

Parking Provision for CBD Area of Pabna Town in Bangladesh

Atikur Rahman, Jakirul Islam Jony Prothan, Marazul Islam, and Ashrafuzzaman Pramanik

Abstract—Pabna is the most ancient city of Bangladesh having a parking problem in CBD area. This study is mainly focused on the demand and supply of parking system in CBD area. The deficiency of parking supply and illegal occupancy of the traffic lane with parking has become a common practice. Basically, an existing parking accommodation, parking demand, parking turnover, average parking duration, parking types and parking index are analyzed on the base of modified patrol survey. The parking space inventory survey helps to identify the present parking spaces, number of parking bays, vacant land for the multistoried parking facility. Both on-street and off-street parking have surveyed to find out the actual measurement of the demand and supply of parking. It should be mentioned that the feasibility of a multistoried parking facility is also proposed to shift the existing on-street parking of CBD.

Index Terms—CBD; Multi-Storied Parking, Parking Demand; Parking Volume.

I. INTRODUCTION

Pabna Municipality is one of the oldest Municipalities in Bangladesh and it was established in 1876. The area of Pabna Municipality is 15.66 Sq.km. The population density is 8130/sq.km. It was upgraded to 'A' Category Municipality. The CBD area of Pabna Municipality covered most of the part of ward no 02 & 03 as administrative and commercial zone and it covered 341.473 acres of land [7]. Both off-street and on-street parking notice available here but off-street parking is used for the only building owner. So, the proportion of the two types of parking facilities is not equal. The off-street parking facilities are limited.



Fig.1. Existing Parking Location

II. LITERATURE REVIEW

L. R. Kadiyali, on his book "Traffic Engineering and Transport Planning" that every car owner would wish to

park the car as closely as possible to the destination. This result in great demand for parking space in the CBD and other commercial areas where the activities are gathered [1].

M. Tariq, recommended that an effective design method towards providing adequate parking space is an essential consideration for the construction of shopping centers in Dhaka city [2].

T. V. Mathew, K. K. Rao, focused on their book "Introduction to Transportation engineering." different types of parking characteristics. The calculation of on-street parking parameters was mentioned in this book with examples [3].

S. Chowdhury, M. Kutub Uddin Chisty, S. Misuk, revealed that the Demand & Supply of Parking System Analysis at Chittagong Commercial Area in greater Chittagong city was undertaken. This study has 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 in "Agrabad" also analysis demand and supply of parking system [4].

III. MATERIAL AND METHODS

The data was collected primarily through the field survey. It was necessary to visit the study area thoroughly in a systematic way for the data collection. For fulfilling the research work it was necessary to conduct systematic parking study which includes parking demand and regulatory measure that were possible for controlling parking. Following methods are followed:

- Parking Space Inventory Survey
- Type Parking Usage Survey by Patrol
- Physical feature survey
- Parking demand survey
- Questionnaire Type Parking Usage Survey

After conducted primary survey total counting parked vehicle convert into PCU for calculating parking, volume, parking accumulation.

Passenger Car Unit (PCU) Calculating vehicles such as rickshaw, motorcycle, CNG, and car are in a single and same unit as a car. For this conversion there are rickshaw=.5, CNG=.5, motorcycle=.25 and the car =1 as a unit for taking actual measurement and the facilities of the calculation [4].

Parking load gives the area under the accumulation curve. The parking load is closely related to the parking accumulation and helps to develop the peak and off-peak parking period of the study area.

$$\text{Average Duration} = \frac{\text{Sum of Accumulation for each Time Interval} \times \text{Time Interval}}{\text{Total Survey Time (in minutes)}}$$

Published on September 18, 2017.

A. Rahman, J. I. J. Prothan, M. Islam and A. Pramanik are with the Department of Urban and Regional Planning Pabna University of Science and Technology, Pabna, Bangladesh.

(e-mail: atikurp121714@gmail.com, jakirpstu12@gmail.com, merazulurp16@gmail.com, ashraf.pramanik@gmail.com)

According to [3], Average duration is the average time for which the parking lot was used by the vehicles. So,

$$\text{Average Duration} = \frac{\sum (\text{Time Interval} \times \text{Time Interval})}{\text{Total Parking Volume}}$$

Parking index is also called occupancy or efficiency

$$\text{Parking Index} = \frac{\text{Parking Load}}{\text{Parking Capacity}} \times 100$$

Turnover is the ratio of a different number of vehicles parked in duration to the number of parking bays available. This can be expressed as a number of vehicles per bay per time duration.

$$\text{Average Turn-over} = \frac{\text{Sum of turn-over Vehicles}}{\text{Total no. of bays}}$$

IV. DATA ANALYSIS AND FINDINGS

After lunch time at 03:00 PM to 04:30 PM is the peak period when a maximum number of the vehicle is accumulated.

