“A STUDY ON SURVEY AND EVALUTION OF PARKING CONDITION AND DEMAND ANALYSIS DHAKA NEW MARKET AREA”

By

MD.AL-RABBY, SADHAN KUMAR BISWAS, BISWAJIT DAS, MD.TAREK AHAMED

A thesis submitted to the Department of Civil Engineering in partial fulfillment for the degree of Bachelor of Science in Civil Engineering



Department of Civil Engineering

Sonargaon University

147/I, Green Road, Dhaka-1215, Bangladesh

Section: 13thB

Semester -Summer11th

Year: 4th

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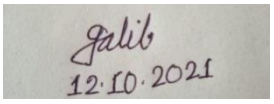
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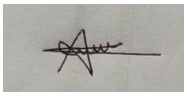
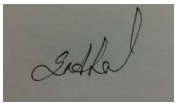
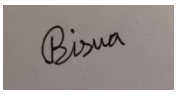
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Dedicated

to

“ My parents,

for always loving and supporting me.

There wasn't a parenting book in the world

that could have prepared you for my eccentricity.

I'm sorry for denting the coffee table with

my ninja swords. Yes it was me.--------”

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ABSTRACT

In Dhaka, a rapidly urbanizing mega city, different private car friendly policies and infrastructure development encourage more people to own and use private. This large number of cars require huge parking space. On-street car parking is now creating severe transportation problems in major roads of Dhaka city, like Mirpur road, which is lined with numerous office and commercial spaces and shopping centers. This paper aims to explicate the parking scenario of the major shopping centers of Dhaka through analyzing the parking and demand supply of New Market, which is a very popular shopping center of this city. The study tried to explore the possibilities of moderating the present parking problems of this market, for which a site-specific study was conducted rather than a city-or nationwide determination of parking characteristics. Required data has been collected from two parking surveys – parking space inventory and parking usage survey by patrol, conducted on two separate working days each covering five hour periods. The study found that the average duration of parking in New Market area is around 45 minutes and a considerable portion of cars occupy the parking area up to 3 to 5 hours which lessens parking turnover. Through analyzing the parking demand and supply of a prominent shopping center of Dhaka city, this study invokes parking characteristics which is a common feature observed in other shopping centers or even in other land uses. Therefore, the findings can be used to provide targeted solutions by addressing specific problems in the parking tendencies.

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CHAPTER 1

INTRODUCTION

1.1 Background and Motivations

Dhaka is a densely populated city which hosts a population of 21.74 million, making it the 06^{th} largest city of the world (World Atlas, 2021). It is the capital and busiest city of Bangladesh which is the main center of education, administration, trade, commerce, etc. These land uses are attracting traffic from all comers of the country. The city is the historic city and this always attracts people from other parts of the country as there are benefits to live in Dhaka for its renowned educational institutions, better business and employment opportunities. Apart from these advantages, it has serious problems with traffic, drainage housing, water supply and sewerage, gas and electricity. Traffic Jam at Dhaka for different vehicles and illegal parking - occupying almost 50 % of the road and hawkers ' activities on footpath. The City is now experiencing severe traffic problem which records high in all considerations. The rapid population growth together with limited space available for new roads and other transport infrastructures has made the congestion problem unbearable to the city dwellers. From this point of view we have decided to prepare a proposal for parking to reduce congestion and proper management of traffic. The present conditions of parking have worsened because the numbers of private car have increased and more and more people have opted to travel by private car. According to the Bangladesh Road Transport Authority (BRTA) , the number of registered cars in Dhaka up to May 2021 was 205,619 (BRTA , 2021) . These cars had been used only for private purpose and constituted almost 25 % of all motorized vehicles registered within Dhaka city. Among all other vehicles, private cars create nuisance in various aspects. It has been found that for 9596 of their time on road, cars remain stationary - which means that most of the time they are parked which consumes large amount of road space. Moreover, as off - street parking is not adequately developed for all land uses in Dhaka, these cars frequently use roadside space for parking in free or insignificant amount of charges. In Dhaka city, especially large shopping centers attract huge amount of traffic. Inadequate parking provisions in these shopping centers contribute to the problems in traffic movement. There are around 3,000 roadside shopping centers in Dhaka, and most of them do not have adequate provisions for parking Dhaka new market, being one of the major arterial shopping center consists of numerous shopping zone along its route and there has been an increase in the parking of cars on roadside. Before any measures for the betterment of the conditions of parking can be formulated, it is required to obtain information concerning the capacity and usage of existing parking facilities. Unfortunately, there is little research on parking condition of Dhaka city. This context provides the motivations for this study. Transportation is one of the most discussed issues for Dhaka city now - a - days. Due to lack of proper transport planning, lives of city dwellers have become really hard. A very significant part of transportation planning is parking. People have become habituated to park of cars just on the road for a long time which eventually degrades the efficiency of the road.

Dhaka new market is one of the most busiest and important shopping center in Dhaka city which generates a huge number of traffics. Commercial buildings can be treated to be mostly responsible for this traffic generation. This study aims at analyzing the demand analysis of parking at Dhaka new market shopping center zone. This will provide an overview on the actual parking scenario along the Dhaka new market. Our main focus of the study is to ensure to present condition and future demand or recommendation of parking system at Dhaka new market zone. This study was conducted in a specific area of Dhaka city, new market area. The condition of the area is more or less comfortable during off peak hours but during peak hours people suffer a lot because of parking condition. Because during that time the parking areas become overloaded. Some vehicles stay for a long period and some for short period. The vehicles which stay for long period create congestion due to parking. There are two kinds of parking we find out in our survey. One is on street parking and another is off - street parking. Parking congestion is mainly create for on - street parking.

1.2 Research Objectives and Overview

1. To analyze present parking condition of Dhaka New Market shopping center.
2. To identify the major parking problem in New Market shopping center.
3. To recommend some initiatives for the improvement of present parking system / situation.

1.3 Organization of the thesis

This study tends to find out the parking demand scenario, Researchers, Planner. Policy makers will get an idea about the parking situation along with one of the most important Shopping center of Dhaka city , New market , as illegal parking severely affects the market efficiency , the study will also be help for transport engineers It will can be an overview for taking decision about implementing charge for on street parking , prohibition of on - street parking , co - coordinating between the demand surplus supply thus total parking management.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Parking denotes the basic requirement in a transportation system. But more often its impact on the efficiency of traffic movement evades our contemplation. This is because our perception of transportation is limited with the notion of movement whereas parking involves the condition when the vehicles are stationary. It is becoming a crucial issue in managing the transportation system since it affects the overall accessibility of a city (Litman 2021). Providing suitable parking spaces has become a challenge for the transport planners in the scenario of ever increasing private car ownership. In order to identify the situation or measure the betterment of conditions, the availability of parking space, extent of its uses and determination of parking demand is very essential. Also it is required to estimate the parking fares and duration of parking. Depending on the land use characteristics the demand of parking varies, which is influencing the supply parameters. This becomes more critical in a degenerated transportation management scenario like that prevailing in Dhaka city where most people prefers to use cars in the busy commercial centers. Thus the viability of these commercial areas depends on the availability of convenient parking facilities adjacent to or easily accessible to desired destinations, especially off - street parking facilities. The problem is worsened by the absence of any effective parking policy for Dhaka where illegal on street parking is a mon scenario in every busy street. This constricts the available carriageway for traffic, thus posing as one of the major contributor to traffic jam. We found that the vehicles cruising for on - street parking create big amount of the traffic congestion. We also found that under pricing of on - street parking is the main cause behind increased tendency to cruise rather than parking on a vacant off - street parking. Frequently and most importantly the question lies in determining the indispensable demand that has to be accommodated. The Institute of Transportation Engineers (ITE) in its period report developed a guideline specifying the number of parking bays required for 1,000 square feet of each category of land use . For shopping centers, ITE recommended 5.05 parking bays for 1,000square feet area of this land use (ITE , 2020) . This area includes shops and also restaurant spaces because of its significant influence on parking demand (ITE, 2018) . ITE has developed this standard in a context where a large number of trips are made by cars and where alternative transport options are minimal (Shoup , 2018). The study conducted for preparing Strategic Transport Plan for Dhaka shows that only 7.6 % of the people use cars for making internal trips (GOB , DTCA , 2018) . Hence, it is inappropriate to apply this standard to provide the minimum number of parking bays in Dhaka city where most of the people use other modes.

2.2 Content

2.2.1 Definition of parking:

Parking system is a system that is used to help managing cars in parking area in other to avoid congestion and arrange cars in an allocated position. The system also helps to track how many cars pass through the gate and the duration taken by each, and then it will calculate the amount of money a car should pay when exiting. Car parking system is being used in many congested area or location where there are many meeting point of people like where there are more than one shopping complex near to each other or where there is megamall stadium.

2.2.2 Parking system:

There are two types of parking are follows in Bangladesh-

1) On - street Parking and

2) Off - street parking.

2.2.3 On street parking:

On street parking means the vehicles are parked on the sides of the street itself. This will usually be controlled by government agencies themselves. Common types of on - street parking are as listed below. This classification is based on the angle in which the vehicles are parked with respect to the road alignment. As per IRC the standard dimensions of a car is taken as 16x8 feet.

1) **Parallel parking:** The vehicles are parked along the length of the road. Here there is no backward movement involved while parking or un - parking the vehicle. Hence, it is the safest parking from the accident perspective. However, it consumes the maximum curb length and therefore only a minimum number of vehicles can be parked for a given kerb length.

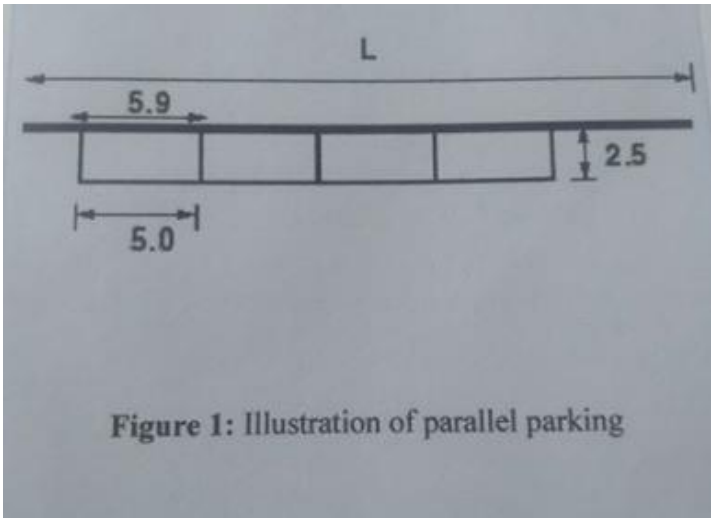


Figure 1: Illustration of parallel parking

since least road width is used. Parallel parking of cars is shown in figure 1.

