# Demand & Supply of Parking System Analysis at Chittagong Commercial Area in Bangladesh

Sudipta Chowdhury, Kutub Uddin Chisty, Md. Shahjalal Misuk

**Abstract**— Chittagong is the Commercial Capital of Bangladesh. The study area at **Agrabad in Chittagong** is one of the most commercial activity centers of Chittagong. Many light industry and commercial land use and residential area are found by the both side of the road. This study is mainly focused on the demand & supply of parking system analysis in Agrabad commercial area. Existing parking accommodation, parking demand, parking index, parking turnovers, parking management, parking types are analyzed on the base of modified patrol survey. Both off street & on street parking have surveyed to find out the actual measurement of the demand & supply of parking in the Agrabad commercial area. Highest number of vehicles was calculated to find out the peak hour time where vehicles are parked in highest numbers. Some specific purposes are determined for which the illegal on street parking is increased day by day. The demand supply ratio is also finding out in data analysis part.

**Index Terms**—: Modified patrol survey, Demand supply ratio, parking accommodation, Parking index & Parking turnovers.

## 1 INTRODUCTION

Parking is an essential component of the transportation system. The growing population of Bangladesh has created many problems – one of the challenging ones being car parking of the commercial areas which we confront almost every day. Parking is one of the major problems that are created by the increasing road track and other vehicles. The availability of less space in urban areas has increased the demand for parking space especially in areas like Central business district. The parking index of the building is the important basis for the construction of city's parking facilities. More over demand & supply of parking system analysis in "Agrabad" commercial area, focus on parking accommodation, parking demand, parking index, parking turnovers, parking management, parking types on the base on parking space. This study has also investigated the evidence about the impact of different types of parking measures and policies on road traffic, congestion and transport safety, car parking, on the level of parking survey of transports through the activity of commercial area.

### 1.1 Objective

1. To analyze parking demand of our study area.
2. To analyze parking supply on the basis of parking acommodation.

### 1.2 Study area

Agrabad is the central business district of Chittagong, Bangladesh. It is located on the south side of the city. Most of the business establishments of the city have offices located in Agrabad. There are some of the government quarters of the Colony, and the CDA residential areas are located. Agrabad mainly is under the Double Mooring police station but some parts of the region Halisahar are the part of Agrabad. It is directly connected to the main roads of Port of Chittagong.

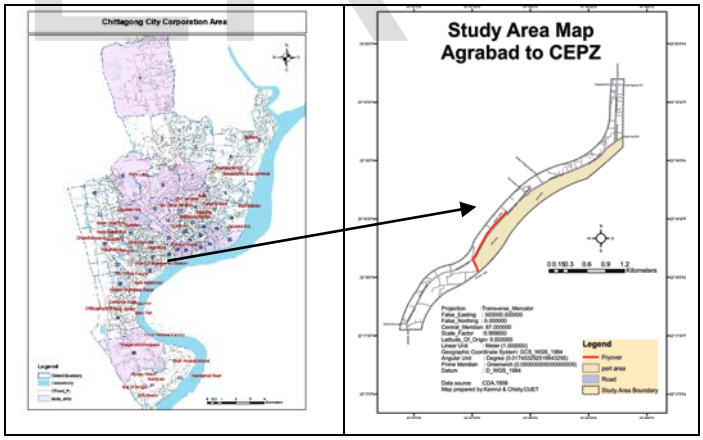


Fig. 1 Study area map

### 1.3 Scope of study

Agrabad is a CBD of Chittagong city in the context of its major commercial activity so parking is an important factor to ensure the safe and comfortable movement of the inhabitants of this area. If the actual demand and the existing & actual scenario of the parking system are determined, it can help to ensure an effective parking & sustainable management system for the inhabitants. By this way the Agrabad area can be converted to a well parking facilitated as well as a well transportation management system.

*Kutub Uddin Chisty and Shahjalal Misuk are the students of department of Urban & regional planning of Chittagong university of Engineering & Technology (CUET), Chittagong-4349, Bangladesh.*

*Co-author Sudipta Chowdhury is the students of department of Urban & regional planning of Chittagong university of Engineering & Technology (CUET), Chittagong-4349, Bangladesh. (Phone+8801914517848, e-mail: (sudipta.urp10@gmail.com).*

## 2 THEORETICAL FRAMEWORK

### 2.1 Parking Concept

Parking facilities and programs are of considerable importance in traffic engineering. Most persons to urban and regional commercial centers are accessed primarily by cars. The viability of these areas depends on the availability of convenient parking facilities adjacent to or easily accessible to desired destinations, especially off-street parking facilities [7]. Various aspects of the parking related index are introduced as follows.