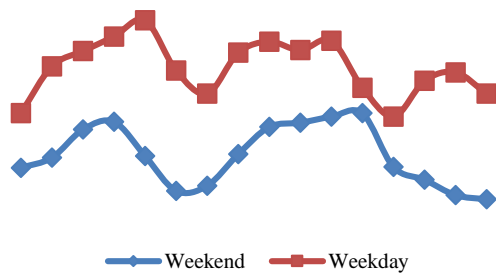


Fig.2. Parking Accumulation curve at Weekday and Weekend

From Fig.2, it is clear that the difference between calculated and expected number of vehicles is higher at weekday. On the other side, the difference between calculated and expected number of vehicles is lower at weekend than a weekday.

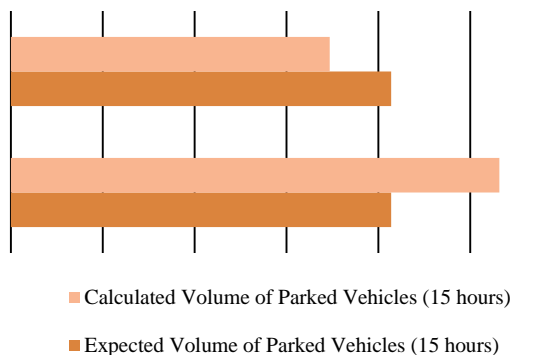


Fig.3. Calculation of expected volume of Parked Vehicles

Fig. 3 shows that demand and supply relationship at different time period. Parking demand curve always remains above Parking supply curve in weekday. Since the parking supply is fixed and there is no way to increase the parking supply, so always some spillover parking is created at this peak time.

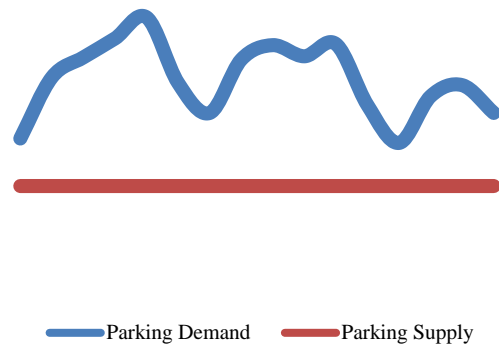


Fig.4. Parking Demand and Supply Relationship at Weekday

Average duration is the average time for which the parking lot was used by the vehicles [3].

$$\text{Average Duration} = \frac{\text{Sum of the accumulation for each time interval} \times \text{Time interval}}{\text{Total parking volume}}$$

So, average duration = $\frac{3745 \times 30}{1418} = 79.23$ minutes/vehicle or 1.32 hours/vehicle.

Average parking duration indicates that each vehicle parked for 1.32 hour which means the time period using by each vehicle exceeds the moderate level.

A. Demand Calculation

During peak hour, there were about 525 vehicles used CBD areas for parking. The Space requirement for parking as per Building Construction Rules, 1996 in Bangladesh is given below.

TABLE I: PARKING DEMAND IN THE STUDY AREA ACCORDING TO BUILDING CONSTRUCTION RULES, 1996

CBD area of Pabna Municipality			
Features(Type of Activity)	Number of the Major Features	Area Occupied (sq.ft)	Parking Demand (sq.ft)
Hotel	5	16000	1820
Commercial Site and Market Center	7	85090	8835
Mixed Use Zone	8	89884	8825
Shopping Mall	4	32595	7485
Bank Offices	11	37638	4335
Others (Commercial, Restaurant)	More than 150	25000	2870
Total Activity		286207	34170

The table shows that the parking demand, according to Building Construction Rules 1996, is 34170 sq.ft for the CBD area.

B. Number of Vehicles and Their Space Requirement

The number of parked vehicles in the study area during peak period (Weekday) is 525. In weekday Rickshaws occupy 4134 sq.ft, 28 cars occupy 6916 sq.ft.

TABLE II: PARKING DEMAND IN THE STUDY AREA ACCORDING TO NUMBER OF VEHICLES (PEAK HOUR) [6].

