehicles in vanivilas road preferred short-term parking .survey result shows that 87.9 % of the vehicles parked between 0-1 hours.

Another parking study area is **N R colony**, which consist of 108 parking lots. Survey result shows that 83% two wheeler are utilized the parking space and vans are other means of transport which also utilized parking space. The parking accumulation was uniform between 8.00am to 8.00pm. Here demand was less compared to other roads.

**Anuja Sajeev, 2015**, Smart Parking is at a very tender stage in India and people hardly know about this technology. They cannot distinguish between automated parking and smart parking which is already very prevalent in India. He studied with Multi-level car parking system (MLCP) and automated parking system and concluded that it will solve many problems of people like space availability, wastage of time, fuel and will also provide security to the vehicle. Hence Smart Parking has got a huge potential as many Smart City projects are coming up in India and a huge investment has already been lined up.

**On-street parking management**, "The secret to parking success is "on-street parking management". Good parking management can help local commerce, pedestrian, residents, bus service, bicycle users and vehicle users of different kinds. It enables efficient and fair use of street space. It can ease local traffic problem at low cost. On-street parking management of every street influence the manner, location, timing and duration of parking along the street. Good on-street parking management is essential for every congested and busy area of every town. Parking management include " a variety of strategies that encourage more efficient use of existing parking facilities, improve the quality of service provide to parking facility users and improve parking facility design"(VTPI).

**T. Subramani 2012**, (International Journal of Modern Engineering Research (IJMER) www.ijmer.com Vol.2, Issue.3, May-June 2012 pp-742-748) studied on parking study on main corridors in major urban centre. According to their study on existing traffic condition on road network he concluded that it is must and required to remove on-street parking system for efficient transportation system. Careless maneuvering of parking and unparking leads to accident which are referred to as a accidents. He also concluded that for short term measure pay and park method will be done at peak hours to control and regulate the parking and

for long term measures off-street parking near CBD areas, with in radius of 1 km.

#### **4. Ill Effect of Parking On Road Traffic**

##### **A. Accident**

The maneuvers associated with packing and unpacking are known to cause road accidents. Careless opening of the doors of parked vehicles, moving out of parked position and bringing a car common causes of parking accident.

##### **B. Congestion**

The loss of street space and traffic attendant congestion is one of the serious ill effect of parking .The capacity of streets is reduced, the journey speed drops down and delay increase.

##### **C. Environment**

The environment of the town centre is degrade by Parked vehicle. Stopping and starting of vehicles result in nose and fumes. Over the years many organizations and research reports demonstrated the link between traffic and the environment. Noise, exhaust pollution, visual intrusion, vibration, and effects on animal, plant life and buildings are some of the negative consequences of traffic on the environment.

**On street parking on state roads Virginia P.SISIOPIKU, Ph.d.** The focus of the literature search was on the impacts from the conversion of traffic lanes into on street parking on:

- a. Capacity,
- b. Safety,
- c. Accessibility,
- d. Development and economic growth,
- e. Traffic calming, and
- f. The environment

##### **D. Capacity**

The effect of on-street parking on roadway capacity is well known. Substitution of a road lane by a parking lane has an important impact on capacity and a potential effect on traffic operations. This is expected to be the case when on-street parking is introduced to

the state trunkline system. On-street parking limits street capacity in two ways. First, it preempts lanes that otherwise would be used by moving traffic. Second, parking and un-parking maneuvers frequently reduce the capacity of the adjacent lanes. Even a single vehicle parked within a curb lane can effectively close the lane to moving traffic.

## Safety

**(Highway Research Board, 1971)** On-street parking adversely affects the safety of the street system. Early sources estimated that about 20% of all urban crashes are related to on-street parking. **(Weant R.A. and Levinson H.S., 1990)** More recent reports attribute approximately 15% of all crashes to the presence of parked vehicles. About 5% of all pedestrian fatalities involve people who entered the roadway from between parked cars. These proportions vary from city to city. An early study in Chicago examined the frequency of crashes involving parking **(Chicago Police Department, 1974)**. It was found that moving vehicles striking parked vehicles accounted for 2% of all fatal crashes, 6% of all injury crashes, and 26% of all property damage crashes.

## Emergency Vehicle Access

**Chick C., 1996**, On-street parking constitutes a serious emergency hazard wherever cars block fire hydrants or obstruct fire apparatus. Parking restrictions in the vicinity of fire stations and fire hydrants are essential public safety requirements. When placement of on-street parking is necessary or desirable, available street space must meet requirements for emergency vehicle maneuvering and fire hose laying. Alternatively, on-street parking bays may be designated for use by ambulances or police, where proper road markings alongside the bay are used to indicate the type of vehicle allowed to use the bay.

## Economic Development

There is a strong argument that convenient parking fosters economic growth and development. The placement of on-street parking near businesses and retail uses improves accessibility and convenience to customers and has been used as a strategy for revitalization of central business districts and attraction of renewed consumer patronage to the

downtown areas. A number of behavioral studies cited availability of parking as a factor affecting shoppers' travel Decisions.