### 2.2 Parking Demand

The number of need parking space in a given area at some time of interval [3].

### 2.3 Parking Capacity

The number of parking behavior can accommodate in a given area. Parking capacity includes planning capacity and actual capacity. Planning capacity is the total parking spaces in the study area and the actual capacity is the number of park space which can be accommodated in the actual parking management and operation [3].

### 2.4 Parking Turnover

Average parking times of a parking space in a given time of interval [3].

### 2.5 Average Parking Duration

It is average parking time of a vehicle in a given time interval. Parking duration is the length of time individual car taken park space. This characteristic is a distribution of individual values and the average values are of great interest [3].

### 2.6 Type of parking

The type of parking to be found at origins varies:

a. Private off-street parking;
b. Public off-street parking (short stay, long-stay, co tract);
c. Controlled (paid) on-street parking and
d. Uncontrolled (free) on-street park.

On the basis of the style of parking Areas, there are two major types of Parking:

1. on Street Parking
2. off Street Parking

On street Parking is divided into three types:

1. Angular Parking
2. Parallel Parking
3. Perpendicular parking (efficient Parking Method).

### 2.7 Parking index

Parking index is also called occupancy or efficiency. It is defined as the ratio of number of bays occupied in time duration to the total space available. It gives an aggregate measure of how effectively the parking space is utilized [1].

Parking index =parking load*100/ Parking capacity

### 2.8 Parking Accumulation

Normally it is expressed by accumulation curve. It is defined as the number of vehicles parked at a given instant of time. Accumulation curve is the graph obtained by plotting the number of bays occupied with respect to time [2].

### 2.9 Parking Survey

Types of Parking Surveys

a. Parking Space inventory.
b. Patrol Method by using surveys.
c. Questionnaires' type parking usage surveys.
d. Cordon Count.
e. Photographic Methods.

### 2.10 Parking Space Inventory

The data on parking facilities invertory should be recorded on the plans using suitable symbols.

a) Length of road.
b) Number of parking spaces.
c) Street width.
d) Location of bus stops, bus bays etc.
e) Traffic management measures in force
f) Numbers and types of parking signs for regulation of parking.
g) Vacant or unused land suitable for temporary parking space.

### 2.11 Patrol Method by Using Surveys

The Parking usage survey by patrol is measured by following aspects.

I. Purpose of parking.
II. Mapping the street system.
III. Frequency of patrol method.
IV. Method of observation.
V. Timing of survey.
VI. Equipment and form of recording.
VII. Analysis.

### 2.12 Questionnaires Type Parking Surveys

The questionnaire types parking usage survey involves interviews with the drivers. As a result, it is possible to collect information on the extent, to which the existing facilities are being used, the parking requirements at the prices existing at the time of survey, the parking demand at different prices, the distribution of demand over area and time and the journey purpose of car parkers [8].

In the interview of actual parkers, the information collect should include:

a) Address of origin of the trip.
b) Address of destination of the trip.
c) Trip purpose.
d) Time of arrival at the park place.
e) Time of departure from the parking place.
f) Type of parking space used
g) Types of vehicles.