2) **30 parking:** In thirty degree parking, the vehicles are parked at 30 degree with respect to the road alignment. In this case, more vehicles can be parked compared to parallel parking. Also there is better maneuverability. Delay caused to the traffic is also minimum in this type of parking . An example is shown in figure 2. From the figure.

$$
\begin{aligned}
AB &= OB\sin 30^\circ = 1.25, \\
BC &= OP\cos 30^\circ = 4.33, \\
BD &= DQ\cos 60^\circ = 5, \\
CD &= BD - BC = 5 - 4.33 = 0.67, \\
AB + BC &= 1.25 + 4.33 = 5.58
\end{aligned}
$$

For N vehicles , L = AC + (N - 1) CE = 5.58 + (N - 1) 5 = 0.58 + 5N

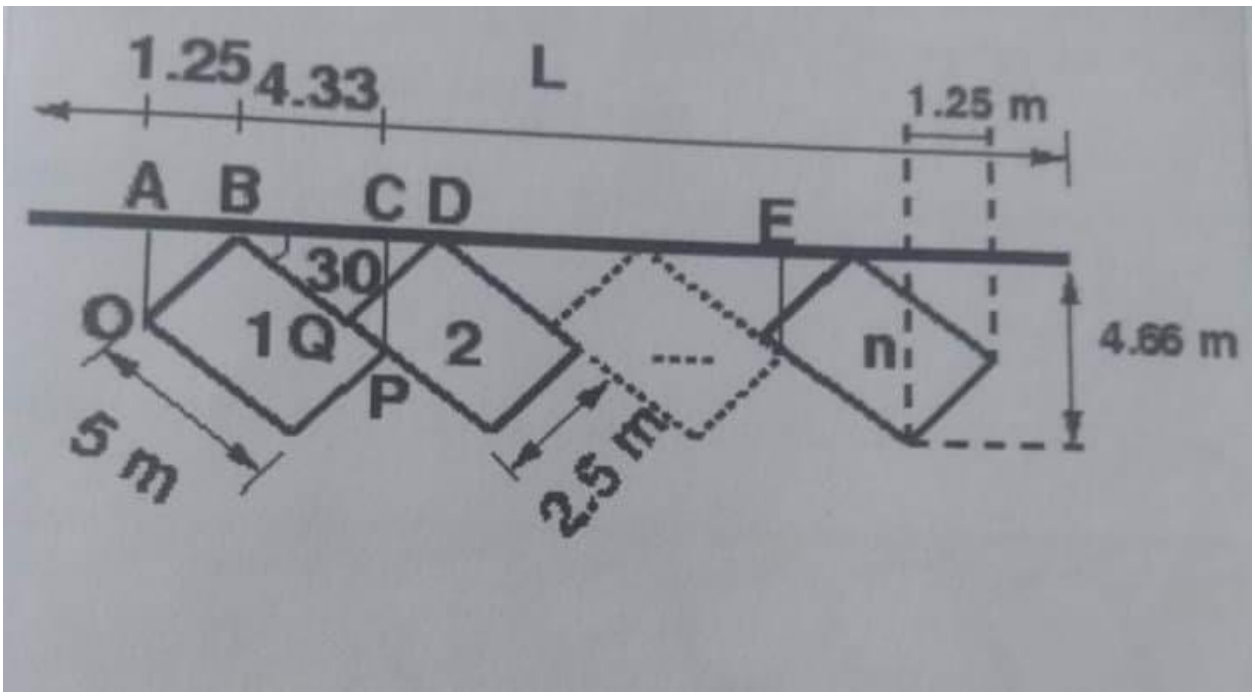


Figure 2: Illustration of 30 ° parking

3) 45 ° parking: As the angle of parking increases , more number of vehicles can be parked Hence compared to parallel parking and thirty degree parking, more number of vehicles can be accommodated in this type of parking. From figure 3, length of parking space available for parking N number of vehicles in a given kerb is L = 3.54 N + 1.77.

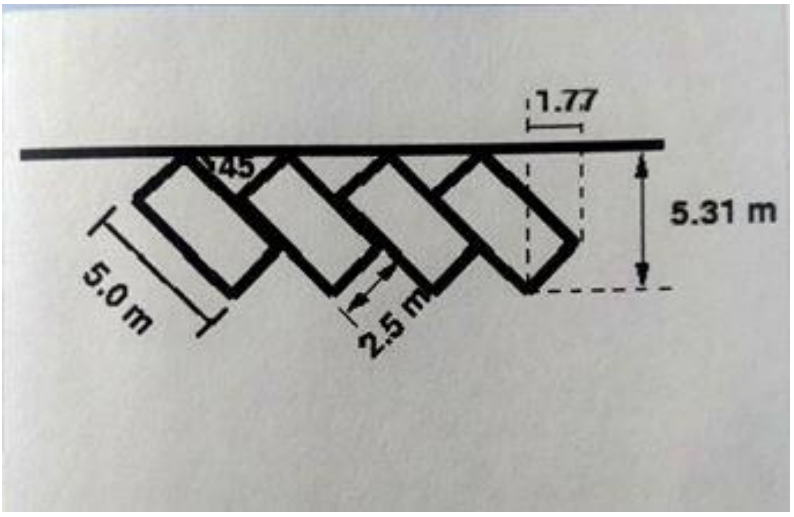


Figure 3 : Illustration of 45 ° parking.

4) 60 parking: The vehicles are parked at 60 ° to the direction of road . More number of vehicles can be accommodated in this parking type . From the figure 4 , length available for parking N vehicles = 2.89N + 2.16.

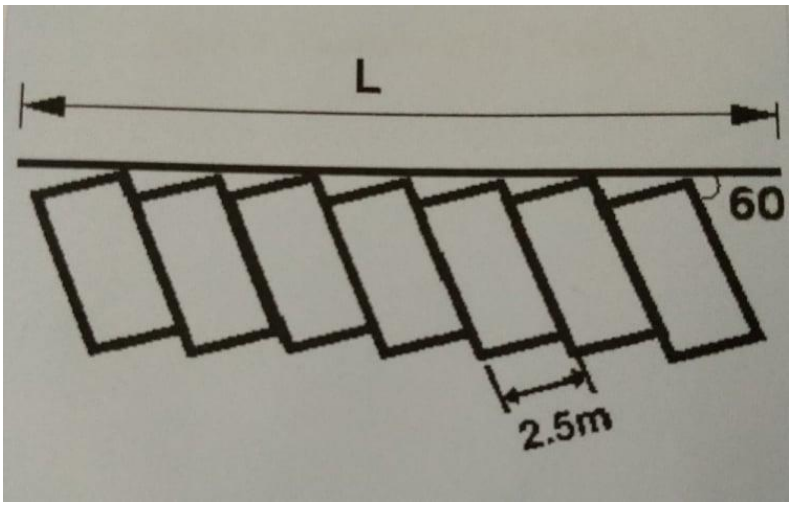


Figure 4 : Illustration of 60 ° parking.

5) Right angle parking: In right angle parking or 90 parking, the vehicles are parked perpendicular to the direction of the road. Although it consumes maximum width kerb length required is very little. In this type of parking, the vehicles need complex maneuvering and this may cause severe accidents. This arrangement causes obstruction to the road traffic particularly if the road width is less. However, it can accommodate maximum number of vehicles for a given kerb length. An example is shown in figure 5. Length available for parking N number of vehicles is L = 2.5N.

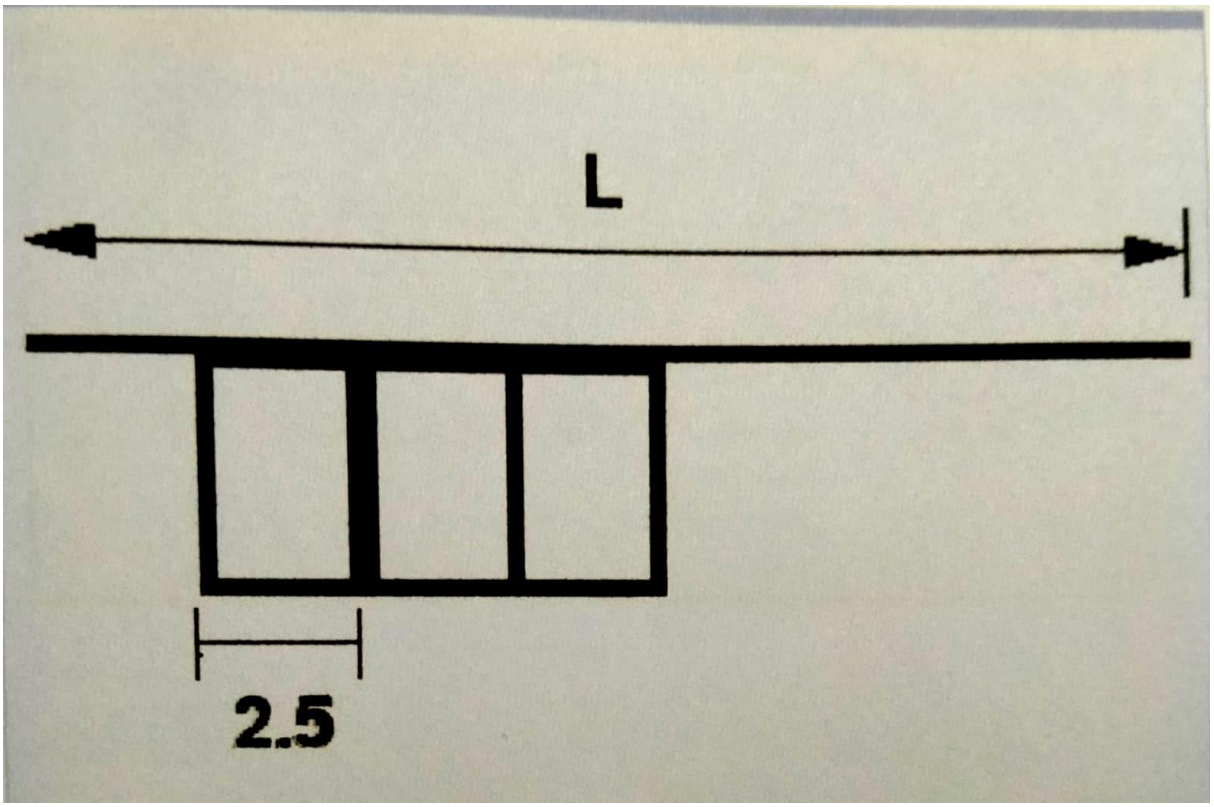


Figure 5: Illustration of 90 ° parking.