Parking Space Demand			
Types of vehicles			
Weekday		Weekend	
No.of	Required	No.of	Required

	vehicles	Area (sq.ft)	vehicles	Area (sq.ft)
Rickshaw	106	4134	107	4173
Car	28	6916	30	7410
Micro/ Pick up	72	22104	30	9210
Bus/ Truck	11	4279	22	8558
Auto/ CNG	146	4234	88	2552
Van	56	1624	33	957
Motorcycle	106	530	52	260
Total	525	43821	362	33120

C. Space Demand According to Parking Time

The table shows that in weekday at 11:30AM-12:30 PM and in a weekend at 4:00PM-5:00 PM the number of Parker in CBD area is the highest compared to others time. The demand for parking in the CBD area in context of peak period is also 43821.

TABLE III: DISTRIBUTION OF NUMBER OF VEHICLES ACCORDING TO DURATION AND TYPE OF VEHICLES

Type of vehicles	Average number of vehicles parked	
	Weekday 11:30AM-12:30 PM	Weekend 4:00PM- 5:00PM
Rickshaw	106 4134	107 4173
Car	28 6916	30 7410
Micro/ Pick up	72 22104	30 9210
Bus/ Truck	11 4279	22 8558
Auto/ CNG	146 4234	88 2552
Van	56 1624	33 957
Motorcycle	106 530	52 260
Total	525 43821	362 33120

The study finds the following requirement of space for parking in the CBD area of Pabna Municipality. Total Demand for Parking in the CBD area of Pabna Municipality:

Demand according to type of Building Construction Act:

$$D_A = 34170 \text{ sq.ft}$$

Demand according to type of time: $D_T = 43821 \text{ sq.ft}$

Demand according to type of number of parked vehicles:

$$D_V = 43821 \text{ sq.ft}$$

So the parking demand for CBD area in Pabna Municipality can be estimated as follows-

$$\begin{aligned}
 &= \frac{\Sigma D_A + D_T + D_V}{3} = \frac{34170 + 43821 + 43821}{3} \\
 &= 40604 \text{sq.ft} \\
 &= (40604 - 11385) \text{sq.ft} \\
 &= 29219 \text{sq.ft}
 \end{aligned}$$

D. Parking Demand – Supply Ratio

TABLE IV: PARKING DEMAND – SUPPLY SCENARIO AT WEEKDAY AND WEEKEND

Time Period	Parked Vehicles (Parking Demand)		Parking Supply	Demand-Supply Ratio	
	Weekday	Weekend		Weekday	Weekend
	10:30 AM	181	117	138	1.31
11:00 AM	236	129	138	1.71	0.93
11:30 AM	254	162	138	1.84	1.17
12:00 PM	271	171	138	1.96	1.24
12:30 PM	290	131	138	2.10	.95
01:00 PM	231	90	138	1.67	.65
02:30 PM	204	96	138	1.47	.69
03:00 PM	252	133	138	1.83	.96
03:30 PM	265	165	138	1.92	1.19
04:00 PM	255	170	138	1.84	1.23
04:30 PM	266	177	138	1.85	1.28
05:00 PM	211	181	138	1.53	1.31
05:30 PM	177	118	138	1.28	.85
06:00 PM	219	103	138	1.59	.75
06:30 PM	229	85	138	1.66	.61
07:00 PM	204	80	138	1.48	.58

E. Conflict Point in CBD Area

Due to the on-street parking some conflict points are created near the undesignated parking spaces. For improper distribution of parked vehicle at the undesignated spaces some conflict points are found during the survey period.

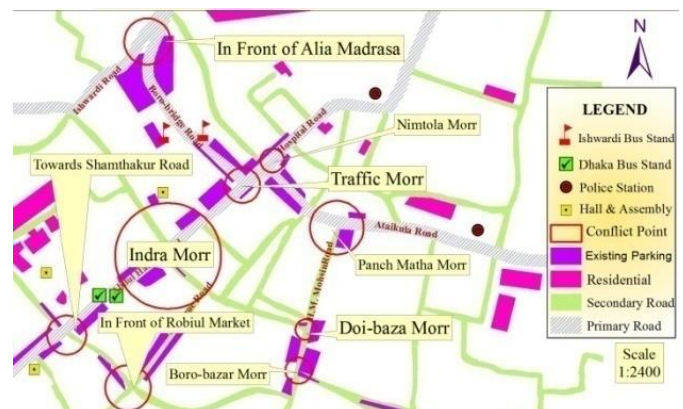


Fig. 5. Conflict point in CBD area

V. RECOMMENDATION

The present study finds that there are no public parking facilities. There are some of the parking lots for some residential building, banks, cinema hall and auditorium but this is used only for their own purposes. There is no parking space for hotel, restaurant, shopping mall, commercial site, small or single shops etc.