## Traffic Calming

**(Residential Streets Task Force, 1990)** For many years replacement of on-street parking by traffic lanes was a common practice as a countermeasure to reduce congestion and increase road capacity. However, a 1990 ASCE report admits that "the tendency of many communities to equate wider streets with better streets and to design traffic and parking lanes as if the street were a 'micro freeway' is a highly questionable practice". Urban planners promoting new urbanism and neo-traditional street designs, as well as advocates of livable and walkable communities and proponents of traffic calming all agree that use of on-street parking can have many benefits. On-street parking is viewed as part of the strategy to reduce motorists speeding through increased side friction. Replacement of traffic lanes by parking lanes, or reduction of traffic lane widths to allow for on-street parking show reduction in motorists speeds and better compliance with posted speed limits. Moreover, alternating of on-street parking from one side of the road to another can create a chicane-like effect in residential settings. This technique is a proven traffic calming measure that can reduce travel speed and result in benefits similar to those of actual chicanes at a fraction of the cost (Ewing, R., 1999). Among other benefits cited in the literature, properly designed and placed on-street parking is viewed as a means to create conditions where large vehicles can use the added space at intersections to improve their effective turning radii. Sight lines are preserved at intersections with 30- to 50-foot parking setbacks from intersecting legs (Burden D., 1999; ITE, 1995). Finally, on-street parking supplements off-street parking and thereby reduces the need for large parking lots. For the reasons listed above, reports on desirable features for pedestrian-oriented neighborhoods recommend the use of on-street parking (Duany A., 1990; Lerner-Lam E., 1992). Still, the use of on-street parking as a traffic calming measure should be restricted to facilities with speed limits at or below 25 miles per hour and shall be avoided on major arterial and collector streets.

## Proposed Methodology

Selected Area For Study -

- a. Jhanda chouk to post office chouraha
- b. Post office chouraha to sabjimundi
- c. Old radhavallabh market to post office chouraha
- d. Main bus station to gour petrol pump

### III. RESULTS AND DISCUSSION

#### Selection of Independent Variables

According to the land uses, the parking accumulation may vary . so in order to develop the parking demand model, different land use variable should be considered . Commercial centers attract more people towards them than most other land uses. At the same time, the parking requirement of different commercial

centers is not the same. Some commercial centers attract more consumer toward it than other. Commercial centers are divided into two types, are as – Type I and type II . Type I is a commercial center with more consumer attraction and Type II is a commercial center with less consumer attraction. The nature of commercial was decided by observing at the particular site for 5 hours. Commercial center which more than 5 customer on an average per unit area visited within one hour was taken as Type I commercial center otherwise it was taken as Type II commercial center.

Table 1 shows the various examples of commercial shop belonging to each type.

**Table 1.** Classification of Shop

| S.No. | Type   | Shops                                                                                                                                                                                                                               |
|-------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1     | Type 1 | Textiles, jewelry, fancy shop, cosmetic shop, kirana shop, stationary shop, internet cafe, utensil shop, Auto parts and garage, Bhojnalay, hotel, pan center, ATM, medical shops, cosmetic shops, petrol pump, Photostat, vine shop |
| 2     | Type 2 | Shoes shop, watch point, optical, tailoring shop, electronic shop, Repairing shop, Residency hotels, shoes shop, Bick showroom Furniture shop                                                                                       |

Offices were also classified into two categories type 1 and type 2. Type I offices offer greater attraction than type II. The details are shown in table 2.

**Table 2.** Classification of Office

| S.No. | Type   | Offices                                                                                                                       |
|-------|--------|-------------------------------------------------------------------------------------------------------------------------------|
| 1     | Type 1 | Union bank, SBI bank, HDFC bank, Mharastra bank, Jila sahkarita bank                                                          |
| 2     | Type 2 | Dainik bhaskar karyalay, construction offices, consultancies, Nayi duniya karyalay, Finance office, krishi Kendra office etc. |

### IV. CONCLUSION

#### Some Independent Variables

- ✓ Demand for parking space,  $d$
- ✓ Area of commercial centre in  $m^2$ ,  $c$
- ✓ Area of office in  $m^2$ ,  $of$
- ✓ Area of Type I commercial centers in  $m^2$ ,  $c_C$
- ✓ Area of Type II commercial centers in  $m^2$ ,  $c_N$
- ✓ Area of Type I office in  $m^2$ ,  $of_N$
- ✓ Area of Type II office in  $m^2$ ,  $of_C$
- ✓ Area of health service in  $m^2$ ,  $h$

#### Expected Outcome

- ✓ We can get mean duration of two wheeler at all selected area.
- ✓ Parking demand model will be developed .
- ✓ Daily traffic volume at particular area will be determined.
- ✓ Parking volume at selected stretches will be determined.

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