Off street parking In many urban centers, some areas are exclusively allotted for parking which will be at some distance away from the main stream They may be operated by either public agencies or private firms. A typical layout of an off-street parking is shown in figure 6. traffic. Such a parking is referred to as off-street parking.

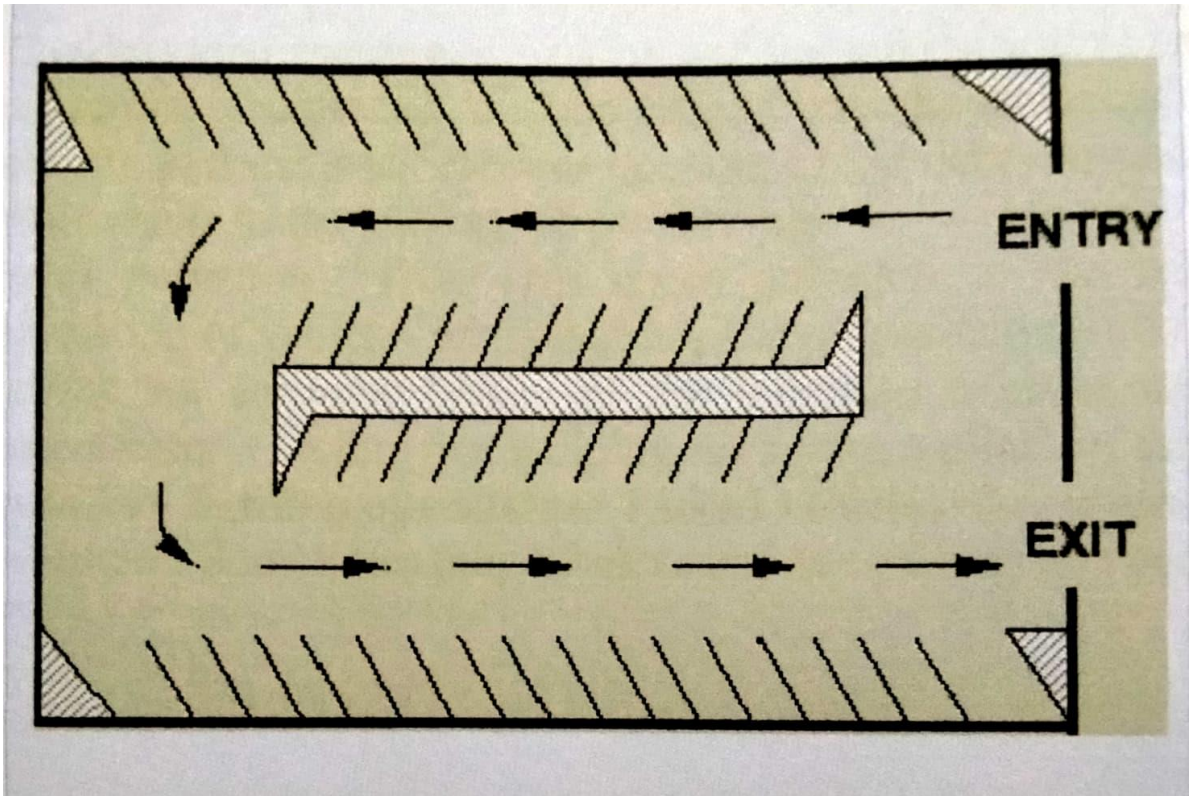


Figure 6: Illustration of off-street parking

2.2.4 Parking requirements:

There are some minimum parking requirements for different types of building. For residential plot area less than 300 sq.m (3227 sq.ft) require only community parking space. For residential plot area from 500 to 1000 sq.m (5380 to 10760 sq.ft) minimum one-fourth of the open area should be reserved for parking. Offices may require at least one space for every 70 sq.m (753 sq.ft) as parking area. One parking space is enough for 10 seats in a restaurant where as theatres and cinema halls need to keep only 1 parking space for 20 seats. Thus, the parking requirements are different for different land use zones.

2.2.5 Effects of Parking:

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

1. **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 great economical loss to the community.

2. **Accidents:** Careless maneuvering of parking and un - parking leads to accidents which are referred to as parking accidents. Common type of parking accidents occur 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.

3. **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 at every available space creates a feeling that building rises from a plinth of cars.

4. **Obstruction to fire fighting operations:** Parked vehicles may obstruct the movement of firefighting vehicles. Sometimes they block access to hydrants and access to buildings.

2.3 Summary

2.3.1 Parking statistics: An overall parking demand analysis improvement program would typically comprise several elements or term, including the study of parking statistic.

2.3.2 Parking accumulation: It is defined as the number of vehicles parked at a given instant of time. Normally this is expressed by accumulation curve. Accumulation curve is the graph obtained by plotting the number of bays occupied with respect to time.

2.3.3 Parking volume: Parking volume is the total number of vehicles parked at a given duration of time. This does not account for repetition of vehicles. The actual volume of vehicles entered in the area is recorded.

2.3.4 Parking load: Parking load gives the area under the accumulation curve. It can also be obtained by simply multiplying the number of vehicles occupying the parking area at each time interval with the time interval. It is expressed as vehicle hours.

2.3.5 Average parking duration: It is the ratio of total vehicle hours to the number of vehicles parked.

$$\text{Parking duration} = \frac{\text{parking load}}{\text{parking volume}}$$

2.3.6 Parking turnover: It is the ratio of number of vehicles parked in a duration to the number Parking bays available.

$$\text{Parking turnover} = \frac{\text{parking load}}{\text{No.of days available}}$$

This can be expressed as number of vehicles per bay per time duration.

2.3.7 Parking index: Parking index is also called occupancy or efficiency. It is defined as the ratio of number of bays occupied in a time duration to the total space available. It gives an aggregate measure how effectively the parking space is utilized. Parking index can be found out as follows.

$$\text{Parking index} = \frac{\text{parking load}}{\text{parking capacity}} \times 100$$

This report is a summary of the original report. For more information, please visit
https://ccdcboise.com/wp-content/uploads/2016/02/Parking-Problems-and-Creative-Solutions.pdf

CHAPTER 3

METHODOLOGY

3.1 Introduction

In order to collect data on existing parking facilities, one is confronted with the problem of the scale of survey, MAPC (2020) documented that parking surveys falls into one of the two categories. i.e. area parking survey and site - specific parking survey. The first category considers all available parking spaces of an area, thus it opens the possibility of shared parking among different land uses. It also provides information about the compatibility of parking supply and demand considering local zoning requirements. The latter category of parking survey, as the name implies, is conducted for a small area or a land use to determine the localized parking supply and demand. This data provides more realistic parking characteristics of a locale as the traditionally developed national level parking ratios runs the risk of providing unused extra spaces and thus resulting in monetary wastage. Since one study area has been selected for this study. data has been collected through site - specific surveys. The existing parking demand and supply conditions of New Market have been explicated through seven measures of parking - parking accumulation, parking volume, parking load, parking turnover, average parking duration, parking spill - over and probability of rejection. These seven parking measures have been evaluated by using the data gathered by conducting two parking surveys - parking space inventory and parking usage survey by patrol.

3.2 Methodology Overview

Among the numerous shopping centers along Mirpur road, New Market is the oldest and busiest one. It is one of the 150 markets of Dhaka City Corporation (DSCC, 2021). After its opening in the year 1954 on 35 acres of land, it served the inhabitants of Dhaka city which is now serving people outside of Dhaka as well (Media Bangladesh, 2012). People of different income groups visit this market everyday as it caters to their diverse requirements. A total of 468 shops, occupying a total floor area of 560,683 square feet, host a range of items from books, stationeries, jewelery to groceries and fast foods. A mosque is located at the center inside the triangular area (Figure l).The central triangular market area and the eastern and western edges are one storied, while the northern edge is extended up to three stores. This open air shopping complex attracts a huge amount of traffic, a major portion of which are cars that are parked on - street when the market is open for six days in a week. Moreover, the designated space for on - street parking proved to be inapt as the surrounding road is overburdened with parked cars which create traffic congestion. All these conditions made this shopping center ideal for selecting it as the study area to depict the parking demand and supply scenario of the commercial land uses in general for Dhaka city.



Figure 1: New Market and its Adjacent Areas

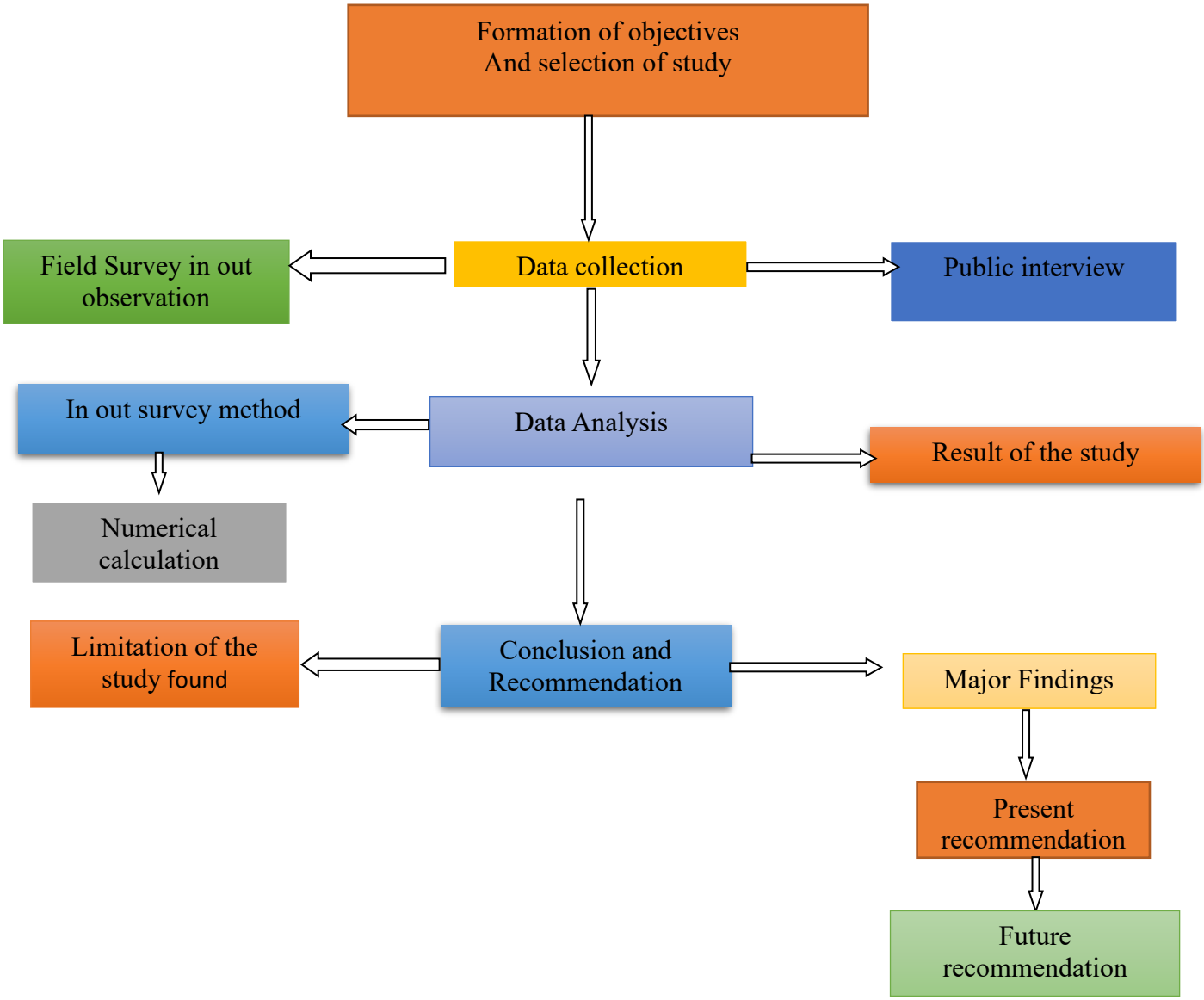


Figure : Overview of the methodology

3.3 Summary

In order to collect data on existing parking facilities, one is confronted with the problem of the scale of survey on seven parking measures have been evaluated by using the data gathered by conducting two parking surveys.