A. Adopting Proper Sign, Symbol and Markings

Proper directional parking sign including parking charge, parking type is needed to overcome this situation. This sign should be placed at different places of Abdul Hamid road, Boro Bridge road, Fazlul Haque road, and H.M. Mohsin road thus the Parker can easily understand which place is legal or prohibited parking space.



Fig. 6. Proposed Multi-Storeyed Building

B. Designated Loading – Unloading Zones

The feasible option is that the delivery vans should be allowed only at the off peak period of the day in three different slots at 06:00 AM – 09:00 AM, 02:00PM – 03:00PM and 09:00PM – 10:00PM to conduct their activities. This will avoid the on street occupancy at the peak traffic periods. Provisions for Two Wheeler (Bicycle & Motor Bike) Parking Space. The area is the South – West site of Traffic Morr, in front of A.R. Plaza and Khan Bahadur Shopping Mall, beside Muktijodha Market and Sonali Bank there is space where two wheeler vehicles can be accommodated.

C. Impose Penalty for Illegal Parking

The parker who parked the vehicle at the undesignated space should be under penalty for his illegal activity. The concerned traffic police of Pabna Sadar Thana will impose the penalty according to their law and the leaseholder of the parking space will help him to identify the illegal parking. This coordinating approach should help to reduce the illegal parking activity.

VI. CONCLUSION

The outcome of study has represented the inadequate space for parking, Lack of maintenance of the present system and lack of implementation of the rules and regulation related to the parking makes the situation worse. Improvement of parking situation is the immediate need by creating parking supply blending with the impose rules and restrictions against illegal parking. By which the traffic jam, accidents can be removed. Proper parking spaces not only help to solve the transportation problems like traffic jam,

accidents but also increase the aesthetic beauty of a city. A proposed multistoried parking scheme has been suggested in the recommendation section that due to land scarcity. For the future plan this study will help to provide better ideas about parking problems. A proposed multistoried parking scheme has been suggested in the recommendation section that due to land scarcity. For the future plan this study will help to provide better ideas about parking problems. Besides this solution some other strategies should be introduced to reduce the parking problems like better facilities for short time parkers to reduce the parking demand. It is the task of the urban development authorities to cater to the demand for parking.

ACKNOWLEDGEMENT

First of all, we would like to express our profound gratitude to the Almighty Allah. We are very much grateful to our respected supervisor Md. Ashrafuzzaman Pramanik, Assistant Professor and Chairman, Department of Urban and Regional Planning, PUST for his constant supervision, hearty support, continuous guidance and encouragement every stage of the work and special guideline for during the progress of the work. We are grateful to Md. Riazul Islam, Councilor of ward no: 02 in Pabna Municipality, for provide us some effective information about study area.

REFERENCES

- [1] L. R. Kadiyali, Traffic engineering and transport planning. Khanna publishers, 2013.
- [2] M. Tariq, "Parking demand analysis of shopping centres in Dhaka city." (1991). Available: <http://lib.buet.ac.bd:8080/xmlui/bitstream/handle/123456789/1691/Fu1l%20%20Thesis%20.pdf?sequence=1&isAllowed=y>
- [3] T. V. Mathew, K. K. Rao, "Introduction to Transportation engineering." Civil Engineering–Transportation Engineering. IIT Bombay, NPTEL ONLINE, <http://www.cdeep.iitb.ac.in/nptel/Civil%20Engineering> (2006).
- [4] S. Chowdhury, M. Kutub Uddin Chisty, S. Misuk, "Demand & Supply of Parking System Analysis at Chittagong Commercial Area in Bangladesh." Available: <https://www.ijser.org/researchpaper/Demand-Supply-of-Parking-System-Analysis-at-Chittagong-Commercial.pdf>
- [5] Building Construction Rules. (1996). Bangladesh.
- [6] J. De Chiara, Time-saver standards for building types. McGraw-Hill Professional Publishing, 2001. Available: <http://www.thebookishblog.com/time-saver-standards-for-building-types.pdf>
- [7] Urban Governance and Infrastructure Improvement Project (UGIIP). (2007). Land Use Survey under UGIIP, Pabna, Bangladesh.