## 3 METHODOLOGY

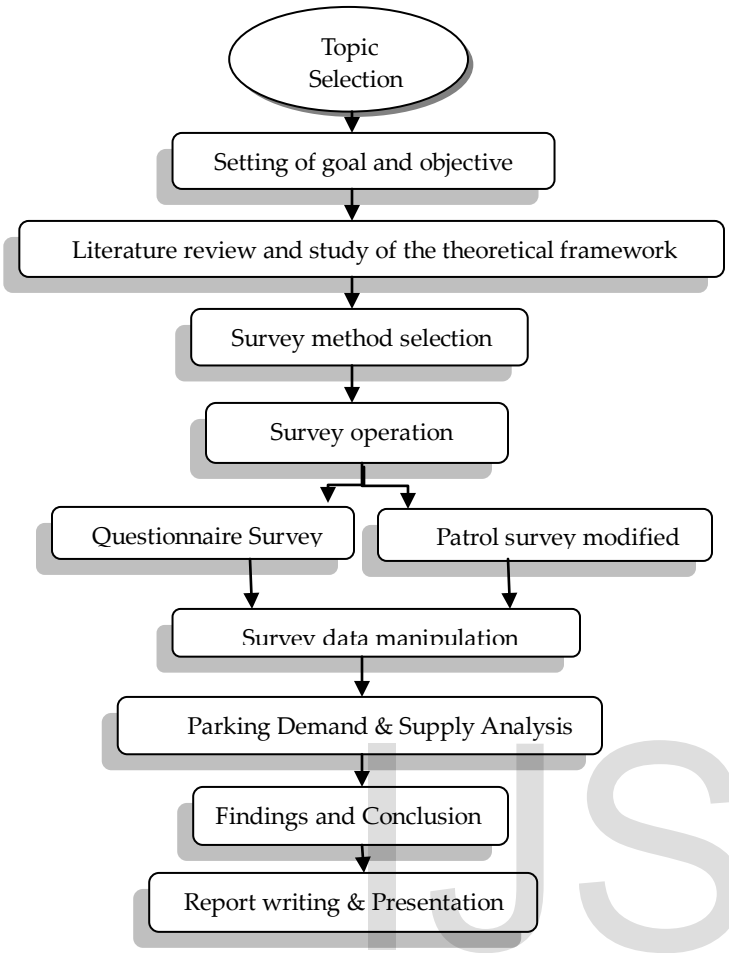


Fig. 2 Methodological flow chat

## 4 DATA PROCESSING/ ANALYSIS

### 4.1 On and Off Street Parking at Working & Weekened day

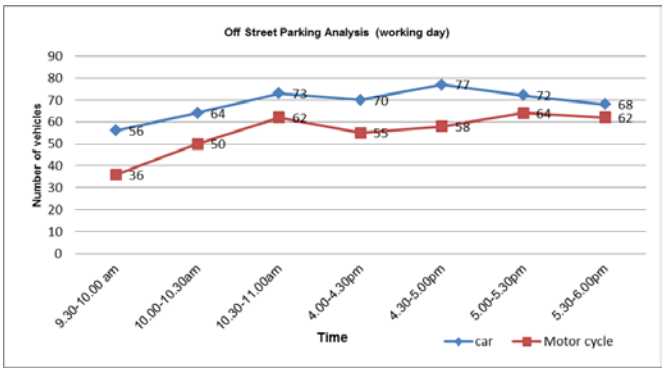


Fig. 3 Number of off street parking at working day

From the upper graph, it is observed that the number of car and motorcycle are higher number of the off street parking at the time of 10.30-11.00 am & 4.30-5.00 pm. at working day.

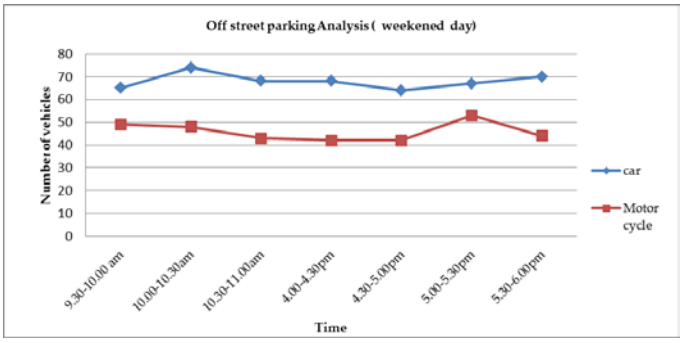


Fig. 4 Number of off street parking at weekened day

From the upper graph, it is observed that the number of of car is higher number of the off street parking at the time of 10.30-11.00 am & the number of motorcycle is higher number at the time of 5.00-5.30 pm. at weekened day.