CHAPTER 4

Result and Discussion

4.1 Introduction

In order to collect data on existing parking facilities, one is confronted with the problem of the scale of the survey. Parking surveys falls into one of the two categories, i.e, area parking survey and site - specific parking survey. The first category considers all available parking spaces of an area, thus it opens the possibility of shared parking among different land uses. It also provides information about the compatibility of parking supply and demand considering local zoning requirements. The latter category of parking survey, as the name implies, is conducted for a small area or a land use to determine the localized parking supply and demand. This data provides more realistic parking characteristics of a locale as the traditionally developed national level parking ratios runs the risk of providing unused extra spaces and thus resulting in monetary wastage. Since one study area has been selected for this study, data has been collected through site specific surveys. The existing parking demand and supply conditions of New Market have been explicated through seven measures of parking - parking accumulation, parking volume, parking load, parking turnover, average parking duration, parking spill - over and probability of rejection. These seven parking measures have been evaluated by using the data gathered by conducting two parking surveys - parking space inventory and parking usage survey by patrol. The surveys had been conducted on two separate working days. In the first day, parking inventory survey had been carried out to collect data on the amount, type and location of space actually or potentially available for parking in an area. Parking usage survey by patrol had been conducted on the following day which included counting parked vehicles at 30 minutes intervals through a period of twelve hours, covering both the morning and evening peak periods. Pilot survey showed that the influx of customers were high during 11:00 am to 1:00 pm and 4:00 pm to 6:30 pm. This excludes the period in the early morning when the market is yet to open and the lunch period in the afternoon.

New Market has been served by on - street parking space at four locations adjacent to the market. Surveys only included these locations as there are no off - street parking provisions.

4.2 Specific Aim 1

Parking Inventory (data collection about parking) of New Market :

The four designated parking spaces of New Market have contained both marked and unmarked parking provisions with an charge of BDT 20 for unlimited time, which is collected by a supervisor. There has been no signage related to parking or markings denoting parking restrictions. The arrangement of the parking space around New Market is portrayed in Figure 2.

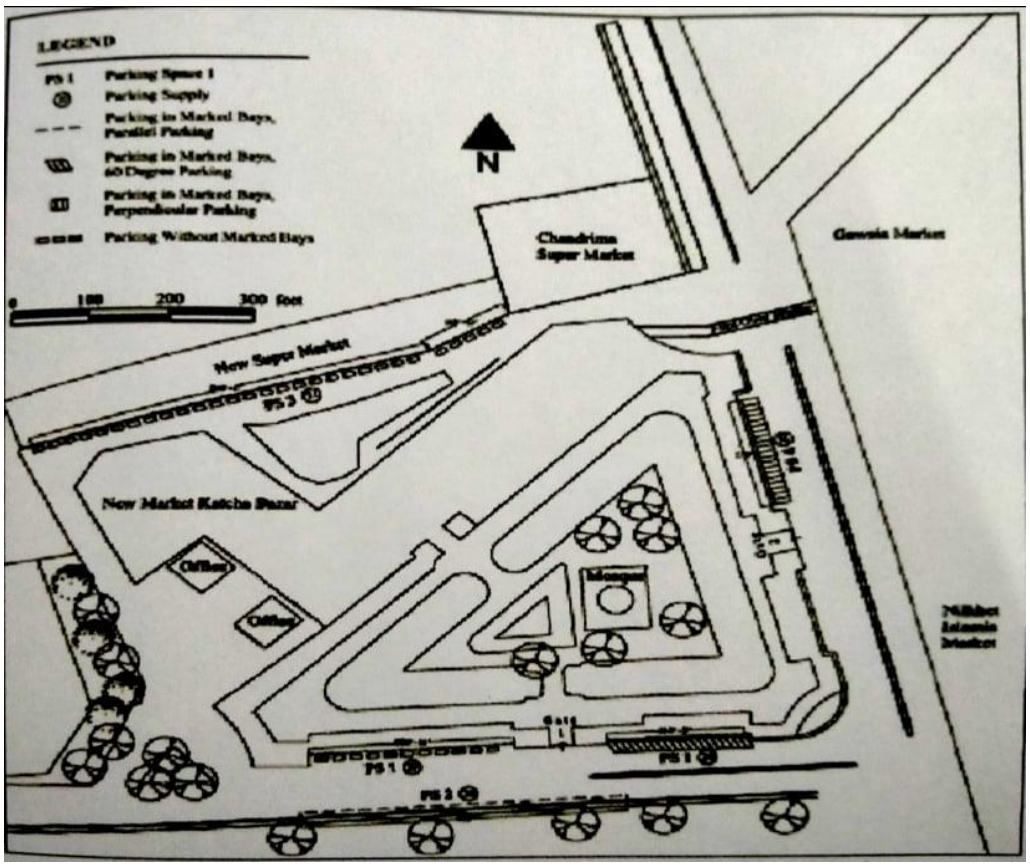


Figure 2: Locations of Parking Provisions around New Market

Parking Space # 1 (Gate - 1)

Parking Space 1 has been divided into two sections around Gate 1 (Figure 2). At the right side of Gate # 1, marked parking bays have been provided with a capacity of 29 cars at a time. This parking lot has marking for 60 ° parking but this marking have not been followed by the parked vehicles as observed during the survey. To use the minimum kerb length, cars have been parked perpendicularly. Space on the left side of Gate 1 have also been used for 20 parking purpose but have been unmarked unlike the other one. This is why both perpendicular and parallel parking have been evident with a maximum capacity of 78 cars if parked perpendicularly. A total of 441 feet of kerb length of 17 feet of the carriageway width have been used for parking. Both of these spaces have some indentation of the kerb to allow for some parking space to reduce impact on road traffic.

Parking Space # 2 (Opposite of gate - 1)

Another designated parking space has been provided opposite to the New Market Gate # 1 (Figure2). Although the markings denoted parallel parking, all cars have been parked perpendicularly using 495 feet of the kerb length and 8.5 feet of the carriageway width. It consisted of 55 parking bays (Right angle parking) according to the markings.

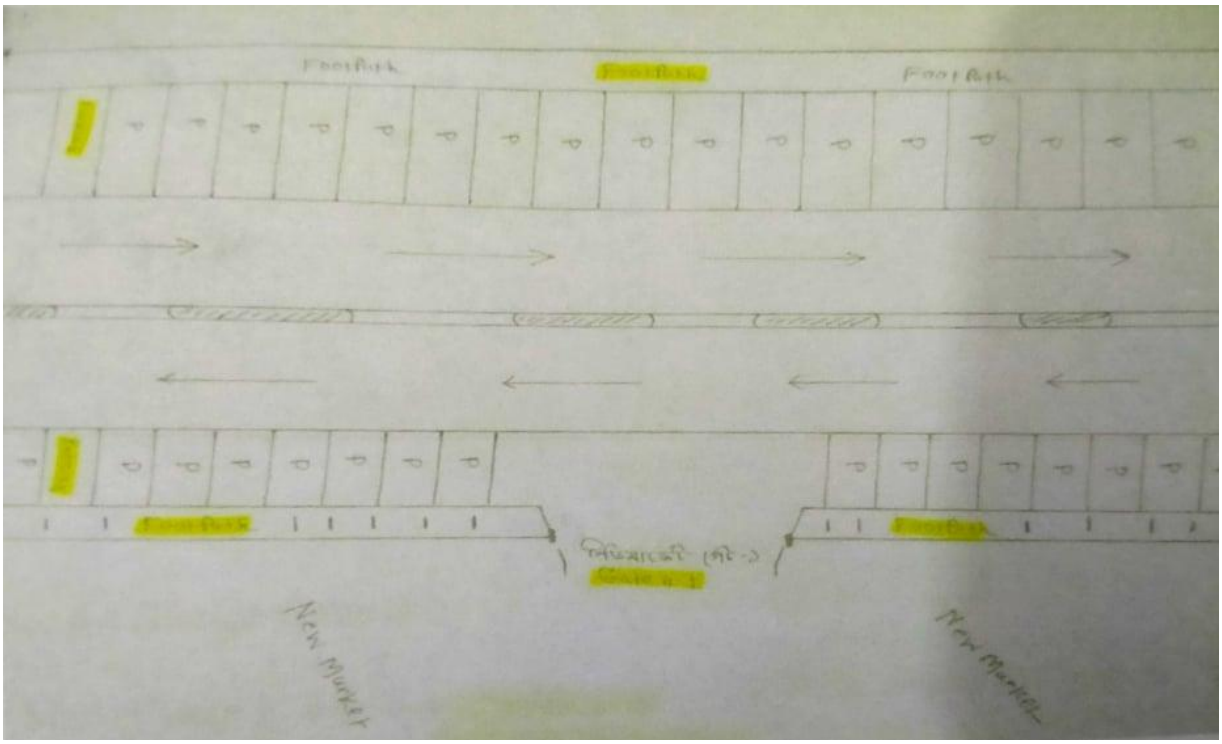


Figure 3: Parking space-1&2

Parking Space # 3 (New super market katcha bazar)

Total kerb length (630 feet) of the road along the New Super Market has been used for parking which is unmarked (Figure 2) . Mainly the customers of Katcha Bazaar (kitchen market) and the freights use this parking space . Although a longer kerb length along the New Super Market has been available here for parking, the road has not been wide enough to support on - street perpendicular parking. So, a mixture of perpendicular and parallel parking has been observed during the survey period, which has created an unsystematic and jeopardized picture. A maximum of 31 cars can be parked using 8.5 feet of the carriageway width if parallel alignment to the Total kerb is maintained l kerb length (630 feet) of the road along the New Super Market has been used for parking.

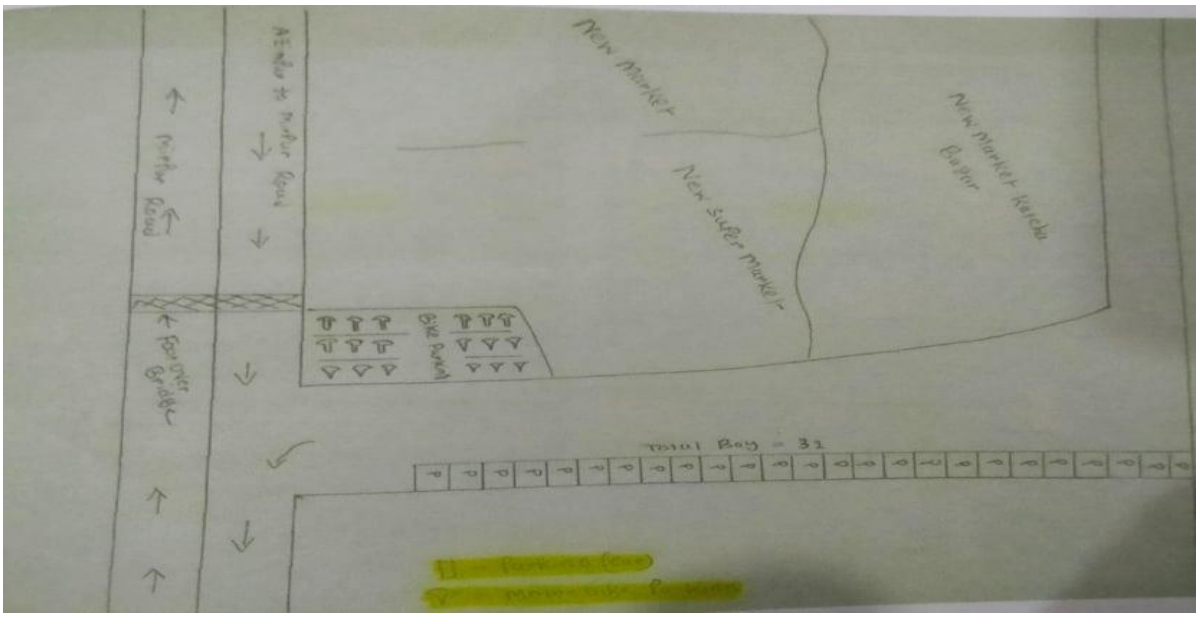


Figure 3: Parking space-3

Parking Space # 4 (Beside Gate - 2)

Beside New Market Gate 2, a marked parking space has been observed along the Mirpur road covering 240 feet of the kerb length. The markings directed for perpendicular parking have been barely visible. This parking zone is denoted only for motor bike parking. Considering the allowed parking arrangement, a total of 60 motor cycle can be parked perpendicular to road length at a time in this space.

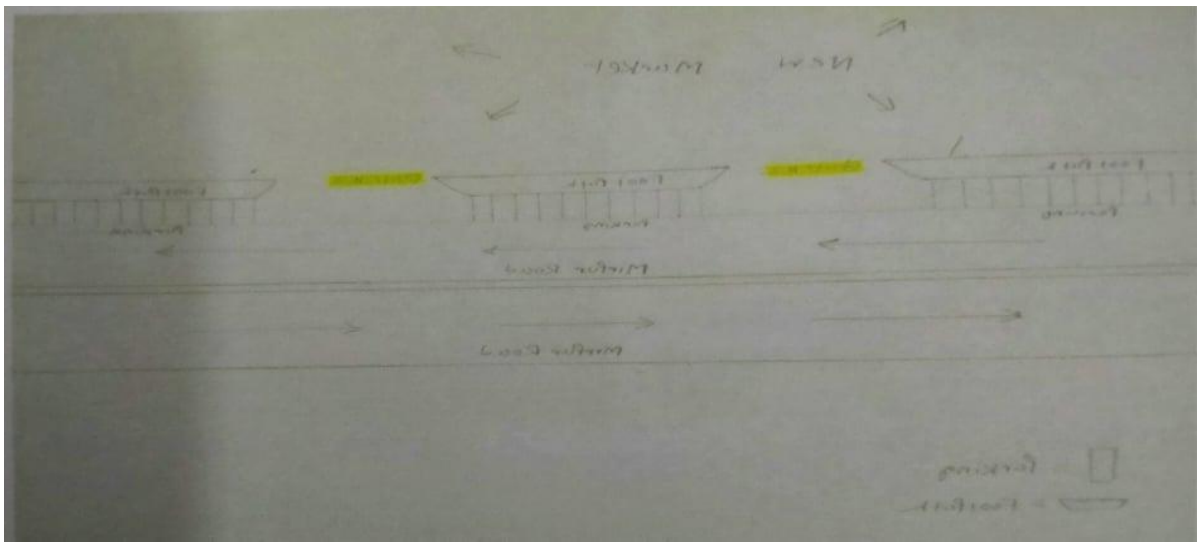




Figure 1 : Parking space-1



Figure 2 : Parking space-1



Figure 3 : Parking space-2



Figure 4: Parking space-2



Figure 5: Parking space-3



Figure 6: Parking space-3



Figure 7: Parking space-4



Figure 8: Parking space-4



Figure 9 : Parking space-5



Figure 10 : Parking space-5



Figure 11: Parking space-6



Figure 12: Parking space-6

Recommended existing parking space picture:



Figure 13: West corner of Gare-1



Figure 14: Beside Carukola gate



Figure 16: New super market entrance gate



Figure 17: New super market entrance gate



Figure 17: West-North corner of New market



Figure 18: New super market entrance gate

Data analysis:

Parking surveys conducted Parking surveys are conducted to collect the above said parking statistics. The most common in - out survey, fixed period sampling and license plate method of survey.

1) In - Out survey analysis –

In this survey, the occupancy count in the selected parking lot is taken at the beginning. Then the number of vehicles that enter the parking lot for a particular time interval is counted. The number of vehicles that leave the parking lot is also taken. The final occupancy in the parking lot is also taken. Here the labor required is very less. Only three person may be enough. But we wont get any data regarding the time duration for which a particular vehicle used that parking lot. Parking duration and turn over is not obtained. Hence we cannot estimate the parking fare from this survey. For quick survey purposes, a fixed period sampling can also be done. This is almost similar to in - out survey. All vehicles are counted at the beginning of the survey. Then after a fixed time interval that may vary alter 30 minutes, the count is taken again. Here there are chances of missing the number of vehicles that were parked for a short duration.

Numerical data calculation-

Parking space – 1: (Get # 1 side road)

Friday- 17th September 2021

Vehicle type- Private car

From an in - out survey conducted for a parking area consisting of 49 bays, the initial count was found 15. Table gives the result of the survey. The number of vehicles coming in and out of the parking lot for a time interval of 30 minutes is as shown in the table 1. We have found the accumulation, total parking load, average occupancy and efficiency of the parking lot.

This report is a summary of the original report. For more information, please visit https://openjicareport.jica.go.jp/pdf/12268272_01.pdf

The solution is shown in the table-

Time zone	Time duration (min.)	In (vehicle)	Out (vehicle)	Accumulation (vehicle)	Occupancy (%)	Parking load (vehicle hour)
Morning hour	09.00am	3	0	18	37	9
	09.30am	7	1	24	49	12
	10.00am	4	0	28	57	14
	10.30am	11	2	37	75	18.5
	11.00am	21	6	52	**106**	26
Noon hour-1	**11.30am**	17	2	67	**136**	33.5
	12.00pm	5	0	72	**147**	36
	12.30pm	2	9	65	**132**	32.5
	01.00pm	0	11	54	**110**	27
Noon hour-2	01.30pm	1	19	36	73	18
	02.00pm	0	12	24	48	12
	02.30pm	4	3	25	51	12.5
	03.00pm	11	6	30	61	15
Evening hour-1	03.30pm	13	1	42	85	21
	04.00pm	24	0	66	**134**	33
	04.30pm	19	8	77	**157**	38.5
	05.00pm	10	9	78	**159**	39
Evening hour-1	**05.30pm**	6	11	73	**148**	36.5
	06.00pm	2	14	61	**124**	30.5
	06.30pm	0	8	53	**108**	26.5
	07.00pm	1	11	43	87	21.5
Night hour	07.30pm	0	17	26	53	13
	08.00pm	3	1	28	57	14
	08.30pm	0	19	9	18	4.5
	09.00pm	2	0	11	22	5.5
Total =				**1,099**	**2,234**	**549.5**

Table : In- Out parking survey analysis: (Get#1 road side)