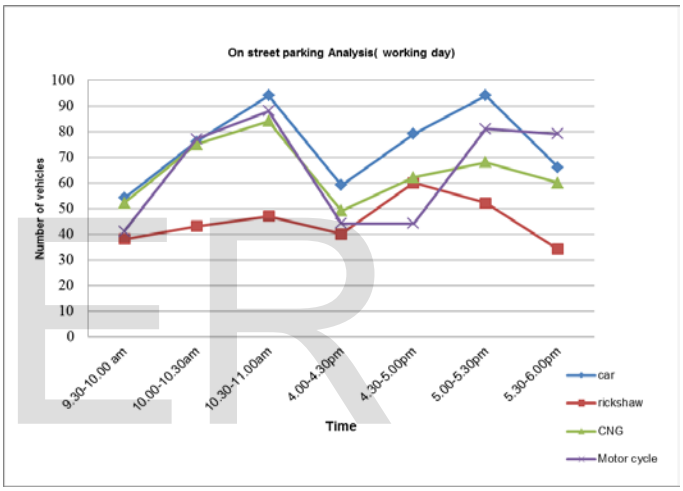


Fig. 5 Peak hour parking at working day

From the chart, it is found that the peak hour in working day is 10.00-11.00 am & 4.30-5.30 pm at which time large numbers of vehicles are parked illegally.

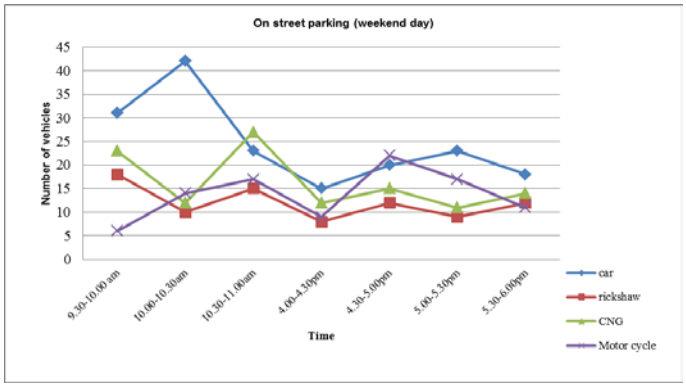


Fig. 6 Number of on street parking at weekend day

From the chart, it is observed that the peak hour in weekened day is 10.00-11.00 & 5.00-6.00 at which large no. of vehicles are parked on street illegally.

## 4.2 Parking Accumulation

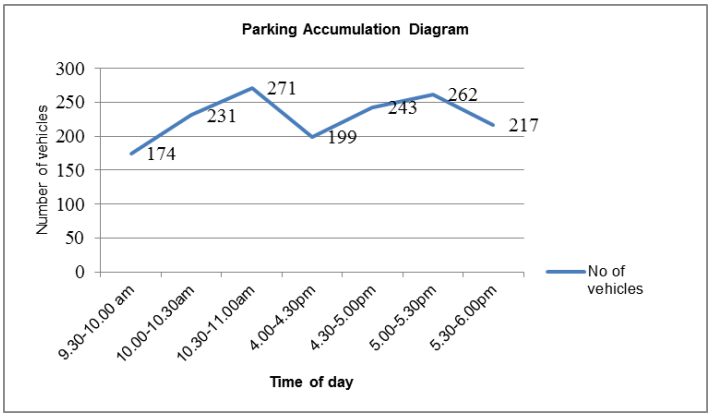


Fig. 7 parking accumulation diagram at working day

Parking accumulation diagram showing the total number of vehicles parked in an area at many specified moment for working day.

## 4.3 Parking turns over

As 7 parking spaces are used by 557 cars in a period of 3.50 hours, then the parking turn over as =(557/7) in the off day

= 79.58 cars/spaces in a period of 3.5 hours.

## 4.4 On and Off Street Parking Demand

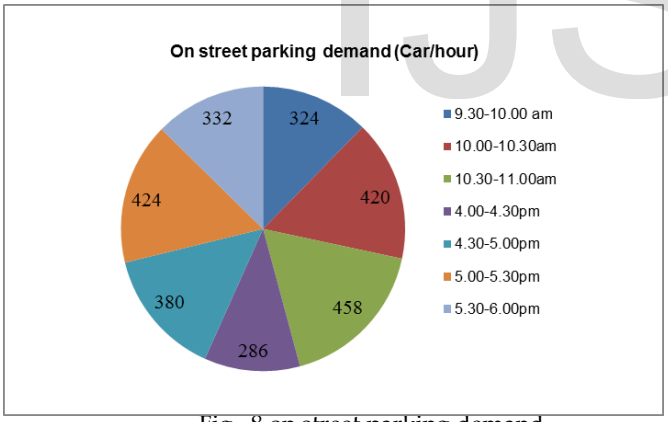


Fig. 8 on street parking demand

Total demand of on street parking (peak hour) = 324+420+458+286+380+424+332/7= 375 cars per hour. Calculating vehicles such as rickshaw, motorcycle, CNG, and car are in a single and same unit as a car. For this conversion there rickshaw=.5, CNG=.5, motorcycle=.25 and the car =1 as a unit for taking actual measurement and the facilities of the calculation.