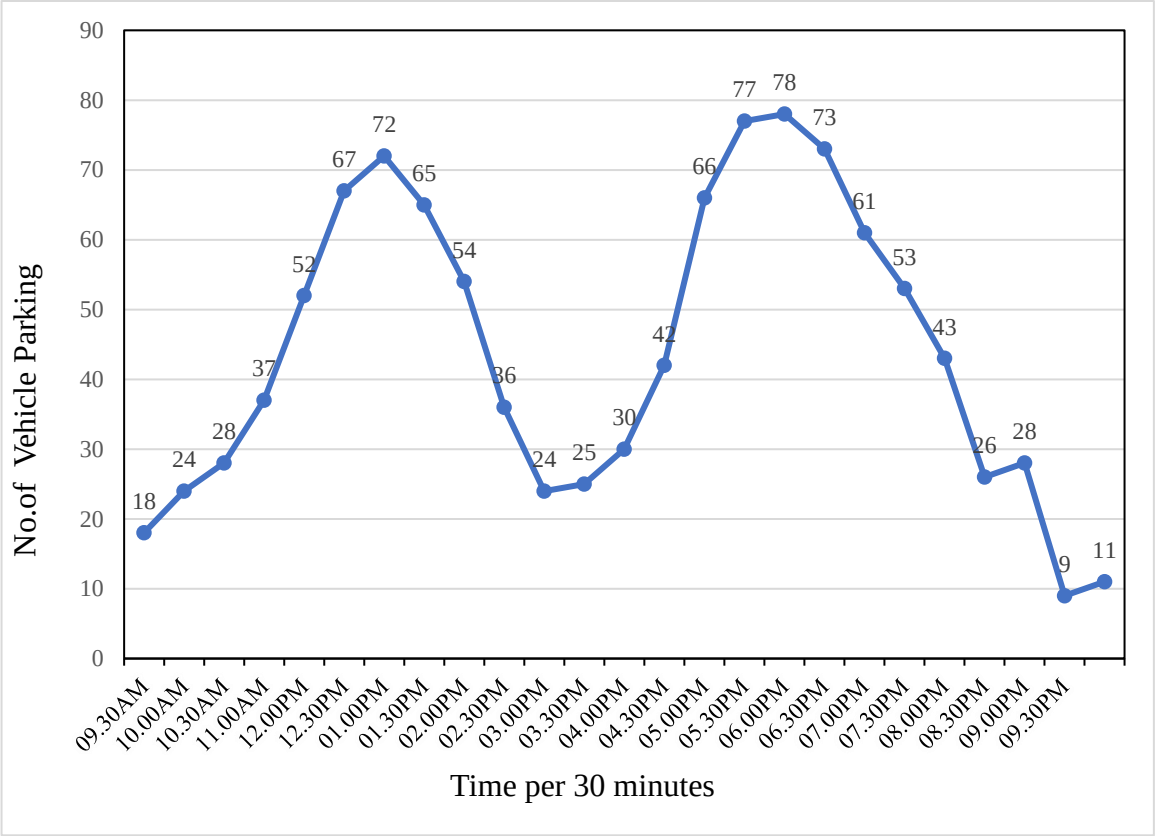


Figure: Parking space-1 Graphical data

Data calculation of l "value & similarly others:

1. **Accumulation** can be found out as initial count plus number of vehicles that entered the parking lot till that time minus the number of vehicles that just exited for that particular time interval. For the first time interval of 30 minutes, accumulation can be found out as 15+ 3-0 = 18. It is being tabulated in column 4. The average accumulation is 44 vehicle per 30 minutes.

2. **Occupancy or parking index** is given by equation For the first time interval of 30 minutes,

   - parking index is $= \frac{\text{No.of bays occupied}}{\text{No of bays available}} \times 100 = \left(\frac{18}{49} \times 100\right) = 37\%$

   - The occupancy for the remaining time slot is similarly calculated and is tabulated in column 5. Average occupancy is the average of the occupancy values for each time interval. **Thus it is the average of all values given in column 5 and the value is 89.36%.**

3. **Parking load** is tabulated in column 6. It is obtained by multiplying accumulation with the time interval. the first time inte rval, parking load = 18×30 = 540 vehicle minutes or 9 veh - hour.

   - **Total parking load** is the summation of all the values in column 5 which is equal to 549 vehicle hours.

   .

4. **Average parking duration is** $= \frac{\text{parking load}}{\text{parking volume}} = \frac{549.5}{1099} = 0.5$ hour or 30 minute / veh.

5. **Parking turnover is** $= \frac{\text{parking volume}}{\text{No.of bays available}} = \frac{1099}{49} = 22$ veh.

Parking space - 2 (Gate # 1 road opposite side)

Saturday- 18th September, 2021

Vehicle type: Private car

From an in - out survey conducted for a parking area consisting of 55 bays, the initial count was found was 12. Table gives the result of the survey. The number of vehicles coming in and out of the parking lot for a time interval of 30 minutes is as shown in the table 1. We have find the accumulation, total parking load, average occupancy and efficiency of the parking lot. The solution is shown in table-

Table : In- Out parking survey analysis: (Get#1 road opposite side)

Time zone	Time duration (min.)	In (vehicle)	Out (vehicle)	Accumulation (vehicle)	Occupancy (%)	Parking load (vehicle hour)
Morning hour	09.00am	1	0	13	23	7
	09.30am	5	0	18	32	9
	10.00am	6	2	22	40	11
	10.30am	9	0	31	56	16
	11.00am	16	3	44	80	22
Noon hour-1	**11.30am**	19	5	58	**105**	29
	12.00pm	5	0	63	**114**	32
	12.30pm	9	2	70	**127**	35
	01.00pm	0	15	55	**100**	28
Noon hour-2	01.30pm	1	11	45	81	23
	02.00pm	0	12	33	60	17
	02.30pm	4	3	34	61	17
	03.00pm	14	6	42	76	21
Evening hour-1	03.30pm	10	4	48	87	24
	04.00pm	24	0	72	**130**	36
	04.30pm	19	9	82	**149**	41
	05.00pm	10	11	81	**147**	41
Evening hour-1	**05.30pm**	6	10	77	**140**	39
	06.00pm	2	8	71	**129**	36
	06.30pm	0	7	64	**116**	25
	07.00pm	3	11	56	**101**	28
Night hour	07.30pm	0	7	49	89	25
	08.00pm	2	13	38	69	19
	08.30pm	0	22	16	29	8
	09.00pm	0	0	16	29	8
Total =				**1,198**	**2,170**	**604**

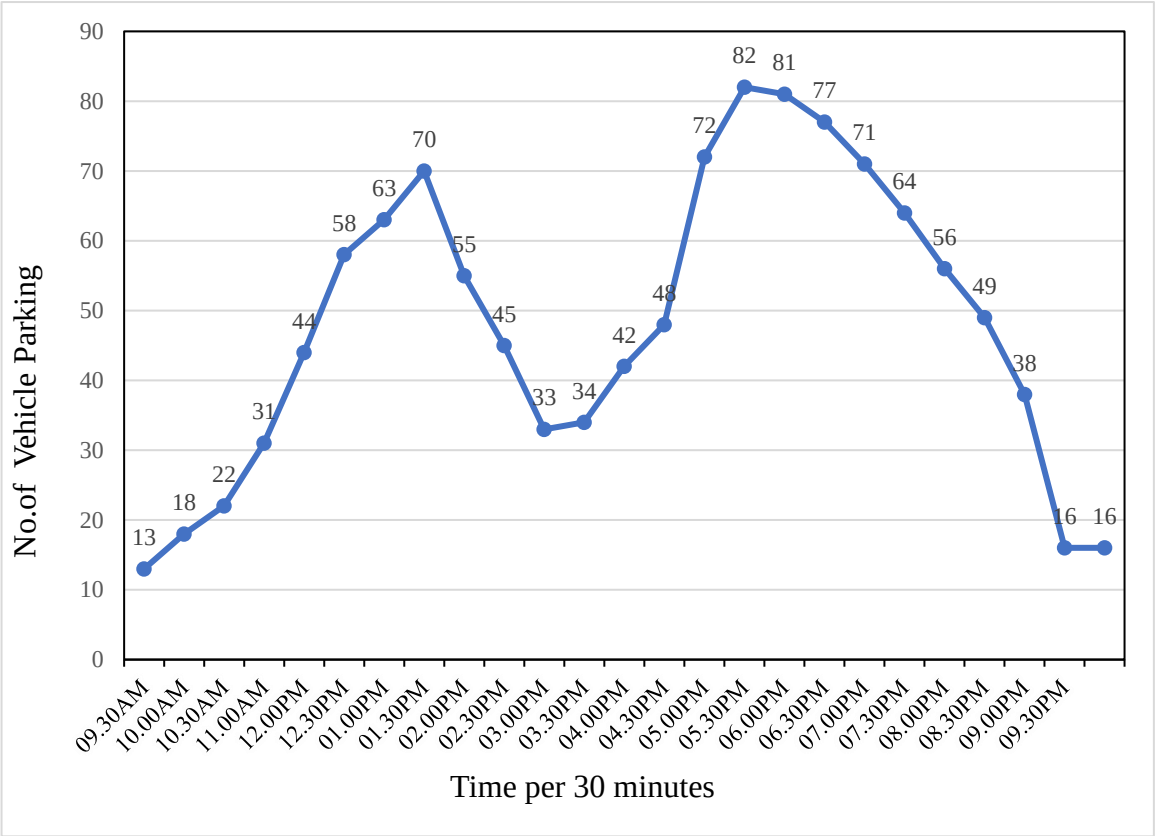


Figure : Parking space-2 Graphical data

Data calculation of l "value & similarly others:

1. **Accumulation** can be found out as initial count plus number of vehicles that entered the parking lot till that time minus the number of vehicles that just exited for that particular time interval. For the first time interval of 30 minutes, accumulation can be found out as 12+ 1-0 = 13. It is being tabulated in column 4. The average accumulation is 48 vehicle per 30 minutes.

2. **Occupancy or parking index** is given by equation For the first time interval of 30 minutes,

   - parking index is $= \frac{\text{No.of bays occupied}}{\text{No of bays available}} \times 100 = \left(\frac{13}{55} \times 100\right) = 23\%$

   - The occupancy for the remaining time slot is similarly calculated and is tabulated in column 5. Average occupancy is the average of the occupancy values for each time interval. **Thus it is the average of all values given in column 5 and the value is 86.8%.**

3. **Parking load** is tabulated in column 6. It is obtained by multiplying accumulation with the time interval. the first time interval, parking load = 13×30 = 540 vehicle minutes or 7 veh - hour.

   - **Total parking load** is the summation of all the values in column 5 which is equal to 604 vehicle hours.

.

4. **Average parking duration is** $= \frac{\text{parking load}}{\text{parking volume}} = \frac{604}{1198} = 0.5$ hour or 30 minute / veh.

5. **Parking turnover is** $= \frac{\text{parking volume}}{\text{No.of bays available}} = \frac{1198}{55} = 18$ veh.

Parking space - 3 (New super market katcha bazaar side)

Sunday - 19th September, 2021

Vehicle type: private car & small pickup

From an in - out survey conducted for a parking area consisting of 31 bays, the initial count was found was 8. Table gives the result of the survey. The number of vehicles coming in and out of the parking lot for a time interval of 30 minutes is as shown in the table 1. We have find the accumulation, total parking load, average occupancy and efficiency of the parking lot.