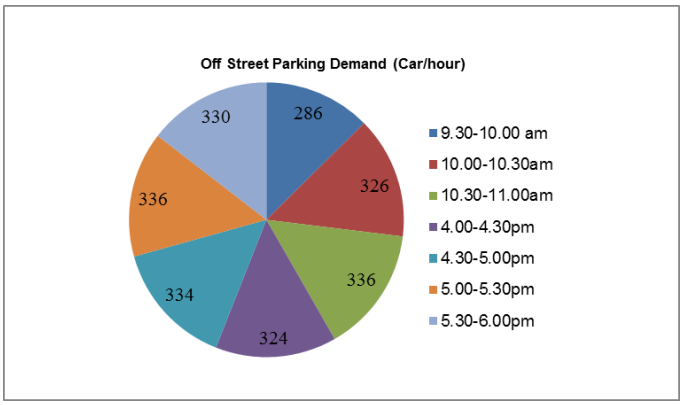


Fig. 9 off street parking demand

Total demand of Off Street Parking (Peak Hour) = 286+326+336+324+334+336+330/7= 325 car per hour.

So the average car parking demand of both on street and off street is (375+325)/2=350

## 4.5 Demands-Supply Ratio

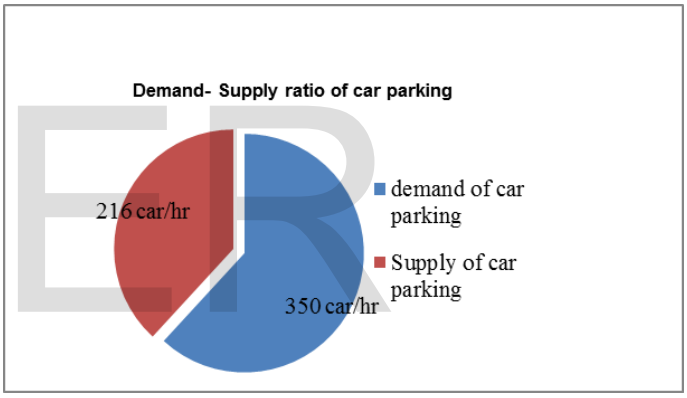


Fig. 10 Demand –Supply ratio

Average demand of car parking is more than the actual supply which get from the field survey. The ratio of the demand and supply is 1.62. So there is no doubt that the lack of car parking facilities is already exists in the Agra bad commercial area according to the demand of the parking. As there is a lack of parking facilities, so peoples are most probably bound to parked their car on the street. Besides this some people park their car or vehicles for their willingness due to have the place of off street parking inside of the office and shopping centers.

## 4.6 Factors of the Illegal Parking

Land use of Agrabad commercial is classified into various categories such as shopping, office, restaurant, bank etc. There is also an ethnological museum which is situated at the eastern side of our study area. This museum is also responcible for the illegal parking. The cars parked on the road hotel Saint Martin to hotel Agrabad illegally because of most of buildings are served as the official purposes. The road of Aktarujjaman centre to the Laki plaza is always found a large number of rickshaw and CNG due to shopping purposes. So functionality of the buildings is an important

for the illegal parking on the roads. Intersection of the roads is another reason for illegal parking due to giving access to all different shopping centers, offices and housing unit.

### 4.7 Duration of Vehicles

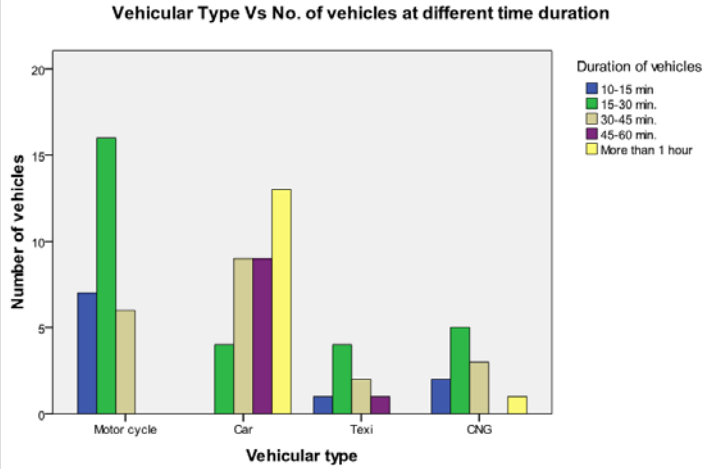


Fig. 11 Duration of different vehicles

Motorcycles are parked at 10-15 minutes, cars are parked more than 1 hour and taxies and CNGs are also parked at 10-15 minutes duration.