The solution is shown in table-

Table: In- Our parking survey analysis

Time zone	Time duration (min.)	In (vehicle)	Out (vehicle)	Accumulation (vehicle)	Occupancy or parking index (%)	Parking load (vehicle hour)
Morning hour	09.00am	0	0	8	25	4
	09.30am	5	0	13	41	7
	10.00am	12	2	23	74	12
	10.30am	10	0	33	**106**	17
	11.00am	6	1	38	**122**	19
Noon hour-1	**11.30am**	3	5	36	**116**	18
	12.00pm	3	5	34	**109**	17
	12.30pm	1	0	35	**112**	18
	01.00pm	0	9	26	83	13
Noon hour-2	01.30pm	0	5	21	67	11
	02.00pm	1	11	11	35	6
	02.30pm	0	3	8	25	4
	03.00pm	4	0	12	38	6
Evening hour-1	03.30pm	0	3	8	25	4
	04.00pm	4	0	12	38	6
	04.30pm	4	1	15	48	8
	05.00pm	9	0	24	77	12
Evening hour-1	**05.30pm**	3	1	26	**83**	13
	06.00pm	6	0	32	**103**	16
	06.30pm	6	4	34	**109**	17
	07.00pm	2	1	35	**112**	18
Night hour	07.30pm	0	4	31	**100**	16
	08.00pm	2	3	19	61	9
	08.30pm	0	9	10	32	5
	09.00pm	0	7	3	10	2
			Total =	**570**	**1, 826**	**290**

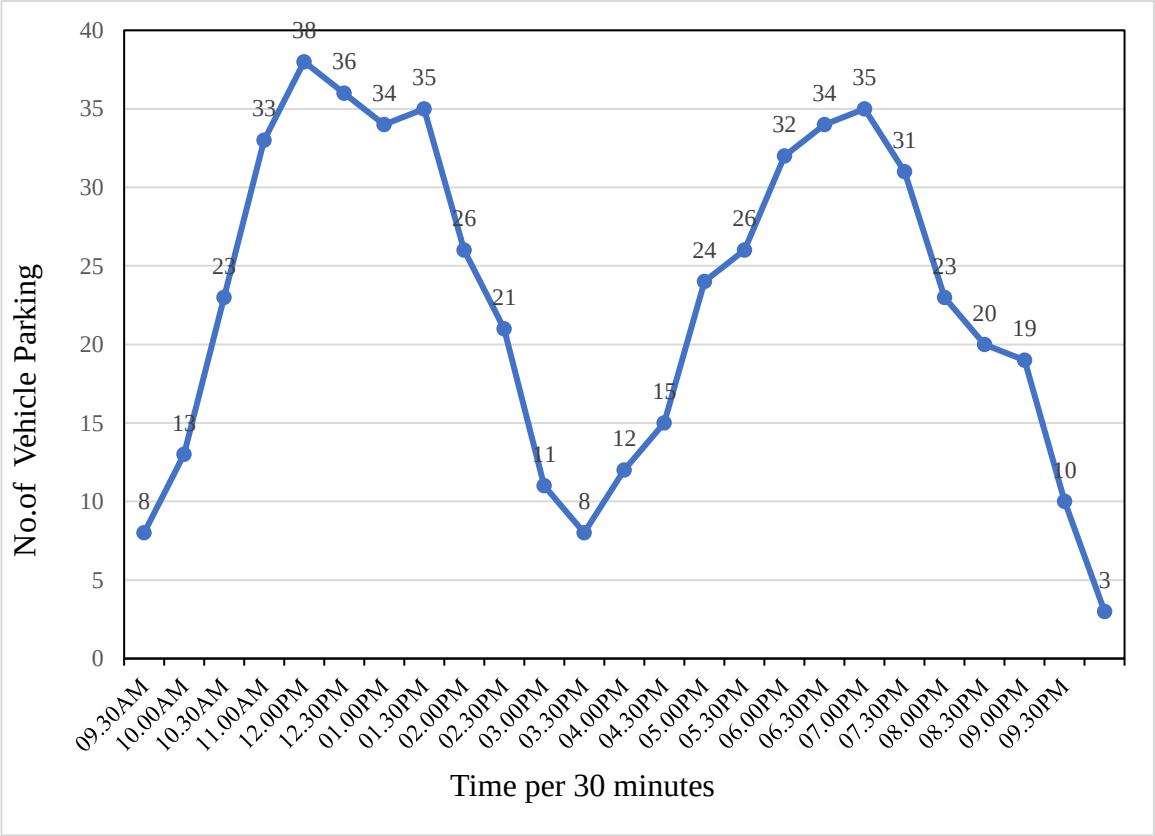


Figure: Parking space-3 Graphical data

Data calculation of l "value & similarly others:

1. **Accumulation** can be found out as initial count plus number of vehicles that entered the parking lot till that time minus the number of vehicles that just exited for that particular time interval. For the first time interval of 30 minutes, accumulation can be found out as 8 + 0-0 = 8. It is being tabulated in column 4. The average accumulation is 23 vehicle per 30 minutes.

2. **Occupancy or parking index** is given by equation For the first time interval of 30 minutes,

   - parking index is$= \frac{\text{No.of bays occupied}}{\text{No of bays available}} \times 100 = \left(\frac{8}{31} \times 100\right) = 25\%$

   - The occupancy for the remaining time slot is similarly calculated and is tabulated in column 5. Average occupancy is the average of the occupancy values for each time interval. **Thus it is the average of all values given in column 5 and the value is 73%.**

3. **Parking load** is tabulated in column 6. It is obtained by multiplying accumulation with the time interval. the first time interval, parking load = 8x30 = 240 vehicle minutes or 4 veh - hour.

   - **Total parking load** is the summation of all the values in column 5 which is equal to 604 vehicle hours.

   .

4. **Average parking duration is** $= \frac{\text{parking load}}{\text{parking volume}} = \frac{290}{570} = 0.5$ hour or 30 minute / veh

5. **Parking turnover is** $= \frac{\text{parking volume}}{\text{No.of bays available}} = \frac{570}{31} = 18$ veh

Parking space - 4 (Beside Gate # 2)

Monday-20th September, 2021

Vehicle type- Motor bike

From an in - out survey conducted for a parking area consisting of 60 bays, the initial count was found was 4. Table gives the result of the survey. The number of vehicles coming in and out of the parking lot for a time interval of 30 minutes is as shown in the table 1. We have find the accumulation, total parking load, average occupancy and efficiency of the parking lot. The solution is shown in table -

Table : In- Our parking survey analysis(Gate road opposite side)

Time zone	Time duration (min.)	In (vehicle)	Out (vehicle)	Accumulation (vehicle)	Occupancy or parking index (%)	Parking load (vehicle hour)
Morning hour	09.00am	0	0	4	7	2
	09.30am	2	0	6	10	3
	10.00am	9	2	13	21	7
	10.30am	10	0	23	38	12
	11.00am	11	1	33	55	17
Noon hour-1	**11.30am**	12	0	45	**75**	23
	12.00pm	9	0	54	**90**	27
	12.30pm	1	8	47	**78**	24
	01.00pm	0	7	40	**66**	20
Noon hour-2	01.30pm	0	5	35	58	18
	02.00pm	4	6	33	55	17
	02.30pm	0	3	30	50	15
	03.00pm	4	0	34	56	17
Evening hour-1	03.30pm	4	9	29	48	15
	04.00pm	9	0	38	**63**	19
	04.30pm	3	1	40	**66**	20
	05.00pm	6	0	46	**76**	23
Evening hour-1	**05.30pm**	6	5	46	**73**	23
	06.00pm	4	6	44	**73**	22
	06.30pm	0	4	40	**66**	20
	07.00pm	2	10	32	**53**	16
Night hour	07.30pm	1	4	29	48	15
	08.00pm	3	2	30	50	15
	08.30pm	0	17	13	21	7
	09.00pm	0	5	8	13	4
			Total =	**732**	**1,312**	**421**

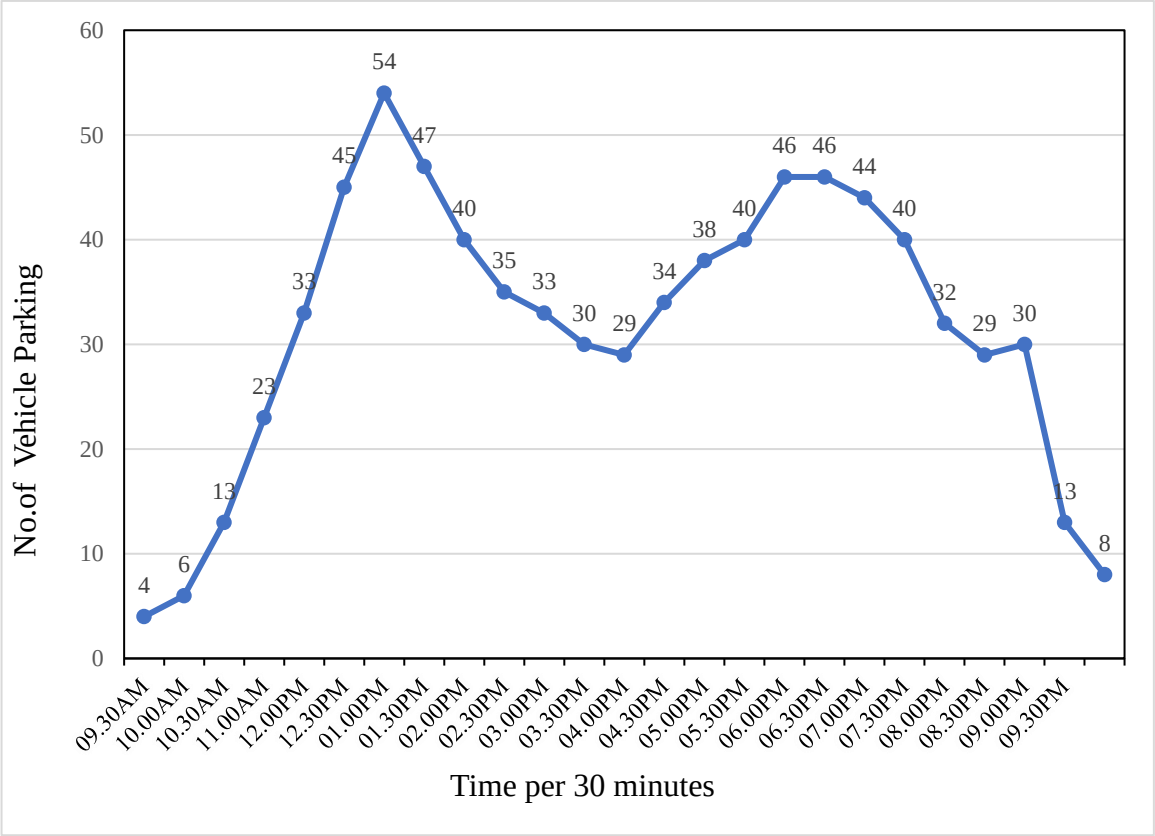


Figure: Parking space-4 Graphical data

Data calculation of 1 "value & similarly others:

1. **Accumulation** can be found out as initial count plus number of vehicles that entered the parking lot till that time minus the number of vehicles that just exited for that particular time interval. For the first time interval of 30 minutes, accumulation can be found out as 4 + 0-0 = 4. It is being tabulated in column 4. The average accumulation is 29 vehicle per 30 minutes.