### 4.8 Percentage of Different Trip Purposes

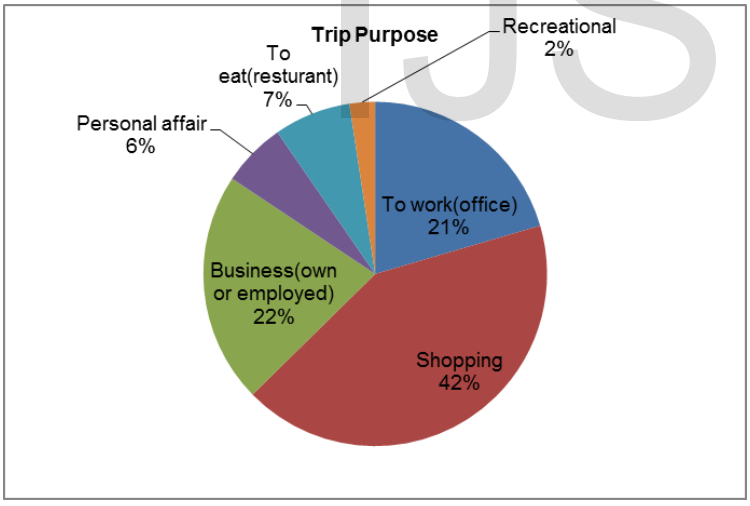


Fig. 12 Percentage of different trip purposes

Most of the vehicle is parked for the shopping purpose because of its commercial area locations besides lowest number of cars are parked at the recreational purpose though there is also an ethnological museum located in that area.

### 4.9 Satisfactory or Unsatisfactory of Services

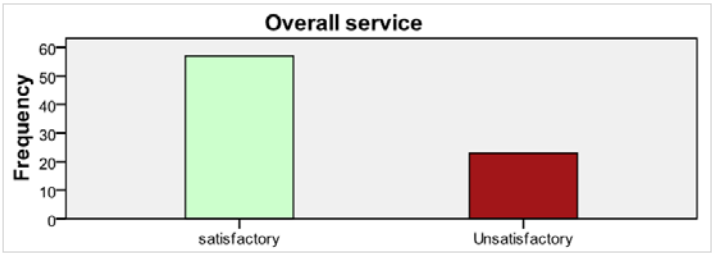


Fig. 13 Condition of overall services

The satisfactory level of services is larger than the unsatisfactory level of services. Actually the owners and the drivers of the vehicles on the off street parking area answered satisfied about existing parking system but on the other hand the owners and drivers on the street parking answered unsatisfied. Because they park their vehicles on the road which is illegal and there is no security of their vehicles.

## 5 FINDINGS

- ✓ Number of cars and motorcycles is higher at the time of 10.30-11.00 am & 4.30-5.00 pm on off street parking at working day.
- ✓ Number of cars is higher at the time of 10.30-11.00 am & number of motorcycles is higher at the time of 5.00-5.30 pm on the off street parking at weekened day.
- ✓ The peak hour for working day is 10.00-11.00 am & 4.30-5.30 pm.
- ✓ The peak hour for off day is 10.00-11.00 am & 5.00-6.00 pm.
- ✓ The average car parking demand of both on street and off street is 350 cars per hour and the capacity of the off street parking which is actual supply of the car parking is 216 cars per hour.
- ✓ The average demand of car parking is more than the actual supply which get from the field survey.
- ✓ The ratio of the demand and supply is 1.62.
- ✓ There is no doubt that the lack of car parking facilities is already exists in the Agrabad commercial area according to the demand of the parking.
- ✓ The functionality of the buildings & much intersection of the roads are an responsible for which the illegal parking on the roads.

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## APPENDICE


Fig. 13 parking space invertory map



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