2. **Occupancy or parking index** is given by equation For the first time interval of 30 minutes,

   - parking index is $= \frac{\text{No.of bays occupied}}{\text{No of bays available}} \times 100 = \left(\frac{4}{60} \times 100\right) = 7\%$
   - The occupancy for the remaining time slot is similarly calculated and is tabulated in column 5. Average occupancy is the average of the occupancy values for each time interval. **Thus it is the average of all values given in column 5 and the value is 52%.**

3. **Parking load** is tabulated in column 6. It is obtained by multiplying accumulation with the time interval. the first time interval, parking load = 4x30 = 120 vehicle minutes or 2 bike - hour.

   - **Total parking load** is the summation of all the values in column 5 which is equal to 421 bike hours.

4. **Average parking duration** is $= \frac{\text{parking load}}{\text{parking volume}} = \frac{421}{732} = 0.57$ hour or 34 minute / bike.

5. **Parking turnover is** = $\frac{\text{parking volume}}{\text{No.of bays available}} = \frac{732}{60} = 13$ bike.

Table-1: Result from data of all parking space -

SL No.	Parking zone	Defined Parking type	Found Parking type	Type of vehicle	Total Parking capacity (No.of day)	Parking Found (No.of day)	Extra vehicle parked (No.of day)
1	Parking space-1	60 degree	Both Perpendicular & Parallel to the road	Private car	49	78	29
2	Parking space-2	60 degree	Both Perpendicular & Parallel to the road	Private car	55	82	27
3	Parking space-3	Parallel	Parallel & Perpendicular	Private car & small pickup	31	38	7
4	Parking space-4	Perpendicular	Perpndicular	Motor Bike	60	54	0
Total extra vehicle parked =							**63**

This report is a summary of the original report. For more information, please visit http://www.brta.gov.bd/index.php/statistics

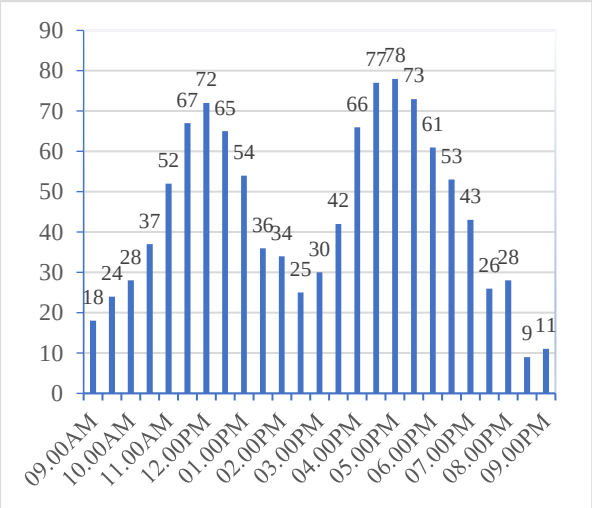


Figure 20: Parking spce-1

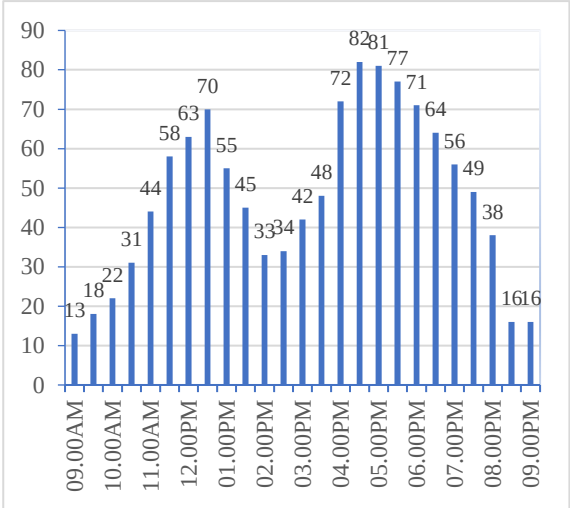


Figure 21: Parking spce-2

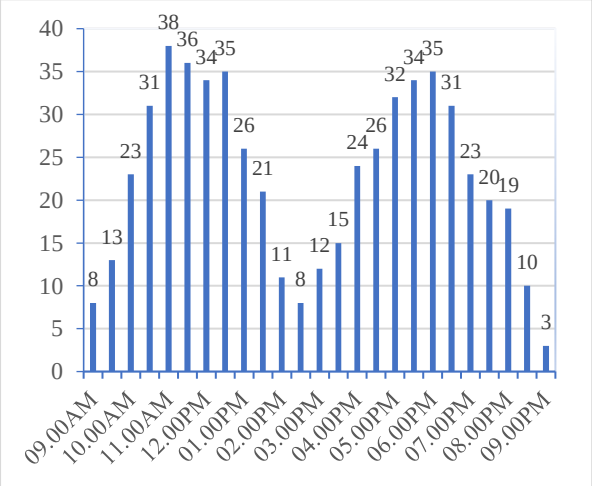


Figure 22: Parking spce-3

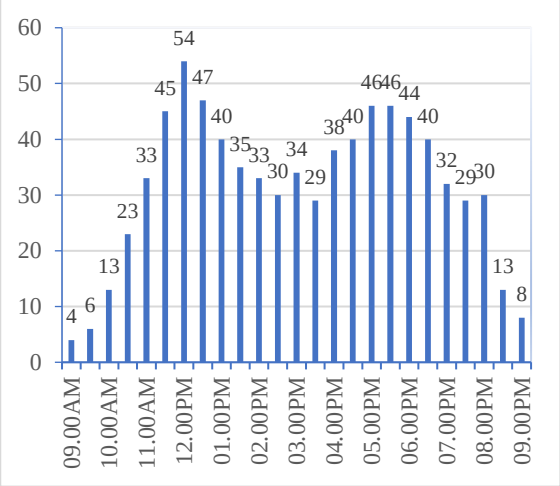


Figure 23: Parking spce-4

Figure: Different parking zone graphical data

4.3 Summary:

In this chapter includes data collection, analysis and result of the study. Our result confirm that, this clearly state the most important finding of different parking zone. And also this is a god example of a direct, declarative and succinct proclamation of the study results.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

Major findings (As per Objectives):

Parking Space - 1 & 2:

Present observed condition & problem-

In parking space-! at present there are only 49 parking bays are determined but we have found that at the top busiest time of new market the parking quantity of car are increased to 78 vehicle. These 29 extra vehicles are parked there which is parallel to the main road length and at the front position of the determined right angle parked cars. As a result extra parked vehicle or cars are Possession of the road carriage way and may create the jam of these road. At road opposite side of Gate - 1 (in parking space -2) of New Market similar condition was observed and there 82 vehicle (car) are parked against 55 parking bay. The extra 27 cars are parked as the same condition of parking space - 1 & same problem was occurred.

Recommendation:

The footpath of both road side of gate - 1 of new marked are possession by illegal shop and vendors, so these footpaths are not used for passers walk. If those 6 feet wide footpath area are reforms into the parking zone there will be increase some area for one row parallel parking to the road length. If it will be possible then there will be increase parking space as for (441/15) = 29 vehicle. As a result the road congestion may decrease.

Parking Space - 3:

Present observed condition & problem In parking space –

At present there are only 31 parking bays are determined but we have found that at the top busiest time of new market the parking quantity of car are increased to 38 vehicle. These 6 extra vehicles are parked there which is parallel to the main road length and create congestion of carriage way. This parking condition are observed as usual all over the days of a week.

Recommendation:

At New Market katcha bazar entrance side there was a 60 feet wide road and that road are used only for transport of loading / unloading of materials of katcha bazar at night time. So there will be create one one row (60 degree or right angle) parking zone. As a result the congestion of parking space - 3 will be decreased.

Parking Space - 4:

Present observed condition & problem -

Although parking space - 4 is not defined for parking but at present there 270 feet road length space are used for only motor bike parking and there were maximum 60 motor bike can parked which are perpendicular to the Azimpur to Mirpur Road. But these parking spaces are creating traffic congestion and traffic jam. It will be better traffic flow of that road if that parking zone will transfer from there.

Recommendation:

At west side of New market old foot over bridge (Entrance corner of New Super Market) there were a defined motor bike parking zone for 40 motor bike (Data from New market office authority) which is occupied by barmiz shoe shopkeepers. If it is possible to re - saved that land then the motor bile parking land of Gate - 2 can be saved for traffic and transport.

5.2 Limitations and Recommendations for Future Works :

Limitations

I. Since the days of the week did not go to the car to get the same pressure so we count the data of most busy days (Friday & Saturday) of the week when the vehicle pressure were maximum.

II. We also count the data of normal day to determine the difference of value between two busy type of day.

III. In this study License Plate Survey is another appropriate digital method but New market is not yet under this system then other shopping center. As a result without digital license plate tracking system it was impossible to survey and counting parking data.

IV. Due to huge gathering and presence of hawkers, shoppers, passers, dustbin measurement of parking kerb length, carriageway were disturbed.

V. The office authority only provide the noted lecture information about parking condition of New market and they also didn't permit us to take any photo of document to keep their privacy.

VI. The DNCC couldn't provide us the Dhaka new market layout plan, as a result we arranged the layout plan by help of google map.

Future recommendation :

1. All existing on - street parking should be limited or prohibited altogether as it greatly restricts the practical road capacity. Also, rows of vehicles in front of an establishment are nuisance to the passerby and also vitiate the appeal of the shops to potential customers.

2. There should be a provision of increasing the parking charge in peak hours. This would definitely affect the parking duration of each car. The amount to be charged for using a parking bay for an hour should be decided based on a comprehensive study considering time and duration of parking.

3. A shared parking can be developed to ease the parking demand of commercial and other establishments. Since Mirpur road serves a wide range of adjacent land uses, they have different peak and off - peak hours of activity and thus can share a parking

facility. For instance, on Tuesdays, when the markets are closed along Mirpur road, parking from other uses can be allowed on charge to generate revenue.

4. To stop the tendency of haphazard parking, all designated parking areas should be marked showing the desired parking alignment and anyone failing to comply with it should be fined with an extra charge.

5. The footpath of both road side of gate - 1 of new marked are possession by illegal shop and vendors, so these footpaths are not used for passers walk. If those 6 feet wide footpath area are reforms into the parking zone there will be increase some area for one row parallel parking to the road length. If it will be possible then there will be increase parking space extra vehicle. As a result the road congestion may decrease.

6. The DNCC can make an arrangement to implement a digital auto parking system structure by considering some area under the New market such as at west end comer og gate - l road or near Charukola Vhaban get. Then the extra pressure of the vehicle can be reduced.

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